Deliverable 2.1

Transnational report on educational needs and opportunities

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Document Control Page

WP/Task	WP2 / T2.1, T2.2
Title	Transnational report on educational needs and opportunities
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Abstract	This deliverable presents the results from the local forums in the participating countries as well as the consultation meetings with experts. The results and the feedback from these events will conclude with the educational needs and opportunities that are presented and will be provide input for the methodological blueprint (D2.2)
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Document Control Page

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1	14/4/2025	SV	First Draft of the Deliverable
2	24/4/2025	All partners	Comments received from partners
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Executive summary

This deliverable provides information from the specific workshops that the STEAM Innovation consortium conducted from December 2024 until April 2025 in Greece, Cyprus, Italy and Portugal, with teachers, students, school heads, parents, experts on educational methodologies, researchers and Cultural & Creative Industry (CCI) representatives.

The consortium partners organised 2 set of workshops in each country (Greece, Cyprus, Italy and Portugal):

1. **Local forums formation and consultation**
   This involved the strategic formation of local forums consisting of key educational stakeholders, including school administrators, teachers, students, and parents. The purpose of these forums was to facilitate a consultative process that grounds the STEAM Innovation project in the needs and aspirations of local communities. As part of this community building effort, educators worked together and exchange good practices, while members of the school and local communities had an active involvement through the use of the Design Thinking Methodology. **Focus groups were organized (in total 5) inviting relevant stakeholders (in total 69)** to voice their perceptions of local educational challenges, to pinpoint the opportunities that exist within the STEAM fields and exchange ideas. Based on the data gathered, each partner developed a national report (see ANNEX 3) and the compiled results are presented in the following section of this document.
2. **Consultation with experts in science, arts and CCIs**
   Each partner organized a local session/meeting with experts in science, arts and CCIs and representatives from local cultural and scientific institutions (**in total there were organised 4 sessions engaging 57 experts**). These sessions extracted valuable insights on current educational practices, innovative pedagogical methods, and future trends in STEAM education. The involvement of experts from varied disciplines helped to ensure that the educational framework that will be developed by the project is scientifically rigorous and creatively stimulating and culturally relevant. Each partner developed a report (ANNEX 4)

The **finding from both set of workshops, that engage 126 educators and experts**, will serve as a cornerstone for the development of an educational framework (D2.2) that will not only be pedagogically sound but also culturally attuned and region-specific.

Table of contents

1 Introduction

In order to organise and realise the 2 set of workshops in the most appropriate way as well as to have similar fields analysed in each one of them, Science View prepare guides for the partners. These guides included the main aspects that the project would like to investigate and so to have useful input for the next steps of the project (development of the STEAM educational and methodological blueprint). Below are presented the guides that each partner followed and organise the workshops in Greece, Cyprus, Italy and Portugal.

1.1 Guides for Local forums formation and consultation

1. General Information

This task involves the strategic formation of local forums consisting of key educational stakeholders, including school administrators, teachers, students, and parents. The purpose of these forums is to facilitate a consultative process that grounds the STEAM Innovation project in the needs and aspirations of local communities. As part of this community building effort, educators will work together and exchange good practices, while members of the school and local communities will have an active involvement through the use of the Design Thinking Methodology. Focus groups (at least one per partner country) will be organized inviting relevant stakeholders (20 per country) to voice their perceptions of local educational challenges, to pinpoint the opportunities that exist within the STEAM fields and exchange ideas. Based on the data gathered, each partner will develop a national report and then Science View will compile the results into a transnational report, that is expected to serve as a cornerstone for the development of an educational framework that is not only pedagogically sound but also culturally attuned and region-specific.

Duration: 2-4 hours

Target Groups: School Heads, Teachers, Students, Parents

2. Guides

The workshop should start with a general presentation of the project's objectives (Presentations are provided – you can modify them as you think appropriate but not changing the main objectives and aims of the project as well as the proposed (right now) approach that the project provide (IBSE and Design Thinking Approach and the use of the STEAM IDEAS' Square). This should last for 30 minutes max.

You should then give the opportunity to the target audience to provide information about the approaches that they are using up to now (concerning STEAM education). This should be targeting the School Heads and Teachers.

You should also take feedback from Students and Parents concerning the effectiveness of the approaches that are using up to now.

3. Recommendations for material to use

3.1 Key STEAM Notions

During the forums you could use the following STEAM notions along with the presented aims, objectives and approach of the STEAM Innovation project.

Collaboration

- Collaboration and relationality highlight the connections among individuals and their relationships.
- Not only teachers and students, but also external partners from various STEAM disciplines, local communities, educational stakeholders, and local citizens are essential.
- Facilitating collaboration involves engagement through acceptance, utilizing technology and game-based learning, emphasizing communication, connecting to specific art forms like music, and acknowledging the link between creativity and collaboration.
- Teachers play a facilitative role, prioritizing connected learning in classroom environments that emphasize problem-solving, authentic tasks, student choice, and technology integration.
- Teachers undertake multiple roles, serving as advisors, counselors, and guides.
- Teachers collaborate with one another, engaging in dialogue, and their manipulation of classroom environments is crucial for disciplinary inter-relationship.

- Collaboration and group working, teamwork, and interaction are sometimes listed as 21st-century skills.
- Collaboration and relationality are integral to a broader STEAM culture characterized by multi-modality.
- Expanding this understanding of 'cultures of collaboration,' authors within the posthuman paradigm also recognize collaboration and relationality not only between people but also between people and all others, such as the environment and the planet, as vital elements of STEAM practice in responding to the issues of the Anthropocene.

Disciplinary Inter-relationships

- Simply including mixed disciplines within STEAM practices involves familiarizing individuals with content outside their discipline or granting freedom to move between disciplines.
- The integration of the arts into curriculum and instruction in science, technology, engineering, and mathematics enhances interdisciplinary learning.
- More complex articulations entail forging new connections between subjects or skill areas within STEAM practice or fostering interaction between disciplines.
- Students' ability to transfer knowledge between disciplines is crucial for their educational development.
- Connection is grounded in the classroom environment, featuring problem-based learning, authentic tasks, student choice, technology integration, and teacher facilitation.
- Encompassing transdisciplinarity involves highlighting the role of transdisciplinary approaches to pedagogy.
- Encompassing interdisciplinarity topics immerses students in a diversity of knowledge across the domains of science, technology, engineering, arts, and mathematics.
- Establishing grounds for cross-disciplinary innovation fosters creative problem-solving and collaboration.
- An even broader approach encompasses inter-, trans-, and cross-disciplinary learning, fostering holistic understanding and collaboration.
- Related to values, multi-modality, positivity, and unlearning, STEAM education promotes a holistic approach to learning.
- Driving change through a process of making, which values experimental and material agency of invention and exchange between arts and science creativities in STEAM practices, facilitates innovation.
- Developing understanding of disciplinary identities, with personal relevance informing connections between disciplines, enhances interdisciplinary learning experiences.

Arts’ Contribution

- The need to address power imbalances within STEAM work, particularly regarding the arts, is a focus of this project aimed at restoring equilibrium.
- Arts are acknowledged for their contribution to the socio-cultural aspects of STEAM practice, often utilized to enhance learners' comprehension of scientific concepts and illustrate their relevance to everyday life.
- Involvement in STEAM can sometimes lead to the dilution of the arts, while STEM subjects may be superficially integrated into arts curricula.
- In the US, there's a slightly different understanding termed 'arts integration,' resembling what European arts educators recognize as 'education through the arts.'
- The arts are viewed as catalysts for fostering the creativity and innovation essential for economic competitiveness.
- They contribute to aesthetic learning intentions and provide meaning within STEAM contexts.
- The three core arts processes—creating, performing/producing, and responding/appreciating—are deemed fundamental across all domains within STEAM practices, regardless of the dominant arts disciplines.

Thinking-Making-Doing

- It's crucial to emphasize the interactivity of these practices rather than them occurring within STEAM separately or in parallel.
- Various kinds of thinking, including habits of thinking, system thinking, critical thinking, creative thinking, divergent, and convergent thinking, are integral to STEAM practices.
- STEAM practices aren't isolated 'brain-based' activities but interact with a broader set of skills, supporting soft skills and fostering the development of 21st-century skills.
- Problem-solving, encompassing creative, cognitive, and interactive aspects, is applied to hands-on design and production processes.

- Within the hands-on making and doing practices of multi-modality, unlearning, uncertainty management, and inquiry-based, real-world learning, STEAM is dynamic and engaging.
- STEAM is not merely sedentary or overly academic but embraces active participation, influenced by the 'Makers movement,' which values individuals as creators and consumers.
- Students are granted an active, constructive, and critical role in their learning within STEAM practices.
- Object-based learning, critique, exhibition, and critical making are derived from signature pedagogies in the arts, enriching STEAM practices.
- Acknowledging spaces, materials, and environments as integral elements integrates the various activities within STEAM.
- Connection-making, including with the environment, bodies, and the materiality of spaces, is vital in STEAM practices.
- The material nature of STEAM spaces is crucial and can be arranged to promote effective practice in various ways.
- Creating spaces and materials to enhance visibility of activities for participants and the public enhances engagement with STEAM.
- Deliberate use of digital technology, such as co-creation opportunities in music, enriches STEAM activities.
- Playful engagement with STEAM via gamification using digital tools enhances learning experiences.

Creativity

- Playfulness is a key element of creative STEAM activity, fostering innovation and the production of something novel.
- The concept of flow is integral, enhancing the relationship between problem-solving and open-ended engagement with problems as facets of creativity.
- Creativity, viewed as a skill developed through STEAM practices, is considered a kind of 'doing,' closely linked to the 'thinking-making-doing' theme.
- Tools and pedagogies, such as digital technologies and design thinking, are creatively utilized within STEAM.
- Creative activities serve as a means of making connections between disciplines, supporting collaboration within STEAM.
- Creativity is both a means of supporting other features of STEAM practices and an outcome fostered by those practices.
- The connectivity fostered through creative practices in STEAM facilitates links between secondary and tertiary learning and between schools/universities and communities in Open Schooling.

Real-world Connection

- Real-world context or connection is essential, providing authenticity and purpose to the disciplinary connections being made.
- Exploration of cutting-edge issues or 'wicked problems,' such as climate change, fosters problem-solving and inquiry within STEAM.
- There's a strong link with wider EU policy, such as the EU Strategy for Enhancing Green Skills, enhancing the relevance of STEAM education.
- Civic space serves as a real-world context, facilitating connectivity between Higher Education learners and the public.
- STEAM offers a means for learners to connect their personal meaning-making within and between disciplines to the external context.
- Identity development, such as enabling girls to identify as change-makers, is fostered within STEAM education.
- Entrepreneurship is viewed as a means of connecting STEAM activity to real-world contexts, emphasizing career focus and technology use.
- STEAM education aims to develop skills that young people might need for future careers, preparing them for the challenges of the modern workforce.

Inclusion/Personalisation/Empowerment

- Inclusivity is a core principle in STEAM education, with the integration of the arts aiming to broaden the range of interests and perspectives involved, suggesting that STEAM is inherently more inclusive than STEM alone.

- Acceptance is crucial in the design of STEAM activities, ensuring that all participants feel empowered to fully engage in every aspect of the process, regardless of their confidence levels in specific areas.
- The concepts of science capital and identity are pivotal, providing a context in which young people can develop their sense of identity within STEAM, recognizing that it is inclusive and relevant to them. Active engagement in STEAM fosters greater self-efficacy, confidence, and motivation towards learning.
- The open-ended nature of many STEAM activities, such as problem-based and inquiry learning, coupled with their real-world contexts, promotes empowerment and engagement among young people.
- Greater inclusion and empowerment within STEAM education can lead to individuals from under-represented groups, like girls, developing identities as change-makers and feeling empowered to contribute to societal progress.

Equity - an underlying value of all STEAM practices

- A values-based approach to STEAM education advocates for a departure from the dominant disciplinary approach in education.
- It entails adopting an affirmative ethical stance, promoting inclusivity and diversity within the curriculum.
- A flattened hierarchy between disciplines is recognized, with the arts regarded as core subjects alongside STEM, ensuring equitable access to time and resources for all.
- Students are empowered to take the lead in their learning, with teachers assuming the role of facilitators and guides, fostering a more equitable power relation in the classroom.
- Equity emerges as a potential outcome of STEAM education, particularly in the production of socially equitable responses to global challenges, although this is more aspirational than evidence-based at present.
- Equity is identified as a key feature of STEAM practices, more commonly observed in tertiary-level education compared to secondary education.

3.2 Recommended Questions/Statements to have in mind for school units and educators/students

Below we propose some questions/statements that you can use and/or have in mind and you can select some or all of them in order to collect feedback from the participants. It is not needed to collect questionnaires but these questions could guide your discussion with the participants. For the collection of the feedback, you will need to fill in the Report that is in Section 4 of this document.

3.2.1 Exploratory questions/statements

- Have you participated as an educator in activities that promote STEAM education?
- STEAM education is adequately represented in the school curriculum.
- STEAM education must by definition take place outside of school hours, because it is not compatible with school education.
- STEAM education can de facto only take place outside of the school curriculum, because there is no space and time for it in the school reality.
- My teaching incorporates the educational approach of STEAM.
- The STEAM activities I implement are closely linked to the school's curriculum.
- The STEAM activities I implement take place:
  - Mainly during school hours
  - Mainly outside of school hours
  - In the context of a group, afternoon activities, etc.
  - Out of school
  - I do not implement STEAM activities.
- Within a school year, the STEAM activities I implement last?
- How many hours of preparation does the STEAM activity you do require of you per school year?
- My school encourages doing STEAM activities.
- The conditions for doing STEAM activities at my school are favorable.
- My colleagues are available to collaborate on the development and implementation of STEAM activities.
- Parents and the external environment of my school favor the implementation of STEAM activities.
- I receive adequate training on teaching with the methodology of STEAM

- I am sufficiently informed about training opportunities on teaching with the methodology of STEAM
- If you are not developing STEAM activities, what are the reasons for this?
- The Performing Arts (Theatre, Music, Dance), Film and other related Art forms are adequately represented in the school's existing curriculum.
- Visual Arts (Painting, Sculpture) and other related Art forms are adequately represented in the school's existing curriculum.

3.2.2 Barrier's questions/statements

Challenges for the integration of STEAM in science education

1. Institutional and Structural Barriers:
- Traditional Educational Paradigm: The traditional education system is often rigid and resistant to change, favoring established practices and methodologies.
- Lack of Leadership and Support: Educational institutions often lack strong leadership and support for innovation, with decision-making processes favoring status quo.
- Financial Resources and Infrastructure: Implementing innovative educational approaches often requires significant financial resources, which may not be readily available to schools and institutions.
- Curriculum and Assessment Frameworks: Existing curriculum and assessment frameworks may not align with innovative approaches, creating challenges in implementing and evaluating change.

2. Teacher Training and Professional Development:
- Teacher Expertise and Capacity: Many teachers may not have the necessary expertise and training to effectively implement innovative pedagogical practices.
- Fear of Change and Resistance to New Approaches: Teachers may be resistant to change and unfamiliarity with new technologies or teaching methodologies.
- Time and Resources for Professional Development: Integrating innovation into teaching practice requires dedicated time and resources for professional development and training.

3. Cultural and Societal Perspectives:
- Traditional Learning Values and Practices: Societal expectations and traditional views on education may hinder the adoption of innovative approaches.
- Parental Concerns and Misconceptions: Parents may be apprehensive about new teaching methods or technologies, fearing that they may harm their children's education.
- Lack of Public Awareness and Support: There may be a lack of awareness and support from the public and policymakers for innovative educational reforms.

3.2.3 Conditions and requirements for the introduction of STEAM in education

To answer the questions below, please think of the educational context you are most familiar with, in the country where you live.

Focus on the curriculum

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?
- Integrating curriculum areas and disciplines which, traditionally, are not connected.
- STEAM practices involving arts in ways that empower students to express themselves, create, innovate.
- STEAM practices that are based on addressing real-world problems and challenges.
- STEAM practices that address community needs, societal concerns, and cutting-edge issues.
- STEAM practices that embrace exploration, multiple pathways to knowledge, uncertainty.
- STEAM practices that are practical and hands-on, involving doing and making.
- STEAM practices that develop a variety of thinking skills (e.g., critical, creative, systems thinking, metacognitive).
- STEAM practices that foster student's active role and ownership of the learning activity.
- STEAM practices that foster collaboration among students.
- STEAM practices that foster collaboration among students and teachers.
- STEAM practices that foster collaboration among students, teachers, and actors from outside school.
- STEAM practices that are joyful, engaging, generating intrinsic student motivation.

- STEAM practices that empower students to develop their identities and personal meaning-making.
- STEAM practices that ensure equity and inclusion, helping all students to see themselves as successful learners.

Focus on learning assessment

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Learning assessment practices that go beyond traditional testing, to cover aspects such as student engagement, collaboration, wider competence development.
- Help in the ongoing evaluation and improvement of educational practices.

Focus on students

In your view, is the following an important condition for the introduction of STEAM in education? And is it easy or difficult to achieve for the introduction of STEAM in today's education?

- Students' positive stance towards STEAM
- Are the following aspects important factors for the effective integration of STEAM in education?
  - Students' previous knowledge and academic achievement
  - Students' socioeconomic background
  - Students' previous learning experiences

Focus on teachers

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Shift in teacher role, from instructor to facilitator of student-led learning
- Teacher's role as a change agent actively driving positive change in education
- Teacher's freedom to decide and act autonomously
- Teacher's ownership and personal investment in STEAM practices and initiatives
- Teacher's job satisfaction and motivation
- Teacher's beliefs and attitudes in relation to teaching and learning
- Teachers' positive stance towards STEAM
- Teacher's belief in their own ability to apply STEAM in practice
- Teacher's familiarity with other areas of the curriculum beyond their own main area(s) of expertise
- Teacher's familiarity with the use of technology in educational practice
- Are the following aspects important factors for the effective integration of STEAM in education?
  - Teacher's previous teaching experiences
  - Teacher's age
- Based on what you consider most appropriate for the integration of STEAM in today's education, you would prefer:
  - STEAM activities implemented mainly by STEM teachers (science, technology, engineering, maths)
  - STEAM activities implemented mainly by arts and humanities teachers
  - STEAM activities implemented by all teachers
  - STEAM activities implemented mainly by teachers with a STEAM specialization

Focus on teacher professional development

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Appropriate pre-service teacher training
- Availability of relevant in-service teacher professional development opportunities
- In-service professional development tailored to teacher's individual needs
- Availability of concrete teacher support structures and schemes, e.g. mentorship, peer coaching, collaborative learning communities etc.

Focus on school leadership

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- School leadership supportive of innovative educational practices
- School leadership trusting teacher autonomy and initiative
- School leadership shifting from top-down approaches to a collaborative vision of distributed leadership roles and shared decision-making
- Visionary school leadership proactively creating the conditions for the integration of STEAM
- Long-term planning and commitment supporting the sustainability and scalability of STEAM innovation in the school

Focus on school climate and culture

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Encouragement of collaboration across disciplines and curriculum areas
- All disciplines valued equally, ensuring equitable access to opportunities and resources
- Encouragement of exploration, experimentation, risk-taking, learning from mistakes
- A culture of ongoing evaluation towards continuous improvement
- Teachers can choose to implement innovations that align with their personal goals and vision
- Teachers sharing expertise, good practices, resources with their colleagues

Focus on school structure and organisation

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Availability of time within the core school schedule
- Possibility to use time flexibly within the core school schedule (e.g. restructuring the schedule)
- Possibility to use time outside the core school schedule
- Space availability within the school
- Possibility to use school space flexibly
- Possibility to use spaces outside the school
- Flexibility to support teachers' collaboration on joint teaching practices and projects
- Availability of material resources beyond traditional textbooks and equipment
- Availability of financial resources
- Budget flexibility to adapt to emerging needs

Focus on the external environment

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Authorities' (above school leadership) positive stance towards STEAM
- School's readiness to interact with external partners
- External partners' readiness to interact with the school
- Parents' active engagement with school life
- Parents' positive stance towards STEAM activities
- The school as one part of a wider collaborative learning ecosystem within the community
- Collaboration with informal/non-formal learning spaces and practitioners
- Collaboration with higher education institutions, teachers, researchers, students
- Socioeconomic, inclusivity and equity-related considerations shaping STEAM practices

Focus on the curriculum and educational policy

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Teachers making independent teaching and assessment choices, within general curriculum frameworks and guidelines
- Curriculum flexibility allowing for innovative practices
- STEAM formally recognized as part of the curriculum
- Based on what you consider most appropriate for the integration of STEAM in today's education, you would prefer:
  - STEAM practices integrated mainly in STEM curriculum areas (science, technology, engineering, maths)

- STEAM practices integrated mainly in arts and humanities curriculum areas
- STEAM practices integrated across the curriculum
- STEAM as a separate curriculum area

Focus on recognizing the value of STEAM

In your view, are the following important conditions for the introduction of STEAM in education? And are they easy or difficult to achieve for the introduction of STEAM in today's education?

- Recognition of the pedagogical value and benefits of STEAM
- Belief in the compatibility of STEAM with the existing educational culture and practices
- Compatibility of STEAM with social norms, beliefs and expectations regarding education
- Availability of evidence on the effectiveness and positive impact of STEAM practices

3.3 Recommended Questions/Statements to have in mind for parents

The following questions can refer to parents participating in the local forums. These questions can help gauge their awareness, attitudes, and expectations.

Awareness and Understanding

- Are you familiar with the concept of STEAM education?
- What do you think are the benefits of integrating arts into traditional STEM subjects?
- Have you heard about any STEAM-related initiatives or programs at your child's school?

Perception and Opinions

- Do you think STEAM education is important for preparing students for future careers? Why or why not?
- How do you feel about the balance between STEAM and other subjects in your child's education?
- Do you think schools should invest more in STEAM-focused programs or facilities?

Engagement and Participation

- Has your child expressed interest in STEAM subjects or activities?
- Do you think the school provides sufficient opportunities for hands-on STEAM learning, such as workshops, labs, or projects?
- Would you be interested in participating in STEAM-related events or activities organized by the school?

Feedback on Current Approaches

- How would you rate your child's school in promoting creativity and critical thinking through STEAM education?
- Are there specific areas of STEAM (science, technology, engineering, arts, or math) that you feel need more emphasis?
- What challenges or obstacles do you see in implementing effective STEAM education in schools?

Suggestions and Expectations

- What kind of STEAM programs or activities would you like to see introduced at the school?
- How can schools better involve parents in supporting STEAM education?
- What role do you think arts should play in enhancing the teaching of science and technology?

Open-Ended Questions

- Do you have any concerns about how STEAM education is currently implemented?
- Can you share any positive experiences your child has had with STEAM-related learning?
- What skills or knowledge do you hope your child will gain from STEAM education?

1.2 Guide for Organizing Meetings with Experts in Science, Arts, CCIs, and Local Institutions on STEAM Education

1. General Information

Each partner will be responsible to organize such local sessions/meetings with experts in science, arts and CCIs and representatives from local cultural and scientific institutions (at least one person from each sector, a total of 10 individuals from each country). These sessions intend to extract valuable insights on current educational practices, innovative pedagogical methods, and future trends in STEAM education. The involvement of experts

from varied disciplines will help to ensure that the educational framework developed by the project is scientifically rigorous and creatively stimulating and culturally relevant.
Duration: 2-3 hours
Target Groups: Experts in science, arts and CCIs as well as representatives from local cultural and scientific institutions

2. Guides

1. Preparation Phase

- Define Objectives: Clearly outline the goals of the session (e.g., gathering insights on current practices, identifying innovative pedagogies, and discussing future trends).
- Stakeholder Mapping: Identify experts, artists, and institutions that are key players in science, arts, CCIs, and STEAM education. Include diverse perspectives.
- Agenda Creation: Develop a clear agenda, balancing presentations, group discussions, and brainstorming sessions.
- Set the Tone: Highlight the importance of interdisciplinarity and encourage open dialogue.

2. Structure of the Meeting

- Introduction (15-20 mins):
  - Briefly present the objectives of the session.
  - Share an overview of the importance of STEAM education in fostering creativity, critical thinking, and problem-solving.
- Panel Presentations (30-45 mins):
  - Invite 3-5 experts to share short presentations about their experiences and insights.
- Breakout Sessions (45 mins):
  - Divide participants into small groups to discuss specific themes or questions.
- Plenary Discussion (30 mins):
  - Gather the breakout groups to present key takeaways.
- Conclusion (15 mins):
  - Summarize insights and outline next steps.

3. Indicative Questions for Discussions

A. Current Educational Practices

1. What are the most impactful practices currently used in STEAM education within your field?
2. How do local cultural and scientific institutions integrate STEAM education into their programs?
3. Can you provide examples of successful interdisciplinary collaborations in education?

B. Innovative Pedagogical Methods

4. What role do arts and culture play in making STEM more accessible and engaging?
5. How can CCIs contribute to developing creative thinking in STEAM education?
6. What technologies or methodologies are revolutionizing teaching and learning in STEAM?

C. Challenges and Opportunities

7. What are the biggest challenges faced in integrating STEAM education at a regional or local level?
8. How can local institutions and experts address gaps in STEAM-related resources or teacher training?
9. What funding or partnerships could be leveraged to advance innovative STEAM initiatives?

D. Future Trends

10. What trends do you foresee shaping the future of STEAM education over the next decade?
11. How can education systems adapt to emerging fields like AI, robotics, or environmental sciences through STEAM?
12. How might collaborations between science, arts, and technology evolve to foster interdisciplinary education?

4. Follow-Up

- Documentation: Summarize the key insights and create the report.

- Networking: Encourage ongoing collaborations between participants as well as with the project.

5. Proposed Agenda Template

Please use the template document from here

Session Title: Exploring STEAM Education: Insights from Experts in Science, Arts, and CCIs

Date: [Insert Date]

Location: [Insert Venue or Online Platform Link]

Duration: [Insert Timeframe]

Agenda

9:30 AM – 10:00 AM | Registration & Networking

- Arrival of participants
- Light refreshments (optional)

10:00 AM – 10:15 AM | Welcome and Introduction

- Welcome by moderator
- Overview of session objectives and agenda

10:15 AM – 11:00 AM | Panel Presentations

- Speaker 1: [Insert Name] – [Topic/Focus Area]
- Speaker 2: [Insert Name] – [Topic/Focus Area]
- Speaker 3: [Insert Name] – [Topic/Focus Area]

11:00 AM – 11:15 AM | Q&A Session

- Open discussion based on panel presentations

11:15 AM – 11:30 AM | Coffee Break

11:30 AM – 12:15 PM | Breakout Sessions

- Group 1: [Theme 1, e.g., Current Practices in STEAM Education]
- Group 2: [Theme 2, e.g., Innovative Pedagogies]
- Group 3: [Theme 3, e.g., Future Trends in STEAM Education]

12:15 PM – 12:45 PM | Plenary Discussion

- Reports from each group
- Moderated synthesis of ideas

12:45 PM – 1:00 PM | Closing Remarks

- Summary of key takeaways
- Outline follow-up actions and opportunities

1:00 PM | End of Session

2 Reports and Analysis

2.1 Local forums formation and consultation

Below are presented the key findings from all the Local Forums in Greece, Cyprus, Italy and Portugal. The full reports from each country are presented in ANNEX 3.

2.1.1 STEAM Innovation Local Forum, Greece

Background:

The STEAM Forum in Greece convened 22 participants, including secondary and primary school educators and specialists from the arts and research education sectors. All attendees had prior experience in STEAM-related activities, primarily through extracurricular initiatives such as *Learning Science Through Theater*.

Key Findings:

- **Current Implementation:**
  STEAM education in Greece predominantly occurs outside the formal school curriculum. Despite isolated initiatives supported by the Ministry of Education, interdisciplinary integration remains limited.
- **Challenges Identified:**
  - **Institutional and Structural Barriers:** The existing educational framework is resistant to change, necessitating comprehensive curriculum reforms.
  - **Teacher Training Needs:** There is a critical need for structured professional development in interdisciplinary, student-centered, and technology-integrated teaching methodologies.
  - **Resource Utilization:** Available digital and technological tools are underutilized, largely due to limited teacher expertise and time constraints.
  - **Assessment Mechanisms:** Participants emphasized the necessity for tailored evaluation methods to measure the effectiveness of STEAM education.
- **Student Engagement and Equity:**
  While a positive attitude among students was recognized as vital for successful STEAM integration, participants expressed differing views regarding the influence of students' socioeconomic backgrounds. There was consensus, however, on the importance of creating inclusive learning environments.
- **Institutional Autonomy and External Partnerships:**
  Participants discussed the emerging role of external partnerships (e.g., community organizations, parents, higher education institutions) in school operations, in light of recent national efforts to enhance school autonomy.

Opportunities Identified:

- Promotion of innovative, experiential teaching practices.
- Strengthening interdisciplinary collaboration among educators.
- Enhancing student creativity, critical thinking, and engagement.
- Expanding professional networks and access to external resources and funding opportunities.
- Positioning schools as dynamic, collaborative hubs within broader learning ecosystems.

Key Questions Raised:

- How can STEAM activities be effectively incorporated into the existing school timetable?
- What professional development programs should be established to support STEAM innovation?
- How can governmental bodies and authorities actively support the scaling and sustainability of STEAM initiatives?

2.1.2 STEAM Innovation Local Forums, Cyprus

Background

Two STEAM forums were held in Cyprus, gathering a total of 19 participants, including primary and secondary school teachers, parents of secondary students, a head teacher, and a retired educator active in the NGO sector. Participants' familiarity with STEAM varied: some had practical experience through training seminars

and extracurricular activities, while others showed limited prior exposure. Overall, STEAM education in Cyprus remains largely extracurricular, with significant challenges in integrating it formally into the curriculum.

Key Findings

Current Implementation

- STEAM initiatives are mostly extracurricular or pilot projects with limited systemic integration.
- Broader integration is hindered by structural rigidity in the traditional education system.

Consensus Points

- STEAM education is critical for building future skills like problem-solving, creativity, confidence, and innovation.
- STEAM should be embedded into existing curricula rather than introduced as a separate subject.
- Strong emphasis on the need for teacher training, infrastructure upgrades, leadership support, and systemic reforms.
- Collaboration among educators and interdisciplinary teamwork are essential for successful STEAM implementation.

Challenges

- Limited knowledge and low awareness of STEAM principles among many educators.
- Lack of financial support, insufficient equipment, and minimal dedicated time for STEAM activities.
- Inadequate teacher training in interdisciplinary and innovative pedagogies.
- Rigid curricula and inconsistent leadership support limit flexibility.
- Socioeconomic disparities affect equitable student engagement.
- Traditional assessment practices are not aligned with project-based, interdisciplinary STEAM approaches.
- Resistance to adopting new methodologies among some teachers.

Opportunities

- Launch awareness campaigns and foundational training to bridge educator knowledge gaps.
- Integrate STEAM into science, technology, and afternoon extracurricular programmes.
- Develop flexible, interdisciplinary curricula across education levels.
- Provide structured, ready-to-use educational materials and continuous professional development.
- Foster collaborative school cultures and partnerships with communities, NGOs, and external organizations.
- Promote early, hands-on engagement in STEAM fields to build student interest and confidence.
- Expand technological integration (e.g., VR, gamification, 3D printing) in classrooms.
- Strengthen national policy frameworks to institutionalize STEAM education and align with EU digital and green transition priorities.

Student Engagement and Equity

- Positive attitudes toward STEAM activities were seen as crucial for student engagement.
- Inclusive strategies are needed to ensure equitable access across diverse socioeconomic backgrounds.

Key Questions Raised

- How can time be allocated within existing school schedules for STEAM activities?
- What financial and material strategies can be implemented to support STEAM education?
- What specific training and resources can the STEAM Invocation project offer to help teachers innovate?
- How can teachers and parents get involved in STEAM initiatives?
- Is there accessible STEAM material available for all educators and parents?
- How can parents stay informed about STEAM activities in secondary education?
- What policy changes are needed to create a sustainable national framework for STEAM?

2.1.3 STEAM Innovation Local Forum, Italy

Background: The STEAM Education Forum in Italy convened a diverse group of participants, including 21 adults (secondary and primary school teachers, parents, and a counselor of alternative school programs) and 9 students. The forum focused on understanding the state of STEAM (Science, Technology, Engineering, Arts,

and Mathematics) education, its integration into curricula, challenges faced by educators, students, and families, and the opportunities for its expansion and improvement. A significant finding was the disparity in prior experience with STEAM education among participants, which influenced their perspectives and suggestions for improvement.

Points of Consensus:

- **Varying Experience with STEAM:** Educators, students, and parents showed a wide range of experiences with STEAM, with some being aware of extracurricular programs and others unaware. The discussion highlighted a need for initiatives to bridge these engagement gaps and enhance awareness and participation across all groups.
- **Challenges in Integration:** A major barrier identified was the lack of integration of STEAM into formal curricula. Participants noted the difficulty of aligning STEAM with existing learning objectives, with many teachers lacking the experience and support to effectively incorporate interdisciplinary methodologies. Time constraints and bureaucratic obstacles also emerged as significant hindrances.
- **Assessment Issues:** Traditional assessment methods were found inadequate for evaluating interdisciplinary skills. Participants emphasized the need for alternative strategies, such as portfolios, rubrics, and peer evaluations, to assess students' critical thinking, creativity, and problem-solving abilities.
- **Need for Collaboration and Resources:** Effective STEAM education requires collaboration among educators, schools, and families. Participants highlighted the importance of teacher training, cross-disciplinary teamwork, and the availability of adequate resources (labs, technology, materials) to create meaningful learning experiences for students.

Focus Areas:

1. **Students:** Students recognized STEAM's role in developing essential skills such as critical thinking, creativity, and collaboration. They stressed the importance of access to well-equipped labs, teacher support, and the integration of STEAM into the curriculum. Students also emphasized the role of parental involvement in encouraging curiosity and supporting educational activities.
2. **Teachers:** Teachers expressed a mixed outlook on STEAM, with some enthusiastic about incorporating it into their teaching, while others viewed it as challenging, particularly due to curriculum limitations, lack of training, and time constraints. A key recommendation was professional development in STEAM pedagogy and assessment, alongside greater collaboration among educators.
3. **School Leadership:** Forum participants stressed the need for school leaders to define a clear vision for STEAM education, integrate it into the school's strategic plan, and ensure that resources and professional development opportunities are available. Leaders must also foster a culture of collaboration and remove administrative barriers that hinder STEAM implementation.
4. **Curriculum and Policy:** The integration of STEAM requires an interdisciplinary curriculum that aligns with clear learning objectives. Educational policies should support funding for professional development, innovative assessment tools, and equitable access to STEAM education for all students, including those from disadvantaged backgrounds.

Challenges Identified:

- Difficulty aligning STEAM activities with the existing curriculum.
- Lack of interdisciplinary courses and insufficient teacher training in STEAM pedagogy.
- Limited resources, including technology, materials, and equipment.
- Bureaucratic and administrative obstacles slowing STEAM adoption.
- Insufficient strategies to engage students from economically disadvantaged backgrounds.
- Resistance to change from educators, particularly older teachers struggling with new methodologies.

Opportunities:

- Increased student engagement and motivation through interdisciplinary learning.
- Development of 21st-century skills such as critical thinking, creativity, and problem-solving.
- Improved learning outcomes in science, technology, engineering, arts, and mathematics.
- Strengthened partnerships between schools, businesses, and community organizations.
- Empowerment of students from underrepresented groups to pursue STEAM careers.

- Fostering a culture of innovation and entrepreneurship.
- Opportunities for real-world learning experiences, such as internships and field trips.

Key Questions Raised:

- How can policies promote STEAM integration in schools?
- What resources are available to support STEAM education at the school or district level?
- How can schools secure funding for STEAM projects?
- How can schools foster collaboration among teachers and create a school-wide STEAM culture?
- How can we measure the effectiveness of STEAM objectives in the classroom?

Conclusion: The focus group discussions highlighted a strong need for systemic changes to support the successful integration of STEAM in Italy's educational framework. Key strategies for overcoming barriers include increasing teacher professional development, fostering collaboration, securing resources, and creating a more flexible and inclusive curriculum. With the right support, STEAM education has the potential to significantly enhance students' skills and prepare them for future careers in high-demand fields.

2.1.4 STEAM Innovation Local Forum, Portugal

Background: The STEAM Education Forum in Portugal brought together a diverse group of 25 participants, including 9 students, 10 parents, 4 teachers, and 2 members of the school board. The forum aimed to explore the current state of STEAM (Science, Technology, Engineering, Arts, and Mathematics) education, the challenges and opportunities in its implementation, and the perspectives of various stakeholders. There was broad agreement on the importance of STEAM education but differing opinions on how best to integrate it into the educational system.

Points of Consensus:

1. **Importance of STEAM Education:**
    - **Teachers:** Recognized STEAM as a tool for innovation, fostering meaningful learning experiences through hands-on experimentation.
    - **Students:** Viewed STEAM as an engaging, modern way of learning that reflects evolving educational needs and encourages creativity.
    - **Parents:** Appreciated STEAM's holistic approach to education, linking knowledge to real-world applications and developing critical thinking.
    - **School Board:** Valued the interdisciplinary nature of STEAM, which fosters empathy and global understanding.
2. **Need for Collaboration:** All groups agreed on the critical need for cooperation among teachers, parents, students, and the school board to implement STEAM practices effectively. This shared responsibility was seen as essential to ensuring the success of STEAM initiatives.

Points of Contention:

1. **Implementation Strategies:**
    - **Teachers and Parents:** Emphasized the need to restructure curricula, invest in teacher training, and create flexible learning environments to accommodate STEAM principles.
    - **Students:** Advocated for enhancing classroom experiences and incorporating more technology into learning.
    - **School Board:** Focused on advocating for policy-level changes and creating partnerships with external organizations to support STEAM initiatives.
2. **Evaluation Methods:**
    - There was ongoing debate about adapting student assessments to align with STEAM principles, aiming to find a balance between traditional and innovative assessment approaches.
3. **Resource Allocation:**
    - Opinions varied on how best to prioritize resources, such as technology, teacher training, and infrastructure, to effectively support STEAM education.

Challenges Identified:

- **Teacher Training and Motivation:** A key challenge was the lack of sufficient teacher training in STEAM methodologies, along with a need for greater motivation among teachers to adopt these practices.
- **Technological Resources and Classroom Spaces:** Participants identified insufficient access to the necessary technological resources and the lack of adaptable classroom spaces as significant obstacles to implementing STEAM education.
- **Resistance to Change:** There was a general reluctance to move away from traditional teaching and assessment practices, which hindered the integration of STEAM.
- **Communication Gaps:** Poor communication between school stakeholders (teachers, parents, school board) and broader educational policies created barriers to effective STEAM implementation.

Opportunities Identified:

- **Engaging Parents and Community Members:** Involving parents and the broader community in STEAM projects could foster greater support and participation.
- **Building Partnerships with Local Businesses and Organizations:** Collaborative efforts with external partners could enhance resource availability and provide real-world applications for students.
- **Transdisciplinary and Project-Based Learning:** Developing transdisciplinary approaches and project-based learning models could help integrate STEAM principles more effectively.
- **Promoting Innovation:** Dynamic workshops and collaborative initiatives present an opportunity to cultivate innovation in education, engaging students in problem-solving and creative thinking.

Key Questions Raised:

1. What specific training programs can be introduced to prepare teachers for STEAM?
2. How can parents be effectively integrated into the school's STEAM activities?
3. What changes are needed in national policies to support STEAM education?
4. How can we balance STEAM's innovative approaches with the current standardized assessment methods?
5. What role should external organizations play in facilitating STEAM implementation?
6. How can schools ensure equal access to resources for all students to participate in STEAM initiatives?
7. What are the most effective ways to measure the success of STEAM education?

Conclusion: The forum underscored the importance of STEAM education for fostering critical skills such as creativity, problem-solving, and global understanding. While there was consensus on its value, the participants identified several challenges, including insufficient teacher training, lack of resources, and resistance to change in traditional teaching methods. To move forward, stakeholders must prioritize collaboration, resource allocation, and policy reforms that support the effective integration of STEAM into the curriculum. By addressing these issues, STEAM education has the potential to provide engaging, future-ready learning experiences for all students.

2.1.5 Consolidate results from the Local Forums

Below are presented the results from the all the local forums in a table for all the countries so to be able to compare. Also, we present a spider diagram comparing main dimensions that were discussed during the forums.

Table 1: *Consolidate results from the local Forums*

Dimension	Greece	Cyprus	Italy	Portugal
General Attitude towards STEAM	Strong support for STEAM as future-oriented education; recognition of STEAM's importance but uneven practical implementation.	Strong support for STEAM; seen as essential for modern skills; enthusiasm among educators and parents.	High support but variable prior experience; acknowledged potential but practical challenges stressed.	Strong support across all groups; viewed as fostering creativity, problem-solving, and critical thinking.
Previous Experience with STEAM	Limited prior exposure; mainly extracurricular initiatives; low integration in curriculum.	Moderate prior engagement; mostly extracurricular activities; formal curriculum lacks integration.	Highly variable; some had experience via extracurricular activities, others had no exposure.	Some exposure noted; particularly via innovative teachers and projects, but inconsistent across schools.
Key Challenges	Lack of teacher training, rigid curricula, limited resources, resistance to new teaching methods, bureaucratic constraints.	Need for teacher professional development, insufficient infrastructure, lack of assessment methods for interdisciplinary learning.	Lack of teacher training, time constraints, insufficient collaboration, bureaucratic barriers, inadequate integration into curriculum.	Lack of teacher training, resource shortages, traditional teaching practices resistance, communication gaps with policymakers.
Focus on Teachers	Need for systematic teacher training and encouragement of interdisciplinary teaching.	Emphasis on equipping teachers with skills for cross-disciplinary learning; supporting risk-taking.	Teachers enthusiastic but hampered by systemic obstacles; older teachers face difficulties adapting to technology and STEAM.	Teachers recognize need for training; mixed readiness; emphasized need for collaboration and motivation.
Focus on Students	Students excited about STEAM but need more engaging, project-based learning; desire real-world connections.	Students motivated by real-world applications and hands-on activities; positive about technology integration.	Students emphasize importance of creativity, teamwork, and need for better-equipped environments.	Students find STEAM fun and relevant; advocate for improved tech use and modernized classroom experiences.
Assessment Issues	Traditional assessment methods seen as inadequate; need for creative, competency-based assessments.	Urgent need for innovative, formative assessment tools that capture interdisciplinary learning.	Traditional assessments unsuitable; challenge in evaluating creativity, critical thinking; call for rubrics, portfolios, peer assessments.	Debate over balancing traditional assessments with STEAM principles; call for new, flexible evaluation methods.
School Leadership Role	Leadership must support innovation, reduce bureaucracy, and encourage collaboration across departments.	Strong leadership support needed; must prioritize resource allocation and create strategic vision for STEAM.	Leaders expected to align STEAM activities with school vision; reduce barriers; foster a collaborative culture.	School boards recognize the need for leadership in policy change, partnerships, and curriculum reform.
Curriculum and Policy Focus	Need to embed STEAM systematically in curriculum; advocate for national policy support.	Require systemic curriculum change and alignment with 21st-century skills; suggest policy incentives.	Call for interdisciplinary curriculum reform, better integration with learning objectives; policy support critical.	Emphasis on policy-level changes, fostering partnerships with external organizations, and curriculum flexibility.
Equity and Inclusion	Risk of STEAM opportunities favoring more privileged students; calls for inclusive approaches.	Recognition that equitable access must be ensured, especially for underrepresented groups.	Concern about reaching disadvantaged students and families; socioeconomic barriers identified.	Need for equal access emphasized; resource allocation a concern for equity.
Opportunities Identified	Enhancing student engagement, promoting 21st-century skills, fostering innovation, preparing students for future careers.	Fostering partnerships, promoting real-world learning, empowering teachers, and increasing STEAM career pipelines.	Empowering students' creativity and critical thinking; fostering a school culture of innovation; economic potential in STEAM careers.	Boosting engagement, strengthening partnerships, promoting project-based learning, fostering educational innovation.

Dimension	Greece	Cyprus	Italy	Portugal
Questions Raised	How to better train teachers? How to secure funding? How to involve parents and communities?	What resources and policies are needed? How to reform assessment? How to engage community partners?	How to reduce administrative barriers? How to design inclusive STEAM initiatives? How to measure success?	What training is needed? How to engage parents and external organizations? How to balance innovation with traditional standards?
Number of Attendees	22 participants.	19 participants.	30 participants (21 adults + 9 students).	25 participants.

Below is presented a visual comparison of Greece, Cyprus, Italy, and Portugal based on key STEAM education readiness dimensions: **Teacher Readiness**, **Curriculum Integration**, **Leadership Support**, **Resource Availability**, and **Equity & Inclusion,** following to the analysis from the reports above.

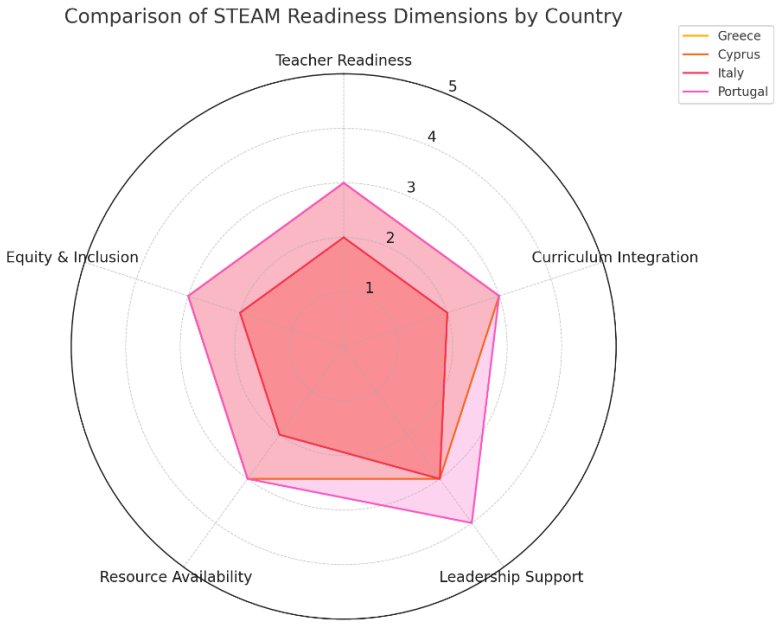

Figure 1: *Spider Diagram from the local forums*

2.2 Consultation with experts in science, arts and CCIs

Below are presented the key findings from all the Experts Forums in Greece, Cyprus, Italy and Portugal. The full reports from each country are presented in ANNEX 4.

2.2.1 Greece STEAM Innovation Experts Forum

The Greece STEAM Innovation Experts Forum gathered 15 participants, including school teachers, artists, a university professor, and a representative of the Cultural and Creative Industries (CCI) sector. The discussion highlighted significant developments, challenges, and opportunities in advancing STEAM (Science, Technology, Engineering, Arts, and Mathematics) education in Greece.

Points of Consensus

Participants agreed that STEAM education in Greece is rapidly evolving through impactful practices such as project-based learning, robotics and coding initiatives, art-science collaborations, maker education, and game-based learning. Cultural and scientific institutions, including museums, universities, and festivals, play an increasingly important role in delivering interdisciplinary learning experiences beyond traditional classrooms. Innovative programs like *Learning Science Through Theater*, *Global Science Opera*, and *Athens Digital Arts Festival* showcase successful arts-science collaborations.

Participants emphasized that integrating arts and culture into STEM fields makes learning more accessible, engaging, and inclusive. Cultural and Creative Industries (CCIs) contribute significantly by fostering creativity,

critical thinking, and innovation. Emerging technologies like VR, AR, AI, and digital fabrication were seen as revolutionizing STEAM teaching and learning.
Future trends discussed included a stronger focus on interdisciplinary, ethical, and sustainability-centered education, with closer collaboration between the arts, sciences, and technology sectors.

Points of Contention

Key challenges identified included:

- Unequal access to STEAM resources between urban and rural areas.
- Fragmented implementation due to reliance on individual teacher initiatives.
- Inadequate assessment methods for interdisciplinary, project-based learning.
- Superficial integration of the arts in some STEAM practices.
- Risk of overemphasis on technology without clear pedagogical purposes.
- Concerns about the commercial influence of CCIs in educational settings.
- Technological divides and teacher training gaps.
- Ethical concerns regarding the integration of AI and robotics.
- Resistance to interdisciplinary models within traditional education structures.

Challenges and Opportunities

Greece faces challenges including limited infrastructure, uneven teacher readiness, rigid curricula, and insufficient funding. However, strong opportunities exist through partnerships with universities, cultural organizations, and the private sector. Funding from EU programs (Erasmus+, Horizon Europe, Creative Europe) and collaboration with CCIs and tech industries were highlighted as key drivers to expand STEAM education locally and regionally.
The creation of STEAM hubs at the municipal level, scaling of successful initiatives, and promoting inclusive access to marginalized communities were seen as critical for future development.

Key Questions Raised

- How can local successful STEAM initiatives be scaled nationally?
- How can arts-science integration be made meaningful rather than superficial?
- How should teacher training programs be reformed to embed STEAM from the beginning?
- How can student voices be better incorporated into STEAM design?
- What low-cost strategies can ensure wider access to STEAM without over-reliance on expensive tech?
- How can municipalities better support regional STEAM ecosystems?

2.2.2 Cyprus STEAM Innovation Experts Forum

Overview

The Cyprus Forum convened 10 experts — including educators, academics, trainers, and researchers — to explore current practices, innovative pedagogical methods, and future trends at the intersection of Arts, Culture, and STEAM (Science, Technology, Engineering, Arts, Mathematics) education. The discussion identified points of consensus and contention, and raised critical questions regarding the sustainability and scalability of interdisciplinary education models.

Key Points of Consensus

Successful Practices

Participants highlighted various effective models for integrating arts into STEAM education:

- **Open Schooling** and **Project-Based Learning** were praised for fostering collaboration and real-world problem-solving.
- Innovative initiatives like **Global Science Opera**, **Girls Go Circular**, and **SciTech Challenge** showcased interdisciplinary engagement and gender inclusion in STEM.
- **Science theatre**, **mathematical approaches to music**, and **E-textiles** were cited as creative ways to make STEM concepts accessible.
- Cultural projects such as the **Innovation Camp in Creative and Cultural Industries** and **Cultural Bees Project** demonstrated successful synergies between cultural heritage and entrepreneurship.

Innovative Pedagogical Methods

- **Project-based** and **game-based learning** were identified as effective interdisciplinary approaches.
- **Nature-based solutions** and **open schooling** projects were highlighted as models promoting sustainability and community engagement.
- Emerging technologies like **AR, VR, AI**, and **embodied learning tools** are opening new dimensions for integrating arts, sciences, and heritage.

Challenges Identified

- Lack of **infrastructure, time, and resources** for interdisciplinary learning in schools.
- **Curriculum rigidity** and **institutional barriers** hamper collaboration between education and cultural sectors.
- Teachers require **specialised training** to confidently integrate arts into STEAM.
- Technologies such as VR/AR, while promising, raise concerns around **cost**, **accessibility**, and **ethical use**, particularly regarding **AI-driven storytelling**.

Future Trends

- **AI** will reshape education, enhancing creativity and critical thinking.
- **Immersive technologies** (AR/VR) will enrich cultural and historical learning.
- Emphasis will grow on **personalised, inclusive education** and **sustainability-driven projects**.
- Cross-sector collaboration (schools, cultural institutions, artists) will be central to the evolution of STEAM models.

Points of Contention

- Divergent views on **standardisation** of interdisciplinary methodologies.
- Ongoing debate between **structured learning** versus **open-ended inquiry**.
- Ethical concerns over **bias** and **accuracy** in AI-generated educational content.
- Differing opinions on balancing **technology integration** with **traditional artistic practices**.

Questions Raised During the Forum

- How can long-term sustainability of school–culture–STEAM collaborations be ensured?
- What professional development is needed to prepare educators for interdisciplinary teaching?
- How should the impact of artistic and interdisciplinary STEAM projects be measured?
- How can AI-generated content be used responsibly without introducing bias?
- How can emerging technologies enhance rather than replace traditional cultural education?
- How can marginalised communities gain equitable access to interdisciplinary STEAM opportunities?

2.2.3 Italy STEAM Innovation Experts Forum

Total Attendees: 10 participants (+10 in one-to-one interviews)

The Italian national forum gathered educators, cultural operators, researchers, and STEAM practitioners to assess current practices, identify challenges and opportunities, and outline future trends in STEAM education.

Points of Consensus

1. Current Practices and Interdisciplinary Collaborations

Participants agreed that the most impactful STEAM practices center on **interdisciplinary approaches** blending art, science, and technology. Projects involving **interactive installations**, **creative programming**, and **digital fabrication** were highlighted.

Cultural and scientific institutions significantly contribute by organizing **workshops, exhibitions, and educational events** using technologies like **VR, AR, and gamification**.

Successful collaborations cited include initiatives like *Lucanum Metaverso* and partnerships between schools, universities, and cultural industries, which enhance **creativity**, **problem-solving**, and **socio-emotional intelligence**.

2. Innovative Pedagogical Methods

There was strong consensus on the vital role of **arts and culture** in making STEM subjects more accessible and stimulating. Arts foster **creative thinking**, support **inclusive education**, and develop **transversal skills** like collaboration and critical thinking.

Cultural and creative industries (CCIs) are seen as essential partners in designing **immersive, technology-driven** learning experiences.

Emerging methodologies such as **Problem-Based Learning (PBL)**, **Design Thinking**, and the integration of **AI, VR, and AR** are revolutionizing STEAM education by making learning more **interactive** and **personalized**.

3. Challenges, Opportunities, and Future Trends

Key challenges identified include:

- **Limited resources** and outdated school infrastructure, especially in disadvantaged areas
- **Inadequate teacher training** on new STEAM technologies and methods
- **Resistance to innovation** and lack of regional educational policies
- **Weak collaboration networks** among educational and cultural institutions

Proposed strategies to overcome these gaps include:

- **Resource mapping** and optimization
- **Targeted teacher training and professional development**
- **Shared mobile labs** and collaborative platforms
- **Leveraging European (Erasmus+, Horizon Europe, Creative Europe), national, and private sector funding**

Future trends foresee greater integration of **AI**, **sustainability**, **global digital learning platforms**, and **inclusivity** into STEAM curricula.

Collaboration across science, arts, and technology is expected to evolve through **project-based learning** on global issues and **immersive community events**.

Points of Contention

- **Feasibility of large-scale integration** of arts into STEAM education
- **Ethical implications of AI** in learning environments
- **Balancing innovation with traditional education methods**
- **Barriers to widespread technology adoption** and effective teacher support

Challenges and Opportunities

Challenges: Resource constraints, teacher training gaps, collaboration difficulties, tech access, low awareness.

Opportunities: Innovation, interdisciplinarity, increased funding access, skills for the future, diversity and inclusion.

Key Questions Raised

- What are concrete examples of impactful STEAM projects in schools?
- How can schools embed STEAM subjects effectively into curricula?
- What are the biggest obstacles for teachers adopting STEAM?
- How to overcome gender stereotypes in STEM?
- Which technologies are indispensable for STEAM education?

2.2.4 Portugal STEAM Innovation Experts Forum

The Portugal STEAM Forum brought together 12 professionals from diverse backgrounds—ranging from scientific researchers and engineers to artists and educators—to discuss the future of STEAM (Science, Technology, Engineering, Arts, and Mathematics) integration in education and professional practice.

Key Points of Consensus

Participants universally agreed on the following:

- **Interdisciplinary Integration** is essential for fostering problem-solving, innovation, and public engagement.
- **Effective Communication**—particularly through visualization and storytelling—plays a vital role in making technical knowledge accessible.
- **Real-World Applications in Education** are critical, emphasizing workshops, interactive experiences, and direct connections with industry professionals.
- **Art's Role** is pivotal, not just for expression but for making STEM subjects more relatable and understandable.
- **Technology's Growing Influence** demands adaptability and a commitment to continuous learning.
- **Emotional Engagement** enhances educational outcomes, advocating for hands-on, nature-based, and interactive learning over passive methods.

Points of Contention

While consensus was strong, some debates emerged:

- The **definition of "Art"** in STEAM varied: some view it as exploratory and free, others as structured communication.
- **Technology's impact on creativity** provoked mixed views; automation is seen both as a tool for creativity and a potential threat to human ingenuity.
- **Future of STEAM Careers** is uncertain; while interdisciplinary skills are seen as crucial, concerns persist about automation reducing job opportunities and fostering a divide between creators and users.

Challenges Identified

- **Bridging Education and Industry** by meaningfully integrating professionals into classrooms.
- **Adapting to Rapid Technological Change**, ensuring educators and students keep pace with developments without losing critical thinking skills.
- **Maintaining Balance Between Automation and Human Expertise**, ensuring technology enhances rather than replaces human creativity.

Opportunities Highlighted

- **Strengthening Industry-Academia Collaboration** through mentorships, workshops, and training in new technologies.
- **Using Art to Enhance STEAM Education**, improving communication and engagement.
- **Advancing Educational Technology** to create more interactive, efficient, and practical learning environments.
- **Promoting Cross-Disciplinary Learning Models** that simulate real-world problem-solving scenarios.
- **Developing New STEAM Career Paths** at the intersection of disciplines, emphasizing adaptability and critical thinking.

Key Questions Raised

- How can professionals from STEAM fields be better integrated into education?
- What strategies can help teachers adopt new technologies with confidence?
- How can we ensure technology amplifies human creativity rather than replaces it?
- What will be AI's impact on scientific research and ethical standards?
- How can a balance be maintained between digital innovation and human touch in education and industry?

2.2.5 Consolidate results from the Experts Forums

Below are presented the results from the all the local forums in a table for all the countries so to be able to compare.

Table 2: *Consolidate results from the experts Forums*

Category	Greece	Cyprus	Italy	Portugal
Points of Consensus	- STEAM fosters holistic thinking and societal progress. - Need for real-world, hands-on education. - Arts critical in communicating STEM to society. - Collaboration across disciplines necessary.	- STEAM integration is critical. - Creativity and critical thinking are key in education. - Arts bridge science and society. - Real-world engagement vital.	- STEAM approach enhances innovation and problem-solving. - Interdisciplinarity is essential. - Creativity and technology must be combined. - Arts humanize STEM.	- Interdisciplinary STEAM integration essential. - Communication and storytelling crucial. - Real-world application boosts engagement. - Art as a catalyst for understanding STEM. - Technology's role growing. - Emotional engagement improves learning.
Points of Contention	- How to balance specialization with interdisciplinarity. - Risks of superficial integration of arts into STEM.	- Overemphasis on technology risks creativity. - Arts integration viewed differently	- Fear of losing depth in scientific education if too broad. - Whether AI enhances or threatens human creativity.	- Art: free exploration vs structured communication. - Automation/AI: enhancer vs threat to human ingenuity. - Future STEAM careers:

Category	Greece	Cyprus	Italy	Portugal
	- Potential resistance from traditional education systems.	(decoration vs core value).	- Debate on future of professional roles.	specialization vs broad skills; fewer creators due to AI.
Challenges	- Institutional inertia (resistance to new education models). - Bridging STEAM with societal needs. - Keeping education relevant.	- Training teachers in interdisciplinary methods. - Adapting to fast technological change. - Engaging students meaningfully.	- Overcoming rigid curricula. - Preparing students for uncertain job markets. - Fostering both tech and human skills. - Equity in access to STEAM.	- Bridging gap between professionals and education. - Keeping pace with technology. - Balancing automation and human expertise.
Opportunities	- Cross-sector partnerships. - STEAM in public spaces (museums, cultural centers). - New hybrid professions emerging.	- Using art to make science accessible. - Developing hands-on learning platforms. - Linking STEAM to societal challenges.	- Technology to democratize education. - Arts and tech innovation for social change. - New STEAM career paths. - Lifelong learning models.	- Industry-academia collaboration. - Art enhances science communication. - Educational technology. - Cross-disciplinary learning. - New STEAM career paths.
Key Questions Raised	- How can education systems adapt to STEAM effectively? - How do we ensure depth alongside breadth? - How can we engage society broadly?	- How to train and support STEAM educators? - How to balance creativity and technological skills? - How to foster critical engagement with technology?	- How can AI be used ethically in education? - How to prevent loss of creativity? - How to design flexible STEAM curricula?	- How to integrate professionals into schools? - How to support tech adoption among teachers? - How to protect human creativity? - Ethical AI use? - Balancing digital and human aspects.
Number of Participants	15	10	20	12
Profile of Participants	Teachers, Researchers, Artists, CCI	Researchers, Engineers, Educators, Artists, CCI, NGO Representatives	Scientists, Engineers, Designers, Teachers, Cultural Professionals	Researchers, Engineer, Teacher, Marine Biologist, Luthier, FabLab Coordinator, Landscape Architect, Musician, CEO

3 Evaluation of the forums

A short evaluation survey was conducted between the participants of the forums. From the 126 participants in total 95 respond, 75% of the participants. The evaluation questionnaire is available in ANNEX 2. Below are presented the main results from the 95 responses.

Category	Results
Overall Satisfaction from the session	All the participants (100%) were very satisfied from the organization of the forums
Aspects of the session that were most valuable	• Learning from others • Specific questions to guide posts and discussion • The valuable insights from an interdisciplinary group of professionals. • Participants from different fields with different expertise allowing interaction and exchange of interesting ideas • Interaction with other experienced teachers • Current practices that integrate science, music and theatre • The STEAM and Theatre suggestions • Exchange of ideas, expertise, practices
Relevance of the presentations and discussions to their work and/or interests	100% of the participants found the discussions and the presentations were very relevant
Rate of the session's structure	The 95% of the participants found the structure excellent while the 5% very good.
Suggested topics or questions that would like to be addressed in future sessions	• Arts and STEAM • AI's role • How Cultural Heritage, Education, Arts and STEAM can come together in the public schooling system. • Developed educational materials that integrate science and arts
Interest in participating in follow-up activities or projects	The 93% of the participants would like to be involved in follow-up activities while the 7% expressed that they maybe be able to attend.

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4 ANNEXES

4.1 Annex 1: Forum Report Template

FORUM REPORT

Forum Event Info		
Title of activity (theme):		
Date / period of activity		
Place of activity		
Responsible partner		
Description		
Target group(s)		
Forum Results/Report Form		
Points of consensus		
Points of contention		
List of challenges and opportunities lying ahead		
Please include any questions raised during the event		
Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	TOTAL NUMBER OF ATTENDEES	

4.2 Annex 2: Forum Evaluation Form

Session Title: Exploring STEAM Education: Insights from Experts in Science, Arts, and CCIs
Date: [Insert Date]

Section 1: General Feedback

1. How satisfied were you with the session overall?

Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied

2. What aspects of the session did you find most valuable?
[Open-ended text box]

3. Were the presentations and discussions relevant to your work or interests?

Yes	Somewhat	No

Section 2: Content and Format

4. How would you rate the session's structure?

Excellent	Good	Fair	Poor

5. Were the breakout sessions engaging and productive?

Yes	Somewhat	No

6. What topics or questions would you like to see addressed in future sessions?
[Open-ended text box]

Section 3: Next Steps

7. Would you be interested in participating in follow-up activities or projects?

Yes	Maybe	No

8. Do you have any suggestions for improving future sessions?
[Open-ended text box]

4.3 Annex 3: Local Forums

4.3.1 Greece

FORUM REPORT

Forum Event Info	
Title of activity (theme):	Local workshop organised in the context of the Learning Science Through Theater Initiative 2024 (agenda attached)
Date / period of activity	5th of December 2024
Place of activity	Science View offices and Online
Responsible partner	Science View
Description	The workshop took place in Science View Offices and most of the participants were online. The participating teachers were introduced to the project, its objectives, and main actions where the teachers will be able to be involved. They were engaged in dialogues and exchanged their experiences regarding the "Learning Science Through Theater" initiative, sharing insights on what they would need in order to implement similar activities within their classrooms. Upon completing the group work, the partner facilitated a group discussion, during which participants presented their key findings and engaged in fruitful discussions. At the beginning of the workshop, participants were asked to complete a short online survey, providing their consent for the use of the data for reporting purposes and for allowing the use of photos for dissemination purposes.
Target group(s)	Teachers from primary and secondar education. Also, in the participants there were people coming from the arts (2) and research educational community (1)
Forum Results/Report Form	
Points of consensus	**Previous experience with STEAM:** All participants in the workshop had experience with STEAM education, mainly through their participation in the Learning Science Through Theater initiative. However, STEAM activities are generally conducted outside the formal learning environment, primarily outside school hours or within the framework that the Greek Ministry of Education is running through projects, creativity laboratories and filed group projects. **Challenges for integrating STEAM in Science Education:** Institutional and structural barriers were identified as significant challenges. The traditional educational system is not so flexible and resistant to change,

	favoring established practices. Participants emphasised the need for curriculum revisions supported by the Ministry of Education. Even effort have been made, STEAM is not really implemented in the Greek Schools, rather we could identify Science and Technology activities, Science and Arts activities and in general collaboration between few fields of STEAM could be realised up to now. Resources and infrastructure are often inadequate in schools. Even where equipment is available, such as through the 'Learning from the Extremes' project, it remains underutilized due to time constraints or lack of teacher training. Teacher training was highlighted as critical, as professional development opportunities are necessary to help educators overcome resistance to new methodologies and adopt innovative approaches. Many teachers have the opportunity to participate in professional development activities either through ERASMUS+ mobility projects or participate in the ESIA's Summer Schools organized every year in Marathon Greece. **Focus on learning assessment:** All participants agreed on the need for assessment methods in STEAM education, such as self-reflection approaches for the School Units as well as professional development assessments. **Disciplinary Inter-relationships:** The need for integration of inter/transdisciplinary approaches in the school curriculum was expressed. According to the discussion the following benefits could be achieved: • The integration of the arts into curriculum and instruction in science, technology, engineering, and mathematics enhances interdisciplinary learning. • More complex articulations entail forging new connections between subjects or skill areas within STEAM practice or fostering interaction between disciplines. • Students' ability to transfer knowledge between disciplines is crucial for their educational development. • Connection is grounded in the classroom environment, featuring problem-based learning, authentic tasks, student choice, technology integration, and teacher facilitation. • Encompassing transdisciplinarity involves highlighting the role of transdisciplinary approaches to pedagogy. • Encompassing interdisciplinarity topics immerses students in a diversity of knowledge across the domains of science, technology, engineering, arts, and mathematics. **Focus on students:** A positive attitude among students toward STEAM was identified as a crucial factor for success. Educators play a key role in fostering such attitudes by providing students with relevant experiences from an early age. The influence of students' socioeconomic backgrounds and prior learning experiences on the successful introduction of STEAM education was noted, though there was some disagreement among participants regarding the extent of this influence. Participants also highlighted the need for technical schools to prioritize STEAM education, which is currently overlooked.
Points of contention	**Focus on students:**

	The role of students' socioeconomic background in the successful introduction of STEAM education was a point of disagreement among participants. Some educators argued that socioeconomic factors significantly influence students' prior exposure to STEAM activities and the level of parental involvement. For instance, students from higher socioeconomic backgrounds may have greater opportunities to participate in extracurricular STEAM programmes or access resources that support their learning. However, one teacher countered this perspective, asserting that socioeconomic background should not or does not inherently limit STEAM engagement. Instead, this educator emphasized that teachers have the ability and responsibility to create equitable opportunities for all students, regardless of their backgrounds, by fostering inclusive practices and providing access to STEAM education within the school environment. **Focus on teachers:** One participant expressed concerns about the ability of some educators to adapt to new methodologies and approaches, noting that teachers might find it increasingly challenging to learn and implement innovative educational practices. This view suggests that there may be resistance or difficulty among some educators in adopting the interdisciplinary and hands-on nature of STEAM education, potentially hindering its effective implementation. **Focus on the external environment** There was a debate between the participants if the external environment could play an important role in the school management and organisation or this should be included in the internal issues of each school. This is due to the fact that the Greek Ministry of Education recently in promoting the school autonomy in the School Units. The concerns were mainly for the following issues: • School's readiness to interact with external partners • External partners' readiness to interact with the school • Parents' active engagement with school life • Parents' positive stance towards STEAM activities • The school as one part of a wider collaborative learning ecosystem within the community • Collaboration with informal/non-formal learning spaces and practitioners • Collaboration with higher education institutions, teachers, researchers, students
List of challenges and opportunities lying ahead	**Challenges** One of the most pressing needs and challenge is to provide educators with structured training that moves beyond traditional disciplinary silos. Many teachers feel unprepared to teach in interdisciplinary ways, as their own training has often been rooted in single-subject instruction. Professional development programs must therefore offer hands-on, experiential learning opportunities where educators can explore project-based and inquiry-based methodologies that reflect the real-world interconnectedness of STEAM disciplines. Training initiatives should also focus on equipping teachers with the skills to facilitate student-centered learning, encouraging collaboration, experimentation, and problem-solving rather than rote memorization of content. Another significant challenge is the integration of digital and emerging technologies into STEAM teaching. While digital

	tools such as coding platforms, robotics kits, and data analysis software are increasingly available in schools, many educators lack the technical expertise and confidence to incorporate them effectively into their lessons. Furthermore, the participants also emphasise on the Institutional and structural barriers, the time constraints and the curriculum restrictions. **Opportunities** • **Innovative Teaching Methods**: STEAM encourages teachers to move beyond traditional lectures, using hands-on projects, collaborative learning, and problem-solving activities that make lessons more dynamic and engaging. • **Professional Growth**: Teachers expand their own skills across disciplines (science, technology, engineering, arts, mathematics), which enhances their expertise and makes them more versatile educators. • **Creativity and Critical Thinking**: STEAM education helps teachers foster creativity, innovation, and critical thinking in their classrooms, skills that are essential for 21st-century learning. • **Interdisciplinary Collaboration**: It opens up opportunities for teachers to work together across subjects (e.g., science teachers collaborating with arts teachers), enriching both teaching practice and school culture. • **Student Engagement**: By connecting learning to real-world problems and encouraging exploration, teachers can increase student motivation and participation, leading to more meaningful educational experiences. • **Use of Technology and Digital Tools**: Teachers are introduced to and become proficient in using various technologies, digital platforms, and creative tools, which are increasingly important in modern education. • **Adaptability to Diverse Learning Styles**: STEAM allows teachers to address different student needs and learning styles, promoting inclusion and personalized learning paths. • **Leadership Opportunities**: Teachers implementing STEAM activities often become leaders in educational innovation within their schools or networks, opening doors to career advancement or specialized roles. • **Networking and Community Building**: Through STEAM initiatives, teachers often connect with broader networks of educators, researchers, artists, and industry partners, enriching their professional communities. • **Access to Funding and Resources**: Many STEAM projects are eligible for special grants, workshops, and educational resources, providing teachers with more tools and support for their classrooms.
Please include any questions raised during the event	*How we can manage the time within the existing school schedule so STEAM activities could be included?* *What professional development courses could be proposed in order to follow the STEAM Innovation approach?* *How could the Ministry and the relevant authorities support initiatives like STEAM Innovation?*

Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	Secondary school teachers	14
	Primary school teacher (in service)	5
	Specialists from the Arts and Research Educational community	3
	TOTAL NUMBER OF ATTENDEES	***22***

AGENDA

1ο Εργαστήριο Επιμόρφωσης Εκπαιδευτικών

Πέμπτη, 5 Δεκεμβρίου 2024, 17.00-20.00

Διαδικτυακό

Πρόγραμμα

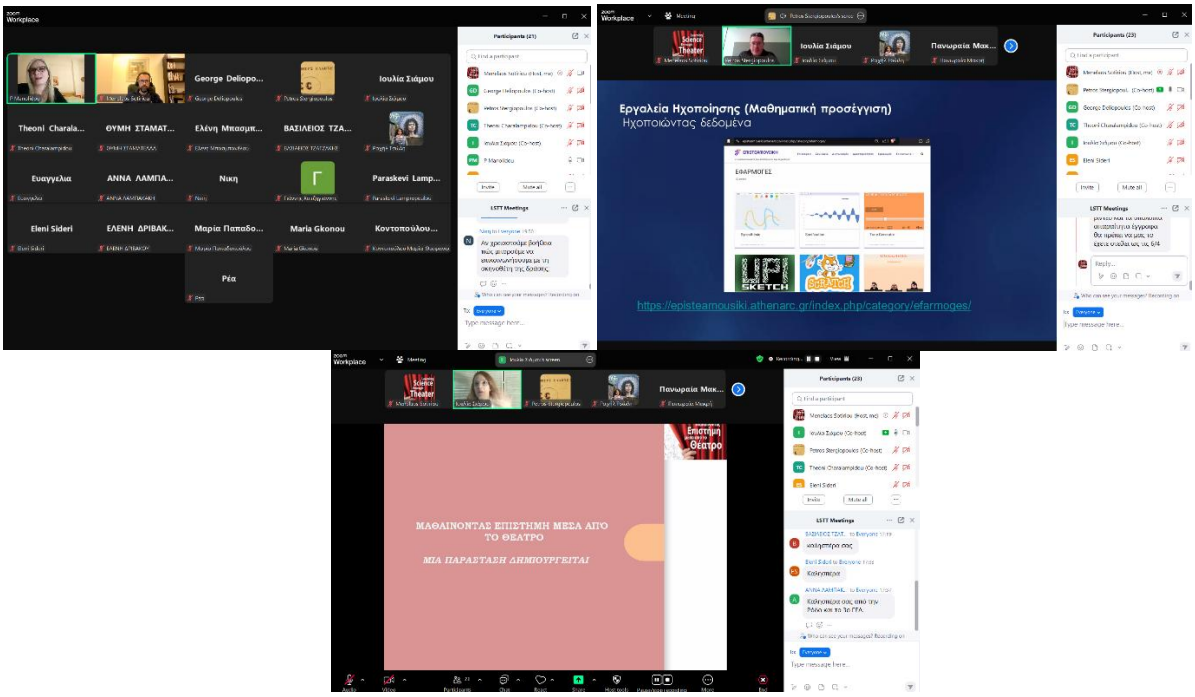
17.00-17.10	**Καλωσόρισμα**
17.10-17.30	**Εισαγωγή και παρουσίαση της εκπαιδευτικής δράσης «Μαθαίνοντας Επιστήμη μέσα από το Θέατρο»:** Παιδαγωγική προσέγγιση, πλάνο εφαρμογής, κανονισμοί, πρακτικές οδηγίες & υποστήριξη *Μενέλαος Σωτηρίου, Συντονιστής της Δράσης, Science View*
17.30-18.00	**Έργο STEAM Innovation** *Μενέλαος Σωτηρίου, Science View*
18.00-18.20	**Εμπειρίες εκπαιδευτικών που συμμετείχαν στη δράση** *Γιώργος Δελιόπουλος, Φιλόλογος, 3ο ΓΕΛ Κοζάνης* - *Παναγιώτα Μανωλίδου, Φυσικός, 1ο Γυμνάσιο Καισαριανής*
18:20-19:30	**Focus Group για το Έργο STEAM Innovation (Σύνδεση με τη δράση «Μαθαίνοντας Επιστήμη μέσα από το Θέατρο»**
19.30-20.00	**Συμπεράσματα / Απορίες – Ερωτήσεις / Συζήτηση**

Διοργάνωση SCIENCE VIEW

Σε συνεργασία με ΕΛΛΗΝΟΓΕΡΜΑΝΙΚΗ ΑΓΩΓΗ

Με την υποστήριξη ROAD STEAMER STEAM L-STEAM SciCultureD AIRBUS FOUNDATION

PHOTOS



4.3.2 Cyprus

FORUM REPORT – GROUP 1

Forum Event Info	
Title of activity (theme):	Local workshop organised in the context of the Cyprus STEAME Festival 2024 (agenda attached)
Date / period of activity	30th of November 2024
Place of activity	Linopetras Lyceum, Limassol, Cyprus, at the Cyprus STEAME Festival 2024
Responsible partner	Inquirium ltd
Description	During the workshop, teachers were introduced to the project. The partner delivered a general presentation for the project, its objectives and main actions. Following this, participants were asked to work in groups and complete a canva for STEAM Education, which was developed for the purposes of the workshop, including key themes and questions of the given protocol. Upon completing this activity, the partner facilitate a group discussion, during which the participants presented their key findings and engaged in fruitful discussions. At the beginning of the workshop, participants were requested to complete a short online survey, providing their consent for the use of the data for reporting purposes and for allowing the use of photos for dissemination purposes.
Target group(s)	Educators from all educational sectors were invited. During the focus we had educators from the secondary education sector from different disciplines (12 teachers), a primary school teacher (1) and one retired secondary school teacher (1).
Forum Results/Report Form	

Points of consensus	**Previous experience with STEAM:** All participants in the focus group had some experience with STEAM education, either through implementing activities with students or participating in training programs such as seminars. However, STEAM activities are generally conducted outside the formal learning environment, primarily outside school hours. This creates challenges in engaging students, who often have demanding schedules, including afternoon tutoring. The exception to this is schools like the Pan-Cyprian Gymnasium, where STEAM programs are piloted as part of an afternoon extended curriculum. **Challenges for integrating STEAM in Science Education:** Institutional and structural barriers were identified as significant challenges. The traditional educational system is inflexible and resistant to change, favoring established practices. Participants emphasised the need for curriculum revisions supported by the Ministry of Education. While some ministry efforts are underway, a more comprehensive and practical approach is required to integrate STEAM effectively. Resources and infrastructure are often inadequate in schools. Even where equipment is available, such as through the 'Learning from the Extremes' project, it remains underutilized due to time constraints or lack of teacher training. Teacher training was highlighted as critical, as professional development opportunities are necessary to help educators overcome resistance to new methodologies and adopt innovative approaches. Economic constraints also pose a significant barrier; for example, participants mentioned having to fundraise for transportation to events like the Cyprus STEAME Festival in 2024. Time constraints within the school schedule further limit STEAM implementation. Many teachers lack the necessary training, and there is no dedicated curriculum or thematic content for STEAM education in schools. **Focus on learning assessment:** All participants agreed on the need for non-traditional assessment methods in STEAM education, such as project-based assessments. **Focus on students:** A positive attitude among students toward STEAM was identified as a crucial factor for success. Educators play a key role in fostering such attitudes by providing students with relevant experiences from an early age. The influence of students' socioeconomic backgrounds and prior learning experiences on the successful introduction of STEAM education was noted, though there was some disagreement among participants regarding the extent of this influence. Participants also highlighted the need for technical schools to prioritize STEAM education, which is currently overlooked. **Focus on teachers:** Teacher training, positive attitudes, and autonomy are seen as essential prerequisites for the successful integration of STEAM education. However, these factors are currently constrained by the pressure to cover the existing curriculum and the lack of dedicated time in school schedules. Despite these challenges, teachers are motivated to participate in STEAM activities because of the satisfaction they gain from seeing their students engage and benefit from such initiatives.

	Focus on school leadership: While school leadership is often supportive of innovative practices, participants noted that this is insufficient without institutional backing from the Ministry of Education. Curriculum changes, the official integration of STEAM into school timetables, and the promotion of collaboration among teachers are necessary to ensure sustainable implementation. **Focus on curriculum and educational policy:** Participants agreed on the need for curriculum revision and greater flexibility to allow for innovative practices. Teachers currently lack the autonomy to make independent choices in teaching and assessment within the framework of the existing curriculum. Addressing this limitation is seen as critical for the successful adoption of STEAM education.
Points of contention	**Focus on students:** The role of students' socioeconomic background in the successful introduction of STEAM education was a point of disagreement among participants. Some educators argued that socioeconomic factors significantly influence students' prior exposure to STEAM activities and the level of parental involvement. For instance, students from higher socioeconomic backgrounds may have greater opportunities to participate in extracurricular STEAM programmes or access resources that support their learning. However, one teacher countered this perspective, asserting that socioeconomic background should not or does not inherently limit STEAM engagement. Instead, this educator emphasized that teachers have the ability and responsibility to create equitable opportunities for all students, regardless of their backgrounds, by fostering inclusive practices and providing access to STEAM education within the school environment. **Focus on teachers:** One participant expressed concerns about the ability of some educators to adapt to new methodologies and approaches, noting that teachers might find it increasingly challenging to learn and implement innovative educational practices. This view suggests that there may be resistance or difficulty among some educators in adopting the interdisciplinary and hands-on nature of STEAM education, potentially hindering its effective implementation. **Challenges for integrating STEAM in Science Education:** The inclusion of students from economically disadvantaged, ethnically diverse, or linguistically varied backgrounds was identified as a significant challenge. These students were described as "difficult" to engage within the context of STEAM education due to the additional resources and tailored approaches required to ensure equitable participation. This perspective highlighted the complexities of addressing diverse student needs while implementing STEAM initiatives, raising concerns about the adequacy of current support systems and resources in schools to overcome these barriers.
List of challenges and opportunities lying ahead	**Challenges** • Institutional and structural barriers: The rigidity of traditional educational systems and their resistance to change hinder the adoption of STEAM practices. Existing curricula lack the flexibility to integrate innovative and interdisciplinary approaches like STEAM education.

	Limited institutional support from ministries and insufficient policy frameworks to promote STEAM implementation. • Time Constraints: Lack of allocated time within school schedules for STEAM activities poses a significant barrier. Teachers are constrained by the need to prioritize curriculum coverage, leaving little room for interdisciplinary or creative activities. • Limited resources: Inadequate infrastructure and resources in many schools, including the underutilization of available equipment due to lack of training or time. Financial challenges, such as the absence of funds for transportation, materials, or program implementation. • Teachers' training and professional development: Many educators lack the necessary training to implement STEAM effectively, leading to a reliance on outdated teaching methods. Resistance to change among some teachers and difficulties in adapting to new pedagogies and methodologies. • Equity and inclusion: Challenges in engaging students from disadvantaged socioeconomic backgrounds or those with linguistic and cultural differences. Perceptions of socioeconomic barriers impacting student participation and opportunities in STEAM education. • Leadership and institutional support: School leaders often lack the autonomy or support needed to prioritize STEAM education, as they must focus on ministry-imposed priorities. Absence of a cohesive, holistic approach from educational authorities to ensure the sustainable integration of STEAM. • Assessment practices: Current assessment systems are rooted in traditional methods, making it difficult to incorporate innovative approaches like project-based or competency-based evaluations. **Opportunities** • Curriculum revision: Revision and flexibility in curricula to incorporate STEAM as an integral part of education, offering space for interdisciplinary learning and creativity. Opportunities to develop thematic content and align STEAM education with real-world issues and societal challenges. • Teacher empowerment and training: Providing professional development and training tailored to teachers' needs can empower them to adopt STEAM practices confidently. Promoting positive attitudes and teacher autonomy in designing and implementing STEAM activities. • Leverage existing resources: Utilizing underused infrastructure, such as equipment provided by projects like 'Learning from the Extremes' through teacher training and dedicated time for activities. • Building inclusive and equitable practices: Developing strategies to ensure that STEAM education reaches students from diverse socioeconomic, linguistic, and cultural backgrounds. Enhancing access and participation for underrepresented groups, particularly in technical schools. • Community and stakeholder engagement: Involving parents, local communities, and external partners in STEAM initiatives to foster a collaborative ecosystem. Leveraging informal and non-formal learning spaces to complement formal education and broaden STEAM opportunities. • Policy and institutional support: Advocating for stronger policy support and institutional frameworks to integrate STEAM formally into

	educational systems. Promoting leadership roles in schools to champion STEAM innovation and ensure long-term sustainability. • Non-traditional assessment methods: Adopting project-based assessments and other innovative evaluation practices to align with STEAM's interdisciplinary and practical nature. • Student engagement and positive outcomes: Capitalising on students' intrinsic interest in STEAM to foster critical thinking, creativity, and problem-solving skills. Encouraging early exposure to STEAM activities to build positive attitudes and foundational experiences. • Technological advancements: Integrating emerging technologies such as VR, 3D printing, and digital tools into STEAM education to enhance learning experiences. Utilising gamification and playful engagement to make STEAM activities more interactive and appealing. • Alignment with broader educational goals: Linking STEAM initiatives with global challenges, such as sustainability and digital transformation, to align with EU strategies like the Green Skills Agenda. Preparing students for future careers by equipping them with 21st-century skills essential for the modern workforce.
Please include any questions raised during the event	*How can time within the existing school schedule be allocated for STEAM activities?* *What strategies can be implemented to address the lack of financial and material resources for STEAM education?* *What specific training programs or resources can be offered by the STEAM Invocation project to help teachers effectively implement STEAM practices?* *How can teachers overcome resistance to new methodologies and adapt to innovative teaching approaches?* *What changes are required at the policy level to provide a sustainable framework for STEAM education?*
Attendees *(by category)*	***Description of category*** / ***Number of attendees by category***
	Secondary school teachers (in service) — 12
	Primary school teacher (in service) — 1
	Retired secondary school teacher (mathematics) and currently Director of an NGO. — 1
	TOTAL NUMBER OF ATTENDEES — ***14***

FORUM REPORT – GROUP 2

Forum Event Info	
Title of activity (theme):	Focus group with 5 participants, organised in Nicosia Cyprus.
Date / period of activity	13th of December 2024
Place of activity	At a local café (convenient meeting point for participants), in Nicosia, Cyprus
Responsible partner	Inquirium ltd
Description	During the focus group, participants were first introduced to the project through a general presentation outlining its objectives and main actions. This introduction aimed to provide a comprehensive overview of the project's purpose and the relevance of STEAM education. Following the presentation, the discussion commenced,

	guided by the provided protocol. Participants were encouraged to share their views and experiences on various aspects of STEAM education. A significant part of the discussion focused on the integration of music into STEAM. To enrich the dialogue, the partner shared practical examples of activities already implemented by the organisation, illustrating how music can complement and enhance traditional STEM subjects. At the beginning of the focus group, participants were also informed about data usage and dissemination purposes and were asked to provide their consent. This ensured ethical compliance and transparency in the use of the data collected during the session.
Target group(s)	The focus group consisted of five participants, all of whom were primary school teachers. Among them, one held the role of head teacher, bringing a leadership perspective to the discussion. Notably, three of the participants were also mothers of secondary school students, providing dual insights as educators and parents.
Forum Results/Report Form	
Points of consensus	**Awareness and understanding** Participants generally displayed limited familiarity with the concept of STEAM education. Only one educator was partially aware of its connection to mathematics, science, critical thinking, and skill development, while the others had no substantial experience with STEAM initiatives. This highlights a significant gap in understanding the principles and potential of STEAM education among primary school educators (in this focus group they participated mostly in their role as 'parents' of secondary school students). Despite the lack of direct exposure, participants recognised the benefits of integrating arts into traditional STEM subjects. They agreed that the inclusion of arts could offer children alternative ways to understand complex concepts, spark interest, and address the needs of children with learning differences or linguistic challenges. Such integration was perceived as a means of creating a more inclusive learning environment that caters to diverse needs and fosters broader engagement. Regarding awareness of existing STEAM-related initiatives, participants reported limited knowledge of such programmes. One educator mentioned hearing about a pilot programme at the Pan-Cyprian Gymnasium, while another referred to a 'Science Festival' organised by science and mathematics teachers (primary school teachers with specialization in science and mathematics) at their school in the previous academic year. This indicates isolated efforts without widespread implementation or communication about such initiatives. **Perception and opinions** The participants strongly believed in the importance of STEAM education for preparing students for future careers. They emphasised that STEAM activities could help children build self-confidence and problem-solving skills by engaging them in projects that allow them to construct, design, and innovate. These activities were seen as

	instrumental in sparking student interest and fostering the development of essential skills for the modern world. However, participants also noted a lack of balance between STEAM and other subjects in schools. Currently, STEAM education is not integrated into the school curriculum, which limits its impact. Participants were unanimous in their belief that schools should invest more in STEAM-focused programmes and facilities. They suggested that teacher training should be prioritised to enable effective implementation of STEAM activities. Instead of introducing STEAM as an additional subject, participants proposed integrating it within existing subjects, such as science, or embedding it into mandatory afternoon programmes. Additionally, they highlighted the need for appropriate materials, equipment, and dedicated time to facilitate successful STEAM implementation. In primary schools, participants identified infrastructure and teacher training as more critical challenges than student assessment. They emphasised the importance of equipping schools with the necessary tools and ensuring educators are adequately prepared to deliver STEAM education effectively. **Engagement and Participation** Participants reported that students were largely unaware of STEAM concepts or activities, indicating a lack of exposure and communication regarding such opportunities. This limited awareness among students was seen as a barrier to their engagement with STEAM subjects. The availability of hands-on learning opportunities in STEAM, such as workshops, labs, or projects, was deemed inconsistent and largely dependent on the initiative of individual educators. While some teachers actively organised STEAM activities, others lacked the resources or knowledge to do so. Participants expressed interest in participating in STEAM-related events or activities, provided they were given adequate training to understand and support these initiatives. **Focus on school leadership** The role of school leadership was identified as a critical factor in the introduction of STEAM education. Participants agreed that while supportive school leaders could facilitate the integration of STEAM, broader institutional support would be required to make such initiatives sustainable. For example, introducing STEAM into the curriculum for Years 5 and 6, where science, technology, and computing are already taught together, was seen as a promising starting point. The introduction of STEAM education would also require structured and mandatory inclusion in the curriculum to ensure consistent implementation across schools. This would necessitate collaboration between school leadership and educational authorities to develop effective strategies. **Conditions for effective STEAM integration** Participants emphasised the importance of fostering a culture of collaboration among teachers, including the sharing of expertise, best practices, and resources. They viewed this as a crucial element for the successful implementation of STEAM education. Additionally,

	continuous evaluation and improvement of educational practices were identified as vital for sustaining innovation. Participants acknowledged that ensuring equitable access to opportunities and resources across disciplines was important. However, they noted that not all educators value disciplines equally, which could present a challenge to achieving true interdisciplinary balance in STEAM education. **Financial and resource considerations** The lack of financial support was identified as a significant challenge. Participants reported that schools often only receive funding for basic consumables, with no dedicated budgets for STEAM activities or equipment. This funding gap limits the ability of schools to provide comprehensive STEAM education and necessitates the creation of specific funding allocations to support these initiatives. **STEM and Music integration** The integration of music and mathematics was highlighted as an example of how disciplines within STEAM could complement each other. Participants agreed that interdisciplinary collaboration among teachers with expertise in different fields would be essential for implementing such approaches. However, they also acknowledged that this would be challenging in practice due to current limitations in teacher training and resources. Participants suggested that structured, ready-to-use materials and appropriate teacher training could facilitate the implementation of interdisciplinary STEAM activities. They advocated for incorporating STEAM either as a standalone subject in the curriculum or through dedicated units within existing subjects. For example, introducing STEAM-related units in primary education where science and technology are already part of the curriculum could provide a feasible entry point.
Points of contention	While there was a general agreement on the importance of integrating arts into traditional STEM subjects, participants expressed differing levels of understanding regarding the concept of STEAM education. Some educators viewed it as a way to promote critical thinking and skill development, while others admitted having no prior exposure to or experience with STEAM. This disparity in familiarity highlighted varying levels of awareness and potential gaps in educators' foundational knowledge of STEAM principles. Participants expressed mixed views on the extent to which schools provide hands-on STEAM learning opportunities. While some educators felt that the availability of such opportunities depends on the individual initiative of teachers, others suggested that systemic barriers, such as limited resources and time constraints, prevent equitable implementation. This inconsistency underscored the need for a more structured and unified approach to integrating STEAM activities into schools. There was consensus on the lack of financial support for STEAM initiatives, but differing views emerged regarding the implications

	of this limitation. While some participants saw this as a systemic issue requiring immediate policy-level intervention, others believed that schools and educators could mitigate some challenges through collaboration and resource-sharing.
List of challenges and opportunities lying ahead	Challenges • Limited familiarity with STEAM education among primary school educators and parents presents a significant challenge. Some participants had no prior exposure to STEAM, while others held fragmented understandings of its principles. This knowledge gap hinders the effective implementation of STEAM initiatives. • Schools often lack the financial resources necessary to support STEAM initiatives. Current funding is restricted to basic consumables, leaving little room for investments in equipment, materials, or specialised programmes. • Many schools lack the infrastructure, such as workshops, labs, or modern technological tools, required for effective STEAM education. Even where equipment exists, such as in pilot programmes, it is underutilised due to insufficient training or time. • A lack of teacher training in STEAM methodologies was identified as a critical challenge. Primary school educators are often unprepared to implement interdisciplinary or hands-on approaches and may resist new methodologies due to fear of change or lack of familiarity. • The absence of structured training and readily available materials further limits educators' ability to deliver effective STEAM education. • Participants noted that the tight schedules and rigid curricula in schools leave little room for STEAM activities. Without dedicated time allocated for interdisciplinary projects, STEAM initiatives are unlikely to be sustainable. • The effectiveness of STEAM implementation is often dependent on school leadership, but inconsistent support from administrators and the absence of mandatory integration into the curriculum create significant barriers. • Broader policy-level support, including curriculum reforms and resource allocation, is currently lacking and is essential for long-term success. • Effective integration of disciplines such as music and mathematics requires collaboration among educators with different specialisations. However, such collaboration is difficult to achieve without structured training, guidance, and support. • Not all educators value disciplines equally, leading to potential imbalances in the implementation of STEAM education. This undermines the interdisciplinary ethos that is central to STEAM.

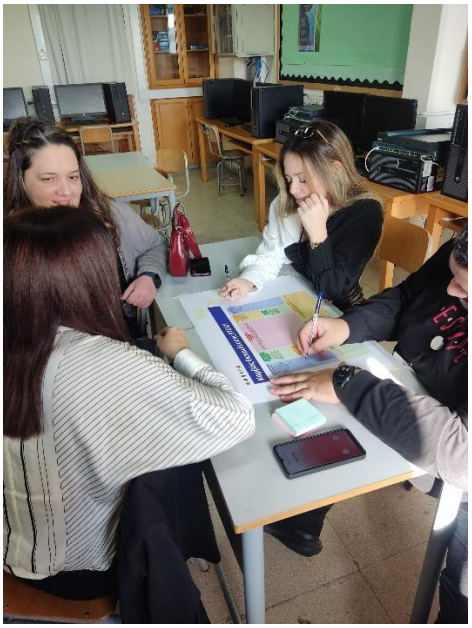
	Opportunities • Increased awareness campaigns and foundational training can bridge the knowledge gap among educators, equipping them with the confidence and understanding needed to implement STEAM effectively. • Integrating STEAM into existing curricula, such as science or technology, and embedding it in mandatory programmes like afternoon activities could provide a feasible pathway for implementation. • Reforms that make STEAM education mandatory across schools, supported by ministry-level initiatives, can ensure consistency and sustainability. • Providing teachers with structured, ready-to-use materials and targeted professional development opportunities can help overcome resistance and build capacity for STEAM education. • Fostering a culture of collaboration among educators, including sharing best practices and resources, can enhance interdisciplinary teaching. • Schools can design inclusive STEAM programmes that cater to students from diverse socioeconomic backgrounds. This can be achieved by leveraging community resources, creating partnerships with local organisations, and offering accessible activities. • Early exposure to STEAM activities can help students develop positive attitudes and foundational skills. Engaging students through creative and hands-on projects can foster interest and confidence in STEAM fields. • Involving parents, local businesses, and external partners in STEAM activities can create a collaborative ecosystem that supports innovative education.
Please include any questions raised during the event	'How can we get involved?' Participants expressed a desire to actively participate in STEAM initiatives but sought clarity on how they could contribute effectively to such programmes. 'Is there material available for everyone to use?' There was a shared concern about the accessibility of structured and ready-to-use resources that could support both educators and parents in engaging with STEAM education. 'As parents of children in secondary education, how can we stay informed about such activities?' Participants expressed a need for better communication channels and informational resources to ensure they are aware of and can support STEAM-related initiatives at their children's schools.

Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	Primary education teachers & parents of secondary school students	*4*
	Head teacher in primary education	*1*
	TOTAL NUMBER OF ATTENDEES	***5***

AGENDA

ΣΑΒΒΑΤΟ 30 ΝΟΕΜΒΡΙΟΥ					
ΩΡΑ	**ΑΙΘΟΥΣΑ 8 (ισόγειο)**	**ΑΙΘΟΥΣΑ 9 (ισόγειο)**	**ΑΙΘΟΥΣΑ 38 (1ος όροφος)**	**ΑΙΘΟΥΣΑ 39 (1ος όροφος)**	**ΑΙΘΟΥΣΑ ΠΡΟΒΟΛΩΝ**
Συντονισμός					
12:30-12:50	**Μ8** **"ΣΤΑΤΙΣΤΙΚΗ ΜΕΛΕΤΗ ΜΕΤΑΒΑΛΛΟΜΕΝΟΥ ΚΙΝΔΥΝΟΥ ΘΑΝΑΤΟΥ"** Σέργιος Νουρτσέλη, Νικολέττα Πεττεμερίδου, Θεοδοσία Τάττη, Γαβριέλλα Αναστασίου, Μαθητές/τριες Λύκειο Αρχαγγέλου Απόστολος Μάρκος Καθηγήτρια Χριστίνα Συμεωνίδου	**WS10** **Βελτίωση αυτοεικόνας των μαθητών μέσα από Project Based Learning (Διαθεματικές Διεπιστημονικές Εργασίες STEAME+)** Γιάννης Λαζάρου Κυπριακή Μαθηματική Εταιρεία	**WS2** **Τεχνητή Νοημοσύνη για Εκπαιδευτικούς**	**WS8** **Οικοσύστημα Καινοτομίας στα πεδία STEAM: Καλλιεργώντας δημιουργικές συνέργειες για μελλοντικές προκλήσεις** Όλια Τσιβιτανίδου INQUIRIUM LTD	
12:50-13:10	**Μ9** **Η ΘΕΩΡΙΑ ΤΟΥ SCHRÖDINGER: ΤΟ ΠΑΡΑΔΟΞΟ ΤΗΣ ΚΒΑΝΤΙΚΗΣ ΥΠΕΡΘΕΣΗΣ** Ανδρέας Δημοσθένους, Παγκύπριον Γυμνάσιον Καθηγητής Ιωάννης Λαζάρου	**WS10** **Βελτίωση αυτοεικόνας των μαθητών μέσα από Project Based Learning (Διαθεματικές Διεπιστημονικές Εργασίες STEAME+)**	**WS2** **Τεχνητή Νοημοσύνη για Εκπαιδευτικούς**	**WS8** **Οικοσύστημα Καινοτομίας στα πεδία STEAM: Καλλιεργώντας δημιουργικές συνέργειες για μελλοντικές προκλήσεις**	
13:10 -13:30	**Κ1** **Η ΕΠΙΔΡΑΣΗ ΤΗΣ ΤΕΧΝΗΤΗΣ ΝΟΗΜΟΣΥΝΗΣ ΣΤΗ ΜΑΘΗΜΑΤΙΚΗ ΠΑΙΔΕΙΑ: ΑΝΑΔΙΑΤΑΣΣΟΝΤΑΣ ΤΗΝ ΕΚΠΑΙΔΕΥΤΙΚΗ ΔΥΝΑΜΙΚΗ ΜΕΣΩ ΤΗΣ ΟΛΙΣΤΙΚΗΣ ΠΡΟΣΕΓΓΙΣΗΣ STEAME.** Δρ. Κυριακούλα Γεωργίου-Λιβίτζη, Μαθηματικός, ΤΕΣΕΚ Λάρνακας	**WS10** **Βελτίωση αυτοεικόνας των μαθητών μέσα από Project Based Learning (Διαθεματικές Διεπιστημονικές Εργασίες STEAME+)**	**WS2** **Τεχνητή Νοημοσύνη για Εκπαιδευτικούς**		
13:30 –13.50	**Κ2** **THE STORY OF A "THEOREM": From Mistakes to New Mathematics** Michael Aristidou, Visiting Professor, American University of Cyprus, Special Scientist, University of Cyprus	**WS10** **Βελτίωση αυτοεικόνας των μαθητών μέσα από Project Based Learning (Διαθεματικές Διεπιστημονικές Εργασίες STEAME+)**	**WS9** **Εργαλεία STEM στην Εκπαίδευση** Μαρία Ευαγόρου, Έφη Νισηφόρου, Μαρία Νικολάου, InSSTER-Πανεπιστήμιο Λευκωσίας		
13:50 – 14:10	**Κ3** **ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ ΣΤΗ ΜΑΘΗΜΑΤΙΚΗ ΕΚΠΑΙΔΕΥΣΗ** Μηλάνθη Ιακώβου, Διδακτορική φοιτήτρια στις Επιστήμες της Αγωγής		**WS9** **Εργαλεία STEM στην Εκπαίδευση** Μαρία Ευαγόρου, Έφη Νισηφόρου, Μαρία Νικολάου InSSTER-Πανεπιστήμιο Λευκωσίας		

PHOTOS



4.3.3 Italy

FORUM REPORT

Forum Event Info	
Title of activity (theme):	Local Focus Group for students, parents and school representatives
Date / period of activity	19th of Dicember 2024
Place of activity	Liceo Scientifico di Ferrandina (Matera)
Responsible partner	Materahub
Description	The Local Focus Group for Students, parents and School representatives took place on the 19th of December dividing the participants in the 3 groups of reference. This setup allowed for open discussions tailored to each audience, creating a space for meaningful conversations and collaboration respecting privacy concerns. **Session 1: Students** The first session was conducted in the classroom with students and two teachers. Given the absence of parental consent for media sharing, no photographs or videos were taken (except for a few pictures of the facilitator's project presentation and students facing away). This session aimed to explore students' perspectives on STEAM education, with a particular focus on music within their school environment. Through interactive discussions, students shared valuable insights into their experiences, aspirations, and expectations, helping to inform the direction of future activities in other schools. **Session 2: Parents** The second session was dedicated to parents, including one parent who is also a teacher at another school. Similar to the first session, no photos were taken due to privacy considerations. Parents were introduced to the project's objectives and encouraged to share their expectations and concerns. Their feedback was instrumental in shaping the initiative to better align with community needs and ensure greater engagement. **Session 3: Educational Professionals** The final session brought together teachers, the headmaster, and a school counselor involved in secondary school's program tailoring. A comprehensive presentation outlined the project's objectives and key actions. Participants formed a circular discussion groups to assess their existing STEAM education programs and identify potential enhancements.

	A collaborative dialogue followed, allowing participants to share findings and exchange ideas. Attendance of all groups was formally recorded through signed participation lists. As a result of these discussions, it was collectively decided that the project will collaborate with an artistic high school in Matera rather than the school in Ferrandina. This decision was driven by the existing technological and artistic resources available at the Matera School, which will enable a more impactful implementation. Given the school's established programs in graphic design and multimedia disciplines, the project can leverage these assets to maximize its effectiveness. Furthermore, the high school's prominence within the Basilicata region provides an opportunity to share outcomes with a broader network of schools. A final event will be organized in Matera, inviting students from neighboring towns to showcase the project's final product. Additionally, the presence of the Conservatory of Music in Matera presents a valuable partnership opportunity, allowing for greater collaboration and long-term benefits over the project's two-year duration. This strategic decision made during this focus group is expected to enhance the project's visibility, sustainability, and overall impact, ensuring that the initiative reaches a wider audience and delivers meaningful educational advancements in the whole Region.
Target group(s)	Parents, Educators and students were invited. During the focus we had educators from the secondary education sector from different disciplines (10 teachers), Head Master (1) a primary school parent / teacher (1), parents (7) one counselor of secondary school teacher (1) and 10 students.
Forum Results/Report Form	
Points of consensus	**Previous experience with STEAM:** During the focus group, a significant discrepancy emerged regarding prior involvement in activities promoting STEAM education among students, educators, and families. Participants were asked: "Have you participated as an educator or student in activities promoting STEAM education?" Responses varied. Some educators reported previous participation, though primarily through extracurricular programs rather than formal school curricula. Others indicated no prior experience with STEAM-related activities. This divergence highlights varying levels of familiarity and engagement with STEAM methodologies among educators, which may influence their perspectives and contributions. A similar disparity was observed among students and parents. While some were aware of extracurricular STEAM opportunities—such as afternoon or weekend programs supported by the PNRR (Piano Nazionale di Ripresa e Resilienza)—others had never heard of such initiatives. This lack of awareness further underscores the uneven accessibility and communication surrounding STEAM education. A key point of consensus within the focus group was the need for targeted initiatives to bridge this gap in engagement. Participants emphasized the

	importance of coordinated efforts among educators, students, and families to ensure a more uniform foundation for STEAM education. Strengthening collaboration between these groups could enhance awareness, accessibility, and participation in STEAM programs, ultimately fostering a more inclusive and effective educational approach. **Challenges for integrating STEAM in Science Education:** Educators highlighted several challenges in implementing STEAM education, emphasizing the need for professional development due to a lack of prior experience in STEAM activities. Many noted that STEAM is not sufficiently integrated into the curriculum, making alignment with learning objectives difficult. Time constraints were also a concern, with some perceiving STEAM education as incompatible with regular school hours. A lack of collaboration among colleagues further hindered efforts, underscoring the importance of fostering a cooperative teaching environment. Bureaucratic obstacles were identified as a significant barrier, slowing the initiation of activities, while concerns over the adequacy of existing programs and courses pointed to the need for curriculum adjustments. Some educators noted a misalignment between STEAM activities and program objectives, indicating that activities are often designed with final outcomes in mind rather than being seamlessly integrated into the learning process. Additionally, the tendency for STEAM initiatives to be driven by individual efforts rather than collective strategies highlighted the need for a more cohesive, school-wide approach. While not explicitly stated, these challenges suggest broader issues such as limited resources, funding, and administrative support, all of which must be addressed to ensure the successful implementation of STEAM initiatives. **Focus on learning assessment:** Assessing interdisciplinary skills within STEAM education presents significant challenges, as traditional assessment methods often fail to adequately evaluate a student's ability to integrate knowledge and skills across the disciplines of science, technology, engineering, arts, and mathematics. When STEAM activities are not well-integrated into the curriculum, aligning assessments with learning objectives becomes difficult. Moreover, the project-based, design-thinking, and collaborative nature of STEAM often requires alternative assessment strategies, such as rubrics, portfolios, and peer evaluations, which may be unfamiliar to many educators. The integration of the arts into STEM further complicates assessment, introducing a degree of subjectivity, particularly in evaluating creativity and innovation; thus, establishing clear and reliable assessment criteria is essential. Ensuring that assessments accurately reflect real-world applications and problem-solving is another challenge, as traditional methods often fall short in capturing students' practical application of STEAM principles. Additionally, assessing divergent thinking, as highlighted by some school representatives, requires specialized methods that may not align with conventional school tasks, and many teachers may

	lack the training to effectively evaluate these skills. To overcome these obstacles, it is crucial to provide professional development for teachers, equipping them with the skills needed to design appropriate rubrics, use portfolios, conduct performance-based assessments, and offer constructive feedback. **Focus on students:** Students widely agree that STEAM education is crucial for fostering critical thinking, creativity, innovation, and problem-solving skills, while also preparing them for future careers by integrating various disciplines. They emphasize the need for schools to provide adequate resources, such as well-equipped labs, technology, and materials, and to incorporate interdisciplinary activities into the curriculum, promoting teacher collaboration. Students also recognize the importance of parental involvement in encouraging curiosity and supporting school activities. Teachers are seen as essential in facilitating STEAM by designing engaging, cross-disciplinary activities that stimulate problem-solving and curiosity, with students acknowledging the need for teacher training and resources to implement STEAM methods effectively. Assessment should focus on practical skills, critical thinking, and teamwork, using projects, presentations, and portfolios. Students highlight that STEAM education can promote equity and inclusion by offering accessible activities, valuing diverse talents, and providing personalized support, ultimately requiring a comprehensive approach to ensure its success. **Focus on teachers:** Teacher perspectives on STEAM education reveal both enthusiasm and hesitation, with some teachers expressing excitement about incorporating the approach into their teaching while others find it a bit complicated or believe that it must take place outside of school hours. This reflects a mixed perception, acknowledging interest in STEAM but also highlighting practical challenges. Curriculum integration remains a significant concern, as many teachers believe that STEAM is not adequately represented in the existing curriculum. While some educators report strong collaboration with colleagues, others note a lack of consistent teamwork , emphasizing the need for more cooperative efforts. Bureaucratic obstacles, such as excessive administrative processes, further hinder STEAM implementation, and many teachers feel that its adoption is more driven by individual initiative rather than supported by a systemic strategy. To address these challenges, teachers suggest a more comprehensive integration of STEAM into the curriculum, aligning activities with learning objectives and ensuring STEAM is not treated as an add-on. Professional development opportunities are also recommended to enhance teachers' skills and knowledge in STEAM pedagogy and assessment. Additionally, reducing bureaucratic hurdles, fostering collaboration among educators, providing sufficient resources, and addressing time constraints are crucial for effective STEAM implementation. Teachers also call for the development of STEAM-specific assessment strategies and a more formal, school-wide approach to STEAM education, which would enhance both the support teachers receive and the level of involvement across the school system. Ultimately, teachers are advocating for a systemic and

	supportive framework that ensures STEAM integration is effective, sustainable, and impactful. **Focus on school leadership:** School leaders must establish a clear vision for STEAM education, integrating it into the school's strategic plan with defined goals, resources, and timelines. They play a hugr role in aligning STEAM activities with curriculum standards, prioritizing professional development in STEAM pedagogy, and allocating necessary resources. Fostering a collaborative culture is essential, encouraging shared planning and cross-disciplinary teams. Leaders must also remove barriers such as bureaucratic obstacles and rigid schedules, advocate for STEAM education to stakeholders, and use data-driven decision-making to enhance program effectiveness. Teachers expect school leaders to provide clear direction, reduce administrative burdens, foster collaboration, and advocate for the importance of STEAM, ensuring it is prioritized alongside other core subjects. **Focus on curriculum and educational policy:** The focus group final feedback on curriculum and educational policy indicated that successful STEAM integration requires an interdisciplinary curriculum that effectively combines science, technology, engineering, arts, and mathematics, aligned with clear learning objectives and standards. STEAM activities should be integral to the curriculum, not supplementary, and connect to real-world problems through project-based learning and problem-solving. The curriculum must be flexible to meet diverse student needs while promoting 21st-century skills like critical thinking, creativity, and collaboration. Educational policies must support STEAM through funding for professional development, curriculum standards, and innovative assessment tools that measure interdisciplinary skills. Teacher preparation programs should train educators in effective STEAM pedagogy, while policies should ensure equitable access to STEAM education for all students, fostering community partnerships to further enhance learning opportunities.
Points of contention	**Focus on students:** A key factor in the success of STEAM education is fostering a positive attitude among students, which educators can achieve by providing relevant experiences early on. Teachers play a crucial role in bridging the gap for students who may not have the same opportunities due to their socioeconomic backgrounds or limited exposure to STEAM-related activities at home. While there is some variation in opinions regarding the extent of this influence, it is clear that many students could benefit from additional guidance and information. Teachers should actively inform parents, particularly those who may not be aware, that there are free STEAM opportunities available for their children through funding from PNRR (National Recovery and Resilience Plan) initiatives. This outreach can

	help overcome barriers where only families with more resources or time can typically engage in such programs, ensuring that all students, regardless of their background, have access to the enriching educational experiences that STEAM offers. **Focus on teachers:** Various participants raised concerns about some educators' ability to adapt to new teaching methodologies, highlighting that the shift towards innovative and interdisciplinary approaches, such as those in STEAM education, may be challenging for certain teachers, especially the old generation of teachers that are still working in Italy. An important part of teachers, especially in primary school are quite old and going towards retirement, but they struggling with new technologies and devices used at school. This highlights the resistance or difficulty in embracing the hands-on, cross-disciplinary nature of STEAM, which could impede its successful integration into classrooms. **Challenges for integrating STEAM in Science Education:** Integrating STEAM into education presents several challenges, particularly when it comes to engaging students from economically disadvantaged backgrounds that is mostly what we can perceive in our region. These students often require additional resources and more tailored approaches to fully participate in STEAM activities, which can complicate the implementation process. The difficulties lie not only in meeting the varied needs of these students but also in ensuring that current support systems and school resources are adequate to foster inclusive and equitable engagement in STEAM initiatives and especially that they (students but parents especially) are aware of funds or incentives that can be given to those students. The need for more targeted strategies to address these barriers is evident, as it requires a concerted effort to level the playing field for all students.
List of challenges and opportunities lying ahead	**Challenges** ● Difficulty in aligning STEAM activities with existing curriculum standards and learning objectives. ● Lack of interdisciplinary units and courses that integrate science, technology, engineering, arts, and mathematics in a meaningful way. ● Insufficient training for teachers in STEAM pedagogy, assessment, and curriculum integration. ● Need for professional development opportunities that support interdisciplinary teaching and project-based learning. ● Lack of appropriate assessment tools and strategies for measuring interdisciplinary skills and project-based learning. ● Difficulty in assessing creativity, innovation, and other non-cognitive skills. ● Inadequate funding for STEAM resources such as equipment, materials, and technology.

	● Lack of access to real-world learning experiences such as field trips, internships, and community partnerships. ● Administrative hurdles that hinder the implementation of STEAM initiatives. ● Rigid scheduling constraints that limit opportunities for interdisciplinary teaching. ● Ensuring equitable access to STEAM education for all students, regardless of their socioeconomic background, race, or geographic location. ● Addressing the needs of diverse learners, including students with disabilities and English language learners. ● Lack of collaboration among teachers, schools, and community organizations. ● Difficulty in establishing meaningful partnerships with businesses and industry. ● Resistance to change from teachers and administrators who are unfamiliar with STEAM education. ● Need to create a school culture that values creativity, innovation, and risk-taking. ● Integrating STEAM activities in a school schedule with limited time. ● Teachers are implementing on their own, instead of being encouraged by schools. **Opportunities:** ● Increased student engagement and motivation in learning. ● Development of 21st-century skills such as critical thinking, creativity, collaboration, and communication. ● Improved learning outcomes in science, technology, engineering, arts, and mathematics. ● Preparation for future careers in high-demand fields such as engineering, computer science, healthcare, and renewable energy. ● Development of skills and knowledge that are valued by employers. ● Fostering a culture of innovation and entrepreneurship. ● Driving economic growth by creating a workforce that is skilled in STEAM fields. ● Strengthening partnerships between schools, businesses, and community organizations. ● Creating opportunities for students to apply their knowledge and skills to solve real-world problems. ● Providing equitable access to STEAM education for all students. ● Empowering students from underrepresented groups to pursue careers in STEAM fields. ● Improve curricula by having teachers adjust instruction to student aptitudes and strengths. ● Empowering Students ● Increased learning outcomes for students by letting them think creatively.

<table>
<tr><td></td><td colspan="2">

- Preparing students to compete in a global economy that is increasingly driven by technology and innovation.

</td></tr>
<tr><td>Please include any questions raised during the event</td><td colspan="2">What policies can we implement to promote STEAM integration in our school?
How can we communicate the value of STEAM education to parents and community members?
How can a school system measure if STEAM objectives are being effectively met?
What resources are available to support STEAM education in our school or district?
How can we secure funding for STEAM projects and initiatives?
How can we make the most of limited resources to provide students with meaningful STEAM learning experiences?
How can we create a collaborative environment where teachers can share ideas and best practices for STEAM instruction?
How can we empower teachers to take risks and experiment with new approaches to STEAM teaching?</td></tr>
<tr><td rowspan="5">Attendees
(by category)</td><td>Description of category</td><td>Number of attendees by category</td></tr>
<tr><td>Secondary school teachers (in service)</td><td>10</td></tr>
<tr><td>Primary school teacher (in service) and parent
_____
Parents</td><td>1
_____
9</td></tr>
<tr><td>Counselor of mathematics for school alternative programs (Lego activities)</td><td>1</td></tr>
<tr><td>TOTAL NUMBER OF ATTENDEES</td><td>21 adults + 9 students</td></tr>
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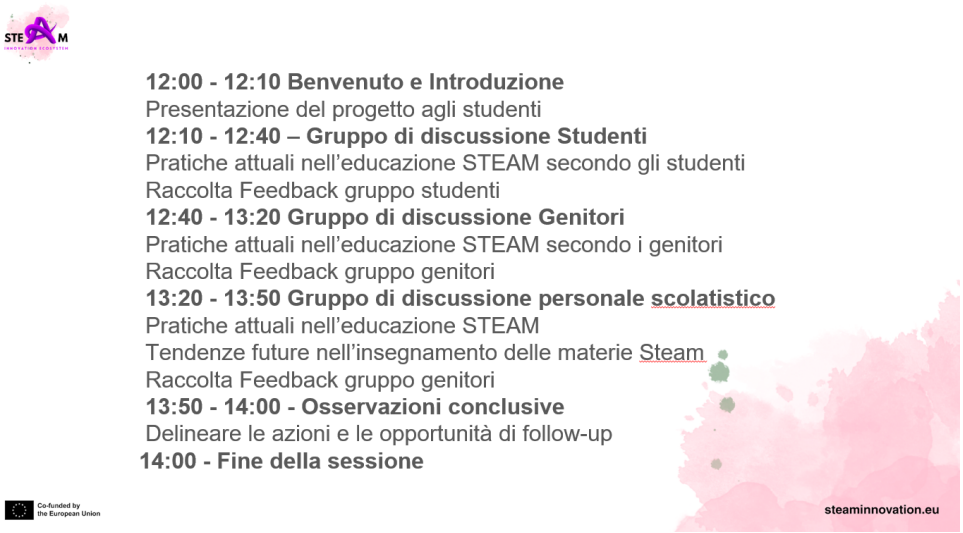
AGENDA



PHOTOS

4.3.4 Portugal

FORUM REPORT

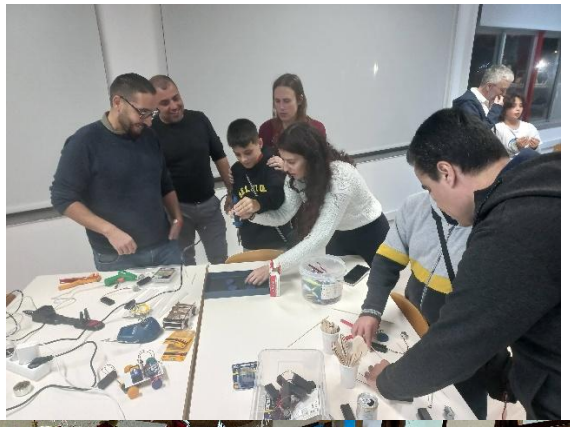
Forum Event Info	
Title of activity (theme):	STEAM on Wheels workshop
Date / period of activity	29th November 2024
Place of activity	Agrupamento de Escolas Conde de Oeiras
Responsible partner	NUCLIO
Description	NUCLIO organized the local forum with Students, Parents, Teachers and School board through a workshop called STEAM on wheels. During the workshop, participants learned how to build an electric car and participated in a reflection (focus group) on the importance of STEAM education and the needs associated to it. During the workshop, the following questions were asked to all participants: Question 1: To me, STEAM education is/is not important because... Question 2: What are the main conditions that need to change/maintain in the school for STEAM education to be implemented? Question 3: How can parents contribute to making STEAM education a common practice in the school? Question 4: How can the school leadership contribute to making STEAM education a common practice in the school? Question 5: What is the role of teachers in the transition to STEAM education in the school?

	Question 6: What kind of support do teachers need to adopt STEAM education? Question 7: My main concerns regarding this new form of learning are... Question 8: How should student assessment be adapted to accommodate STEAM education? Participants were mixed and received a set of post-its of a color identifying their representation in the event (students received a color, parents another and so on). Each question was presented at a time and participants answered it. A moment of discussion and joint reflection was after each question.
Target group(s)	Students, Parents, Teachers and School board
Forum Results/Report Form	
Points of consensus	● **Importance of STEAM Education:** Participants agreed that STEAM education is important and that it fosters critical thinking, problem-solving, and prepares students for future challenges by integrating disciplines and encouraging creativity. ○ *Teachers:* Highlighted STEAM's role in innovative education and making learning meaningful through experimentation. ○ *Students:* Saw STEAM as a fun and modern way of learning that reflects evolving educational needs. ○ *Parents:* Emphasized its holistic approach, linking knowledge to real-world applications, and developing critical thinking. ○ *School Board:* Valued STEAM for its ability to connect different disciplines and promote empathy and global understanding. ● **Need for Collaboration:** All groups agreed on the importance of cooperation among teachers, parents, students, and the school board to effectively implement STEAM practices.
Points of contention	● **Implementation Strategies:** While there was agreement on STEAM's value, opinions varied on how to implement it: ○ *Teachers and Parents:* Suggested restructuring curricula, investing in training, and creating flexible learning environments. ○ *Students:* Focused on improving classroom experiences and integrating technology. ○ *School Board:* Advocated for policy-level changes and partnerships with external organizations. ● **Evaluation Methods:** ○ Debate emerged around adapting student assessments to align with STEAM principles, balancing traditional and innovative methods. ● **Resource Allocation:** ○ Varied perspectives on prioritizing resources such as technology, training, and infrastructure.

List of challenges and opportunities lying ahead	**Challenges:** Lack of teacher training and motivation to adopt STEAM methodologies. Insufficient technological resources and versatile classroom spaces. Resistance to change in traditional assessment and teaching practices. Communication gaps between school stakeholders and broader educational policies. **Opportunities:** Engaging parents and community members in STEAM projects. Building partnerships with local businesses and organizations. Developing transdisciplinary and project-based learning models. Promoting innovation through dynamic workshops and collaborative initiatives.	
Please include any questions raised during the event	● What specific training programs can be introduced to prepare teachers for STEAM? ● How can parents be effectively integrated into the school's STEAM activities? ● What changes are needed in national policies to support STEAM education? ● How can we balance STEAM's innovative approaches with the current standardized assessment methods? ● What role should external organizations play in facilitating STEAM implementation? ● How can schools ensure equal access to resources for all students to participate in STEAM initiatives? ● What are the most effective ways to measure the success of STEAM education?	
Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	Students	***9***
	Parents	***10***
	Teachers	***4***
	School Board	***2***
	TOTAL NUMBER OF ATTENDEES	***25***

AGENDA

PHOTOS

4.4 Annex 4: Experts Forums

4.4.1 Greece

FORUM REPORT

Forum Event Info	
Title of activity (theme):	Local workshop organised in the context of the Learning Science Through Theater Live Event 2025 (agenda attached)
Date / period of activity	5th and 6th of April 2025
Place of activity	Ellinogermaniki Agogi
Responsible partner	Science View
Description	The workshop took place in Ellinogermaniki Agogi Premises during the Learning Science Through Theatre Live Event (Festival). The participants were introduced to the project, its objectives, and main actions where they could be involved. The participants were teachers (mainly participating already in the Learning Science Through Theatre initiative, researchers, artists and representatives from the CCI.
Target group(s)	Teachers from primary and secondar education, Artists, HEI Professors, CCI representatives.
Forum Results/Report Form	
Points of consensus	**A. Current Educational Practices in Greece: STEAM Education** *1. Most Impactful Practices Currently Used in STEAM Education* In Greece, STEAM education has gained growing attention, especially in recent years as educational reforms increasingly emphasize interdisciplinary learning and innovation. Some of the most impactful practices currently used include: • Project-Based Learning (PBL): Widely adopted in primary and secondary education, PBL allows students to explore scientific, technological, engineering, artistic, and mathematical concepts through real-world projects. Students often design prototypes, conduct

	experiments, or develop creative presentations that integrate multiple STEAM disciplines. • Robotics and Coding Initiatives: Programs such as *WRO Hellas* and *First Lego League Greece* have been particularly influential, introducing thousands of students to engineering, technology, and teamwork through hands-on robotics challenges that also encourage artistic creativity in design. • Art-Science Collaborations: Schools are increasingly incorporating activities such as theatrical performances, storytelling projects, and visual arts exhibitions that explain scientific concepts creatively. Initiatives like *Learning Science Through Theater* have become a pioneering example, blending performing arts with scientific inquiry and offering students a unique, experiential way to engage with science. • Maker Education and Fab Labs: Several schools and municipalities have established makerspaces and digital fabrication labs, where students engage in STEAM learning through the use of 3D printers, laser cutters, and electronics, combining design thinking with technical skills. • Gamification and Game-Based Learning: Digital and board games focused on scientific topics are becoming common in Greek classrooms, promoting critical thinking, collaboration, and problem-solving in an interactive environment. *2. Integration of STEAM Education by Local Cultural and Scientific Institutions* Greek cultural and scientific institutions play an increasingly active role in promoting STEAM education: • Museums and Science Centers: Institutions such as the *Eugenides Foundation*, the *Hellenic Cosmos Cultural Centre*, and the *Thessaloniki Science Center and Technology Museum (NOESIS)* have integrated STEAM into their educational programs, offering workshops, exhibitions, and interactive experiences that combine scientific discovery with artistic expression. • Universities and Research Centers: Higher education institutions often collaborate with schools through outreach programs and competitions, promoting interdisciplinary approaches to science and arts education. For example, several university departments organize summer schools or hackathons focused on STEAM topics. • Art and Technology Festivals: Events like the *Athens Digital Arts Festival* and the *Onassis STEAM program* blend artistic creativity with technological innovation, offering students and educators exposure to emerging technologies, creative coding, digital storytelling, and interactive media. • Local Government and NGO Initiatives: Municipalities and NGOs promote science communication and STEAM education through large-scale public events such as *Athens Science Festival*, combining science, arts, and culture to engage the wider community. Overall, in Greece, STEAM education is increasingly seen not just as a school-based effort but as a broader societal initiative, with many stakeholders—from museums to startups to cultural institutions—working together to create dynamic, interdisciplinary learning opportunities for young people. *3. Examples of Successful Interdisciplinary Collaborations in STEAM Education*

- Learning Science Through Theater (LSTT): Coordinated by Science View, LSTT invites students and teachers to create theatrical performances that interpret scientific topics creatively, enhancing both science literacy and artistic expression through experiential learning.
- Global Science Opera (GSO): Is an initiative where Science View and Ellinogermaniki Agogi is involved in Greece for more than 10 years. This initiative brings together students, teachers, researchers in order to develop scenes of Operas that connected with each other and comes from schools participating from more than 40 countries. Each year in November the premiere of the Science Opera is presented through streaming.
- Junior Engineer Academy (JEA) Greece: In collaboration with the Goethe-Institut and local universities, the program empowers students to develop engineering and problem-solving skills by working on interdisciplinary projects that combine technology, science, and design.
- Athens Digital Arts Festival (ADAF) Educational Programs: Through workshops on digital storytelling, AR/VR, and interactive design, ADAF blends artistic innovation with technological exploration, helping students develop interdisciplinary STEAM competencies.
- NOESIS Collaborations: The NOESIS Science Center engages schools and communities in programs that combine scientific exhibitions with digital media, filmmaking, and creative workshops, promoting hands-on STEAM education.
- STEAM Education through Cultural Heritage: Erasmus+ projects coordinated by Greek organizations, such as *STEAMuseum*, integrate cultural heritage with digital innovation, enabling students to recreate historical experiences using technologies like VR and AR, while applying both scientific methods and artistic interpretation.

B. Innovative Pedagogical Methods in STEAM Education

1. Role of Arts and Culture in Making STEM More Accessible and Engaging

Arts and culture play a crucial role in humanizing STEM education by providing creative entry points for learners of diverse backgrounds. Through storytelling, performance, visual arts, and cultural narratives, abstract scientific concepts become more relatable, emotional, and engaging. Integrating arts fosters critical thinking, empathy, and imagination, transforming STEM from a technical field into a more inclusive and inspiring experience.

2. Contribution of Cultural and Creative Industries (CCIs) to Developing Creative Thinking in STEAM

Cultural and Creative Industries (CCIs) offer powerful tools for nurturing creativity in STEAM education. By introducing practices from design, architecture, digital media, performing arts, and heritage sectors, CCIs stimulate interdisciplinary thinking, problem-solving, and innovation. Collaborations with artists, designers, and creative technologists enable students to approach scientific and technical challenges from new, imaginative perspectives.

3. Technologies and Methodologies Revolutionizing Teaching and Learning in STEAM

Emerging technologies such as Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI), and digital fabrication (e.g., 3D printing) are revolutionizing STEAM education by offering immersive, hands-on learning experiences. Methodologies like Project-Based Learning (PBL),

	Open Schooling, Maker Education, and Gamification foster active participation, collaboration, and real-world problem-solving. These approaches empower students to become creators, innovators, and critical thinkers in an increasingly complex world. **C. Future Trends in STEAM Education** *1. Trends Shaping the Future of STEAM Education* Over the next decade, STEAM education will be increasingly shaped by the integration of Artificial Intelligence (AI), robotics, sustainability, and immersive technologies like Virtual and Augmented Reality. There will be a stronger emphasis on creativity, ethical reasoning, and real-world problem-solving, moving beyond technical skills to holistic, interdisciplinary learning. *2. Adapting Education Systems to Emerging Fields* Education systems must adopt flexible curricula that integrate emerging fields such as AI, robotics, and environmental sciences into core learning. This requires promoting cross-disciplinary projects, strengthening teacher training in new technologies, and encouraging partnerships between schools, research centers, and industries to ensure students are prepared for rapidly evolving careers. *3. Evolution of Collaborations Between Science, Arts, and Technology* Collaborations between science, arts, and technology will become more structured and essential, fostering interdisciplinary education where creativity, critical thinking, and innovation intersect. Artists, scientists, engineers, and technologists will co-create learning experiences, using cultural narratives and technological tools to address societal challenges and inspire new ways of thinking.
Points of contention	• **Unequal Access**: Not all schools and regions in Greece have the same access to resources like robotics kits, makerspaces, or collaborations with cultural/scientific institutions. • **Fragmented Implementation**: STEAM practices often depend on individual teachers' or schools' initiatives rather than a coordinated national policy. • **Assessment Challenges**: Traditional assessment models (exams, grades) are poorly suited to interdisciplinary, project-based STEAM learning, leading to tensions within school systems. • **Balance between Arts and Sciences**: In practice, arts are sometimes added superficially rather than being fully integrated into STEM education. • **Overemphasis on Technology**: There's a risk that emerging technologies (e.g., VR/AR) are treated as ends in themselves rather than thoughtfully integrated to serve pedagogical goals. • **Role of CCIs**: Some educators may view Cultural and Creative Industries (CCIs) as being too commercially driven, potentially clashing with educational values centered on critical thinking and inclusivity. • **Technological Divide**: Rapid advancement in AI, robotics, and digital tools may widen inequalities between students/schools with different access levels to technology. • **Teacher Readiness**: Many education systems are not yet equipped to train teachers adequately for emerging interdisciplinary fields, risking superficial adoption of new trends.

<table>
<tr><td></td><td colspan="2">

- **Ethical and Social Challenges**: Greater integration of AI and robotics raises ethical concerns (e.g., data privacy, bias, job displacement) that are often under-discussed in education reforms.
- **Resistance to Interdisciplinary Models**: Traditional disciplinary silos (especially in secondary and higher education) may resist efforts to restructure education around interdisciplinary collaboration.

</td></tr>
<tr><td>List of challenges and opportunities lying ahead</td><td colspan="2">Integrating STEAM education at the regional and local level in Greece faces several significant challenges. These include limited access to technological infrastructure, uneven teacher preparedness for interdisciplinary teaching, rigid curriculum structures, and a general lack of dedicated funding for innovative educational projects. In many cases, schools outside urban centers have fewer opportunities to participate in STEAM-related activities, deepening regional inequalities.
Local institutions — such as universities, research centers, museums, cultural organizations, and municipalities — can play a key role in bridging these gaps. They can offer teacher training programs focused on interdisciplinary methods, provide access to laboratories and creative spaces, and foster mentorship networks that connect educators with STEAM professionals. Experts from both the arts and sciences can co-develop curricula and workshops that make STEAM learning accessible and culturally relevant.
To advance innovative STEAM initiatives, funding opportunities from national and EU programs — such as Erasmus+, Horizon Europe, and Creative Europe — can be leveraged. Partnerships with Cultural and Creative Industries (CCIs), private sector sponsors (especially tech and green economy companies), and philanthropic foundations can also provide essential resources. Building strong cross-sector collaborations will be key to sustaining and expanding STEAM education at the local and regional levels.</td></tr>
<tr><td>Please include any questions raised during the event</td><td colspan="2">

- *How can we systematically document and scale successful local STEAM initiatives across regions?*
- *What mechanisms are needed to ensure meaningful, rather than superficial, arts-science integration?*
- *How can teacher education programs be reformed to embed STEAM competencies from the start, not just as add-ons?*
- *In what ways can student voice and co-creation be better incorporated into STEAM project design?*
- *How do we ensure that STEAM initiatives reach marginalized or minority communities equally?*
- *What low-cost, low-tech strategies can make STEAM education accessible without reliance on expensive technologies?*
- *How can schools establish sustainable partnerships with CCIs and tech industries without compromising educational values?*
- *What role could municipalities and local governments play in funding or coordinating regional STEAM hubs?*
- *How could the Ministry and the relevant authorities support initiatives like STEAM Innovation?*

</td></tr>
<tr><td rowspan="3">Attendees
(by category)</td><td>Description of category</td><td>Number of attendees by category</td></tr>
<tr><td>Primary and Secondary school teachers</td><td>11</td></tr>
<tr><td>Artists</td><td>2</td></tr>
</table>

	HEI Professor	1
	CCI Representative	1
	TOTAL NUMBER OF ATTENDEES	***15***

AGENDA

Εργαστήριο – Forum STEAM Innovation

Σάββατο, 5 Απριλίου 2025, 12.00-15.00

Ελληνογερμανική Αγωγή

Πρόγραμμα

12.00-12.10	**Καλωσόρισμα**
12.10-12.30	**Το Έργο STEAM Innovation** *Μενέλαος Σωτηρίου, Science View*
12.30-13.00	***Σκοπός και στόχος του forum:*** *Current Educational Practices in Greece: STEAM Education* *Innovative Pedagogical Methods in STEAM Education* *Future Trends in STEAM Education* *Challenges and opportunities* *Μενέλαος Σωτηρίου, Science View*
13.00-14.30	**Working Groups Time**
14.30-15.00	**Συμπεράσματα / Απορίες – Ερωτήσεις / Συζήτηση**

Διοργάνωση SCIENCE VIEW

Σε συνεργασία με ΕΛΛΗΝΟΓΕΡΜΑΝΙΚΗ ΑΓΩΓΗ

Με την υποστήριξη ROAD STEAMER STEAM L-STEAM SciCultureD AIRBUS FOUNDATION

PHOTOS

4.4.2 Cyprus

FORUM REPORT

Forum Event Info	
Title of activity (theme):	Focus group with experts in science and arts
Date / period of activity	15th of January 2025
Place of activity	Virtually via teams
Responsible partner	Inquirium ltd
Description	An invitation was sent to selected experts, who were requested to register via an online form. As part of the registration process (https://forms.gle/dhtRvHTP2qC74fZ16), participants were required to provide their consent for the use of data for reporting purposes and to allow the use of photos for dissemination purposes. Those who registered received an agenda and a link to join the session. At the beginning of the focus group, participants were requested to complete an attendance list (online); then introductions took place, and participants were asked to complete a Mentimeter word cloud survey to share their areas of expertise. The facilitator then delivered a general presentation outlining the project, its objectives, and its main activities. Following this, the partner facilitated a group discussion, during which participants presented their key insights and engaged in fruitful discussions. Throughout the discussion, the facilitator provided links via Padlet, requesting participants to post short responses, which were then discussed collectively. At the end of the meeting, the facilitator invited participants to complete an evaluation survey (https://forms.gle/321BysqcxjgkWnsP8) to gather feedback on the session. The online session was recorded.
Target group(s)	The focus group consisted of ten professionals from diverse backgrounds, contributing expertise in STEAM education, science communication, cultural heritage, and entrepreneurship education. The group included academics, researchers, project managers, and industry professionals, representing higher

	education institutions, research centres, cultural organisations, SMEs and NGOs. Their areas of specialisation (as derived from their responses in the registration form) encompassed Mathematics and STEAME+ education (1), education (2), Technology, Engineering, Mathematics, STE(A)M (1), Arts and Cultural and Creative Industries (CCIs) (3), STE(A)M education (1), Educational technologies and technology (2). The discussion reflected a broad range of perspectives, integrating academic research, hands-on educational initiatives, and project management experience in STEAM and arts-based learning.
Forum Results/Report Form	
Points of consensus	**Topic 1: Current practices and interdisciplinary collaborations** ***Successful STEAM practices in Arts and Culture*** Participants highlighted several successful practices in integrating arts and culture into STEAM education. A participant with a Science Education background mentioned Open Schooling as an effective model that fosters collaboration between schools, academic institutions, and social entities to address scientific and cultural topics. A participant with background in STEAM education mentioned the Project-Based Learning, which enables skill development through structured projects that enhance real-world problem-solving. Participants also discussed the role of science theatre and mathematical approaches to music in making abstract STEM concepts more accessible. These methods integrate performance and music to bridge arts and sciences in engaging ways. Makerspaces and E-textiles were mentioned by a participant with background in educational technologies, practical tools that support hands-on learning by combining technology, design, and creativity. Additionally, the Global Science Opera (https://globalscienceopera.com/) was mentioned by a participant with Education and Computer Science background, an interdisciplinary initiative that encourages schools to contribute to theatrical physics education. Further examples included various initiatives under Junior Achievement, such as Girls Go Circular (https://eit-girlsgocircular.eu/), which promotes women's participation in STEM through online learning focused on circular economy principles (Girls Go Circular). Another recognised programme was the SciTech Challenge (https://jaeurope.org/learning-experiences/portfolio/sci-tech-challenge/), designed to motivate students aged 15-18 to consider STEM careers by raising awareness of the practical applications of these fields. One participant also referred to the Innovation Camp in Creative and Cultural Industries, a collaboration with the Cyprus National Commission for UNESCO that promotes cultural and artistic awareness. Additionally, the Cultural Bees Project, funded by the Creative Europe programme, was noted as a significant initiative that supports the creation of cultural heritage businesses through hybrid learning models and cross-border curricula. ***Successful Arts and Culture practices that could integrate with STEAM*** Successful practices in arts and culture that could integrate with STEAM include educational theatre, which employs humour, storytelling, and performance as an effective engagement tool. Dance and science competitions, such as Dance Your PhD, combine movement with scientific understanding to enhance learning. Physics and astrophysics performances provide immersive science experiences through theatrical representation. The integration of literature and technology helps bridge the humanities and sciences, fostering interdisciplinary learning. **Examples of interdisciplinary collaborations in education**

	Examples of successful interdisciplinary collaborations include projects such as the Erasmus+ SciArt programme (https://sci-art.eu/), which integrates science and art to foster creative approaches to education. The AR Mural Work/Study Project, coordinated by the STEMarts Lab (http://www.stemartslab.com), a research Lab providing innovative sci-art and STEAM youth programming for The Paseo Festival and for TISA (Taos Integrated School of the Arts) in Taos New Mexico, engages students in creating augmented reality murals that combine visual storytelling with interactive technology. In this project, STEMarts Lab brought in artists that had been exploring AR technology to collaborate with a class of eighth grade students in order to paint a mural for a new frozen yogurt store Students worked together with the artists and with the shop's owners to design and create an AR mural that made the whole space interactive – with animated images popping-off the wall when pointing a smartphone or iPad at the mural (see https://www.stemarts.com/blog/artaos-tisa-augmented-reality-mural-at-ziggys-frozen-yogurt-shop/). The European SciArt project (https://sci-art.eu/) promotes the integration of artistic methods in STEM education, emphasising creative problem-solving. Also, one of the participants with expertise in Mathematics Education, referred to the following article for consideration: Leavy, A., Dick, L., Meletiou-Mavrotheris, M., Paparistodemou, E., & Stylianou, E. (2023). The prevalence and use of emerging technologies in STEAM education: A systematic review of the literature. *Journal of Computer Assisted Learning*, *39*(4), 1061– 1082. https://doi.org/10.1111/jcal.12806. Section 5.2 of this review article (Leavy, et al., 2023) provides an overview of how arts disciplines are being integrated with emerging technologies in STEAM education in the reviewed articles. It includes several examples of studies that connect science, arts and culture in education. **Topic 2: Innovative pedagogical methods** ***Innovative pedagogical methods for interdisciplinary approaches*** Project-based learning was recognised as an effective interdisciplinary approach, particularly in activities such as constructing traditional musical instruments. This approach can enable students, through the development or projects, to explore concepts in physics, sound, music, and cultural history simultaneously. Game-based learning was also mentioned as an engaging method for teaching complex scientific concepts, as it allows students to explore themes interactively through digital and physical games. Gamification strategies were highlighted as powerful tools for supporting motivation and engagement in the learning process. Open schooling initiatives, where students develop games or interactive projects that address real-world socio-scientific issues, were also emphasised as a promising approach. Nature-based solutions in education were further mentioned as a way to integrate the arts, technology, and sustainability in projects such as designing school gardens and exploring ecological systems through artistic and scientific methods. **Technologies enhancing the connection between Arts, Sciences, and Cultural Heritage** Several emerging technologies were identified as key facilitators of interdisciplinary learning. Embodied learning technologies, including movement-based learning systems, were seen as effective in connecting dance, motion, and scientific learning, particularly in kinaesthetic and performance-based approaches. Augmented Reality (AR) and Virtual Reality

	(VR) were mentioned as potentially valuable tools for making learning more immersive, with applications in interactive exhibits, digital storytelling, and the exploration of historical and scientific themes. Visual arts software, such as Artivive (https://www.artivive.com/) and Halo AR (https://haloar.app/), was considered useful for animating historical and artistic objects, enhancing storytelling and interactive learning experiences. The use of electronic musical instruments and AI-driven tools, such as Surfio for modifying sound through digital means, was seen as a promising way to integrate the arts and technology dynamically. AI applications, such as bringing historical figures to life through virtual simulations (e.g., Alan Turing providing an AI-driven account of his life), were mentioned as valuable for enriching cultural and historical learning. **Topic 3: Challenges, opportunities, and future trends** ***Challenges for integrating Arts and Culture into STEAM Education at a local or regional level*** Participants identified several key challenges in incorporating arts and culture into STEM education. One of the most prominent issues was the lack of infrastructure, resources, and time dedicated to interdisciplinary learning. Schools often do not have adequate spaces, such as dedicated arts and culture labs, limiting hands-on engagement. Additionally, curriculum constraints and rigid educational structures hinder interdisciplinary collaboration, as subjects remain siloed with little opportunity for cross-disciplinary integration. Another major concern was the lack of a structured mediator or facilitator who can effectively connect schools with external cultural organisations, artists, and institutions. Without a central figure or governmental initiative to bridge this gap, schools struggle to form meaningful partnerships. Teacher preparedness also emerged as a key issue, with many educators feeling ill-equipped to integrate arts and culture into STEAM due to limited professional development opportunities in this area. ***Trends shaping STEAM education over the next decade with an emphasis on Arts and Cultural Heritage*** Participants largely agreed that the increasing role of AI in education will significantly influence STEAM learning. AI is expected to enhance creativity by assisting students in generating new ideas and content, shifting the focus from memorisation to critical thinking and question formulation. Another major trend is the expansion of immersive technologies, such as VR and AR, which will allow students to explore cultural heritage in a more engaging and interactive way. The integration of sustainability and environmental awareness into STEAM education was also mentioned, particularly through art-based projects that promote ecological consciousness, such as sustainable school gardens. Personalised and inclusive learning approaches, supported by AI and digital tools, are expected to make STEAM education more adaptable to diverse student needs and cultural backgrounds. Finally, interdisciplinary collaboration across the arts, sciences, and cultural institutions will likely become a central feature of future educational models.
Points of contention	**Topic 1: Current practices and interdisciplinary collaborations** ***Challenges in implementing STEAM in Arts and Culture*** Challenges include the lack of standardisation in STEAM approaches, as some participants expressed concern that while interdisciplinary projects are beneficial, they often lack uniform methodologies, making implementation inconsistent. Difficulty in assessing impact remains a key issue, with differing opinions on whether quantitative or qualitative assessments are more effective in evaluating interdisciplinary projects. Balancing artistic freedom with structured learning also sparked debate, as some educators

	advocate for creative freedom in arts-based education, while others stress the need for structured pedagogical approaches to ensure measurable learning outcomes.' ***Feasibility of interdisciplinary collaborations*** Institutional barriers pose a significant challenge, as some participants highlighted difficulties in obtaining institutional support for interdisciplinary initiatives, particularly within rigid educational curricula. Resource limitations, including funding and teacher training, also hinder the effective integration of STEAM with arts and culture. The scalability of collaborative projects is another point of contention. While smaller-scale initiatives, such as museum partnerships, were deemed feasible, concerns were raised about the sustainability of larger, international collaborations over time. **Topic 2: Innovative pedagogical methods** ***Challenges in implementing innovative pedagogical methods*** While there was strong agreement on the effectiveness of project-based and game-based learning approaches, some participants raised concerns about their scalability and feasibility in different educational contexts. One key issue was the resource-intensive nature of these methodologies, requiring significant teacher training, technological access, and funding to implement effectively. Another debate centred around the balance between structured learning and student-driven inquiry, with some educators advocating for more open-ended exploration, while others emphasised the need for clearer learning objectives and assessment frameworks. ***Limitations and barriers to technology integration*** Although technologies such as AR, VR, and AI were viewed positively for their potential, concerns were raised about the accessibility and/or cost of these tools (VR/AR), particularly for underfunded schools and marginalised communities. One participant also expressed reservations about the over-reliance on digital technologies, arguing that traditional hands-on and face-to-face learning experiences should not be replaced but rather supplemented by technological innovations. The ethical implications of AI-driven content, such as the use of AI-generated historical narratives, were also discussed, with participants questioning the accuracy and interpretive biases that could emerge from AI-generated storytelling. **Topic 3: Challenges, opportunities, and future trends** ***Feasibility of integrating Arts and Culture into STEAM on a large scale*** While participants agreed on the benefits of integrating arts and cultural heritage into STEAM education, some expressed concerns about the feasibility of large-scale implementation. Questions were raised about whether all schools have the necessary funding and resources to support such initiatives, particularly in rural or underfunded areas. Some participants argued that traditional STEM subjects should remain the priority, while others believed that interdisciplinary approaches are essential for fostering creativity and innovation. **Ethical and pedagogical implications of AI in education** The role of AI in education sparked debate, particularly concerning bias, accuracy, and its impact on critical thinking. While AI can be a powerful tool for creativity, there were concerns that students may become overly reliant

	on AI-generated content, rather than developing their own critical and analytical skills. Ethical issues related to AI's influence on historical and cultural narratives were also discussed, with some participants questioning how AI-driven storytelling might shape perceptions of historical accuracy. ***Balancing tradition with innovation*** Another point of contention was the balance between traditional teaching methods and emerging technologies. While some of the participants embraced the potential of VR, AR, and AI, others emphasised the importance of maintaining traditional hands-on artistic practices that have been central to cultural education. The discussion reflected differing opinions on whether technology should complement or replace certain aspects of traditional arts and culture education.
List of challenges and opportunities lying ahead	One of the main **challenges** in integrating arts and culture into STEAM education is the lack of standardisation in interdisciplinary approaches. While such projects are beneficial, the absence of uniform methodologies makes implementation inconsistent across different educational contexts. Another key issue is the difficulty in assessing impact, with ongoing debates about whether quantitative or qualitative methods are more effective in evaluating interdisciplinary projects. Institutional barriers pose a significant challenge, as rigid educational curricula and a lack of institutional support hinder interdisciplinary initiatives. Resource limitations, including insufficient funding and a lack of teacher training, also restrict the effective integration of arts and culture into STEAM. Additionally, concerns about scalability persist, particularly regarding large-scale or international collaborations, which may struggle with long-term sustainability. The resource-intensive nature of project-based and game-based learning methodologies creates another challenge, requiring significant investments in teacher training, technological infrastructure, and financial support to be implemented effectively. The balance between structured learning and student-driven inquiry remains a point of contention, as some educators advocate for open-ended exploration, while others stress the importance of clearer learning objectives and assessment frameworks. Technology presents **both an opportunity and a challenge**. While AR, VR, and AI offer immense potential for immersive learning experiences, their accessibility and cost remain significant concerns, particularly for underfunded schools and marginalised communities. There are also ethical concerns regarding AI-generated content, especially in historical and cultural education, where biases in AI-driven storytelling could impact perceptions of historical accuracy. Some participants have also raised concerns about over-reliance on digital technologies, arguing that hands-on, face-to-face learning experiences should be preserved rather than replaced. Despite these challenges, numerous **opportunities** lie ahead. The increasing role of AI in education presents new ways to enhance creativity, enabling students to focus on critical thinking and question formulation rather than rote memorisation. While there is a need to address concerns regarding ethical implications and accessibility, these technologies hold the potential to transform STEAM education by fostering deeper engagement and cross-disciplinary connections. The shift towards personalised and inclusive learning is another significant opportunity, as AI and digital tools are expected to make STEAM education more adaptable to diverse student needs

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<tr><td></td><td colspan="2">and cultural backgrounds. The expansion of immersive technologies, such as VR and AR, can provide students with more engaging ways to explore cultural heritage and historical themes. The growing emphasis on sustainability and environmental awareness offers further possibilities, with arts-based projects fostering ecological consciousness through creative initiatives such as sustainable school gardens.</td></tr>
<tr><td>Please include any questions raised during the event</td><td colspan="2">What strategies can be implemented to ensure the long-term sustainability of interdisciplinary collaborations between schools, cultural institutions, and STEAM programmes?
What professional development opportunities and training resources are available to help educators effectively implement interdisciplinary STEAM education?
How can educators effectively measure the impact of interdisciplinary STEAM projects, particularly those involving artistic and creative processes?
To what extent should AI-generated content be used in educational settings?
How can educators ensure that AI-driven storytelling does not introduce bias or misrepresent historical and cultural narratives?
How can educators integrate emerging technologies such as AR, VR, and AI without compromising traditional hands-on artistic and cultural education?
How can interdisciplinary STEAM education be made more accessible to marginalised communities, ensuring that students from diverse backgrounds have equal opportunities to participate in and benefit from such initiatives?</td></tr>
<tr><td rowspan="5">Attendees
(by category)</td><td>Description of category</td><td>Number of attendees by category</td></tr>
<tr><td>Educators with expertise in STEAM education</td><td>2</td></tr>
<tr><td>Academics from HEIs</td><td>4</td></tr>
<tr><td>Trainers, researchers, project managers, experts in Arts and CCIs</td><td>4</td></tr>
<tr><td>TOTAL NUMBER OF ATTENDEES</td><td>10</td></tr>
</table>

AGENDA

Co-funded by the European Union

STEAM INNOVATION ECOSYSTEM

Exploring STEAM Education: Insights from Experts in Science, Arts, and CCIs

Date: 15 January 2025

Location: at the premises of the Center for Social Innovation Ltd (Rigenis 62, Nicosia 1010, Cyprus) and/or connection via teams

Time: 15.30

Agenda

15.30 – 15.50 | Welcome and Introduction

- Welcome by moderator
- Overview of session objectives and agenda

15.50 – 17.00 | Focus Group Discussion

- Current educational practices
- Innovative pedagogical methods
- Challenges and opportunities for the integration of arts and CCI industries in STEAM education
- Future trends

17.00 – 17.30 | Closing Remarks

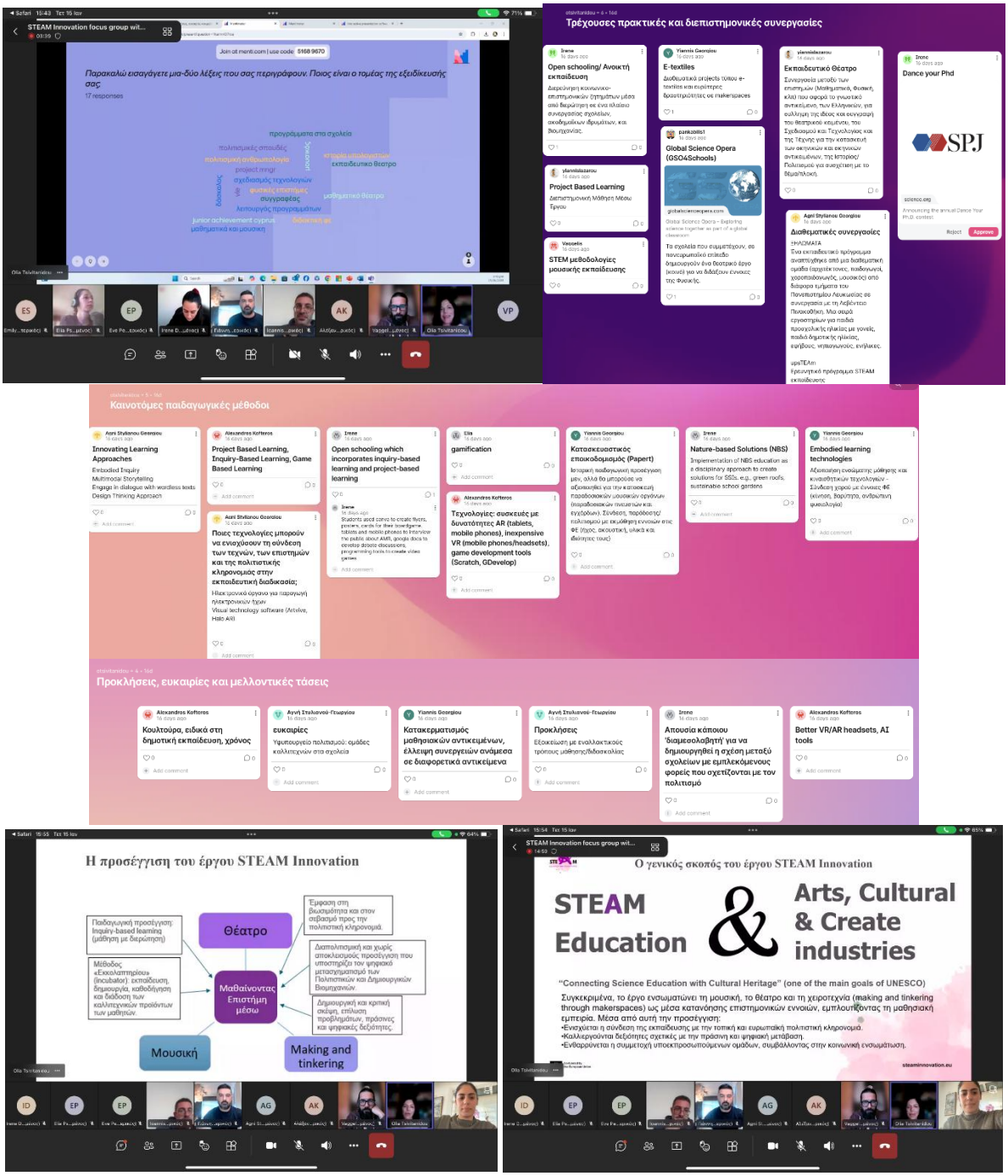
- Open discussion
- Summary of key takeaways
- Follow-up actions and opportunities

17.30 PM | End of Session

Our project partners:

SCIENCE VIEW inovirium NUCLIO materahub

PHOTOS



4.4.3 Italy

FORUM REPORT

Forum Event Info	
Title of activity (theme):	Focus group with experts in science and arts
Date / period of activity	21st of February 2025
Place of activity	Virtually – Online session via meet
Responsible partner	Materahub
Description	On January 24th, the Materahub team visited the Conservatorio of Music in Matera to meet with teachers and the headmaster to plan the upcoming focus group. Given the focus on music for both Italy and Cyprus, it was essential to

	select a few representatives from the Conservatorio. Based on the recommendations of the staff, a formal paper invitation was created and personally distributed to the chosen participants. The selection process took place on February 7th, ensuring that only those who confirmed their availability for the online meeting scheduled on February 21st (11:00 - 13:00 CET) received an invitation. The same invitation was extended to other professionals in Matera who were eligible to participate in the online focus group. All invited participants provided their consent for the use of their data and images for reporting and dissemination purposes. On February 21st, the facilitator initiated the session by conducting an online attendance check to confirm the presence of participants. To establish an engaging and interactive atmosphere, attendees were invited to introduce themselves by sharing their areas of expertise, skills, and competencies. The facilitator then introduced the STEAM Innovation Ecosystem Project, outlining its objectives and key activities, with particular emphasis on its relevance to the music sector. The discussion that followed was highly interactive, with participants contributing valuable insights and exchanging ideas. To further stimulate the conversation, the facilitator revisited responses from a previously completed Google Form, allowing participants to reflect on their earlier input and delve into the challenges and opportunities within the Music and STEAM fields. To conclude the session, participants were encouraged to complete an evaluation survey (https://shorturl.at/gKoXt) to provide feedback on their experience and the overall session.
Target group(s)	A total of ten professionals participated in the online focus group on the 21st of February. However, due to work commitments, I also conducted individual conversations with an additional ten experts who were unable to join the online session on that date but wanted to contribute with their experiences and their imput anyway. Each of them provided their input during these one-on-one discussions and completed also the questionnaire via Google Forms, which you can find here: https://drive.google.com/drive/u/0/folders/1mjzVBs7w5OXOh-43z2gpXfmJzqctpHy- This allowed me to incorporate their insights and feedback into the online focus group and in the report too. Their areas of expertise (as identified during their presentation online and through individual calls), include music, performing arts education, pedagogy and educational innovation, theatre and performing arts, cultural heritage and creative industries, STEAM education and interdisciplinary learning, as well as science and technology applied to education. Among them were educators, teachers, PhD students from conservatories, artists, performers, and theatre directors. Despite their diverse backgrounds, these professionals share a common goal: promoting innovative teaching methods and fostering interdisciplinary collaboration in education. The discussion brought together a wide range of perspectives, integrating academic research, teaching experience, artistic practice, and educational methodologies. This diversity enriched the exchanges, enabling a deeper exploration of the intersection between arts, science, and education, with a particular focus on innovative STEAM approaches within the music and performing arts sectors.
Forum Results/Report Form	

Points of consensus	**Topic 1: Current practices and interdisciplinary collaborations** ***What are the most impactful practices currently used in STEAM education within your field?*** From the participants' exchange of ideas, there was broad consensus on the most effective practices currently adopted in STEAM education. A central aspect is the interdisciplinary approach, which combines art, science and technology to create richer and more engaging learning experiences. In many educational settings, this translates into projects that integrate different disciplines through collaborative activities, such as the development of interactive installations, scientific experiments with artistic applications and the use of creative programming. The use of advanced technologies is another widespread practice and is considered essential for innovating teaching methods. Tools such as virtual reality, 3D printing and gamification are increasingly being used to make learning more immersive and to stimulate creativity and problem solving. For example, simulation platforms allow students to experiment with complex concepts in a practical way, while digital fabrication laboratories encourage the concrete application of acquired knowledge. Another key element is experiential learning, which manifests itself through practical workshops, educational games and learning-by-doing methodologies. These approaches are adopted in many schools and educational centres to encourage a direct application of theoretical knowledge to real contexts, improving students' understanding and retention. Furthermore, there is increasing recognition of the importance of developing transferable skills, such as critical thinking, creativity and socio-emotional skills, integrating these aspects into STEAM pathways through collaborative problem-solving and participatory design activities. Finally, participants emphasised that interdisciplinary collaborations are a fundamental pillar of STEAM education. Many schools and research centres are already implementing partnerships with companies, universities and museums to offer students more varied and enriching experiences. These collaborations favour a more contextualised education and allow access to resources and skills that go beyond the traditional school environment. Overall, the discussion highlighted how the most effective current practices in STEAM education are characterised by a strong interdisciplinary orientation, the integration of new technologies and experiential methodologies that favour more dynamic and meaningful learning. ***How do local cultural and scientific institutions integrate STEAM education into their programs?*** The discussion revealed broad agreement on the key role of cultural and scientific institutions in promoting STEAM education through integrated and collaborative approaches. They talked about the central aspect of organisation of interdisciplinary workshops that combine art, science and technology, offering practical and engaging learning experiences. All of them said that these workshops are fundamental tools for stimulating creativity and innovation among students, allowing them to apply theoretical knowledge to concrete contexts. They also agreed that Cultural and scientific institutions also invest in organising educational events, conferences and interactive exhibitions, with the aim of raising awareness and involving the public. These initiatives offer students the opportunity to learn through direct interaction with works of art, scientific experiments and technological applications, making the educational process more dynamic and stimulating. Another key element is the close collaboration with schools and universities to develop innovative projects that integrate the STEAM disciplines. They all think that this partnerships are

	fundamental to create more effective training programmes and to facilitate access to advanced resources and skills. One particularly important aspect concerns the integration of the most advanced technologies into educational programmes. The use of augmented and virtual reality, for example, allows for the creation of interactive installations and immersive experiences that capture students' interest and promote more engaging learning. Finally, during the session a strong focus on inclusive and sustainable education has emerged: many institutions are committed to developing programmes that are accessible to all, including students with special educational needs, recognising STEAM education as a powerful tool for promoting inclusion, well-being and social innovation. Overall, the discussion highlighted how cultural and scientific institutions are adopting an increasingly integrated and technological approach to make STEAM education more accessible, stimulating and effective, thus responding to the needs of an ever-changing educational landscape. **Can you provide examples of successful interdisciplinary collaborations in education?** The discussion with participants revealed a strong consensus on the growing importance of interdisciplinary collaborations in education. Numerous successful examples were highlighted, underscoring the effectiveness of an integrated approach that blends art, science, and technology to create engaging and impactful learning experiences. These examples demonstrate how interdisciplinary collaboration fosters innovation and enhances students' educational journeys. One such example is the 'Lucanum Metaverso', an educational game that combines geography, technology, and gamification. This project allows students to explore their territory in an interactive, immersive environment, promoting practical learning and sparking curiosity in subjects that might otherwise seem abstract or distant. By integrating different fields, it offers students a more holistic and dynamic way to engage with content. Another noteworthy example comes from creative workshops in schools, where interdisciplinarity is at the heart of the curriculum. In particular, workshops combining music and technology have been highly successful. In these settings, students use tools like Scratch to learn programming while exploring the intersection of logic and creativity. This approach encourages a deeper, more versatile understanding of the subject, merging artistic expression with technical skills. Workshops organized by professionals from the cultural and creative industries have also had a positive impact. These sessions, which involve both students and teachers, offer opportunities to develop transversal skills through collaborative projects that integrate art, science, and technology. By working together on real-world projects, students gain hands-on experience and practical knowledge in ways that traditional subjects cannot always provide. Collaborations between universities and local schools further enrich students' learning experiences. Practical workshops and interdisciplinary laboratories, often facilitated by universities, offer students access to advanced resources and specialized expertise. These partnerships allow for a more contextualized and enriched learning environment, blending academic rigor with creative exploration. Importantly, these interdisciplinary collaborations promote the development of essential transversal skills, such as problem-solving, creativity, and socio-emotional intelligence. These skills are crucial for students to navigate complex challenges in interdisciplinary contexts, where they must draw upon knowledge

	from various disciplines. As emphasized in the discussion, STEAM projects provide opportunities for students to engage in practical problem-solving and creative thinking, preparing them for the challenges of the modern world. The examples shared during the focus group highlight how interdisciplinary collaborations are fundamental to fostering educational innovation. These collaborations not only create dynamic, engaging learning environments but also equip students with the skills and knowledge needed to tackle the multifaceted challenges of today's society. **Topic 2: Innovative pedagogical methods** **What role di arts and culture play in making STEM more accessible and engaging?** The discussion revealed a strong consensus on the crucial role that art and culture can play in making STEM (science, technology, engineering, and mathematics) more accessible and engaging. Participants emphasized that the creative integration of the arts into STEM education transforms complex concepts into more understandable and captivating learning experiences. Artistic techniques such as visual narration and graphic representation were highlighted as powerful tools for simplifying scientific ideas, making them easier to assimilate, and stimulating students' curiosity. Furthermore, art plays a significant role in fostering creativity and critical thinking. By encouraging innovative approaches to problem-solving, the arts enable students to explore STEM subjects in new and creative ways. This, in turn, helps students develop original solutions to complex challenges, nurturing a mindset that is adaptable and open to new ideas. Inclusivity emerged as another key theme in the discussion. Art serves as a bridge to engage a variety of learning styles and talents, making STEM more accessible to students who might feel intimidated by traditional scientific subjects. Artistic experiences help break down cognitive and cultural barriers, creating a more inclusive and stimulating learning environment for all students. This inclusive approach not only enhances engagement but also facilitates the communication of scientific ideas. Visual media and design, as discussed by participants, are effective tools for conveying scientific content in a clear and engaging manner, which improves comprehension and retention of information. Finally, the synergy between art and STEM fosters the development of essential transversal skills such as collaboration, communication, and critical thinking. The integration of these disciplines offers students a unique opportunity to approach real-world problems with a holistic perspective, preparing them to solve challenges in a creative and cooperative manner. Overall, the insights shared by participants underscore how art and culture can play a pivotal role in transforming STEM education. By making these disciplines more accessible, engaging, and relevant, art enriches the learning experience and prepares students for the complexities of the modern world. This integrated approach not only enhances academic achievement but also cultivates skills essential for success in today's interconnected society. **How can CCIs contribute to developing creative thinking in STEAM education?** All participants agreed on the fundamental role that the cultural and creative industries play in fostering the development of creative thinking within STEAM (Science, Technology, Engineering, Art, and Mathematics) education. Participants emphasized that interdisciplinary collaboration between cultural industries and educational institutions is essential for designing innovative educational experiences that integrate art, science, and technology. This

	collaboration creates a dynamic and stimulating learning environment, where students are encouraged to explore concepts in practical and creative ways.The cultural industries also contribute significantly to the development of hands-on projects, such as creative laboratories and practical workshops, which provide students with the tools and resources to turn their ideas into reality. Events like hackathons and design labs were cited as examples of activities that not only stimulate creativity but also promote critical thinking. These events make learning more engaging and tangible, offering students the opportunity to engage with real-world challenges in a creative context. An important aspect that emerged during the discussion was the introduction of emerging technologies by the cultural industries. Tools such as augmented reality, virtual reality, and gamification were highlighted as innovative resources that make learning more interactive and captivating. These technologies encourage students to think creatively and approach complex problems from fresh perspectives, further enhancing the learning experience. Moreover, the cultural industries play a crucial role in promoting transversal skills such as creativity, cooperation, and adaptability. These skills are vital for both professional and personal development, as they are essential for navigating the complexities of the modern workforce and everyday life. The combination of art and STEM through hands-on experiences helps students cultivate these skills, equipping them to face future challenges with confidence and creativity. Participants also emphasized how the cultural and creative industries help make STEAM education more accessible to a diverse range of students, including those with different learning styles or special needs. By incorporating artistic approaches, cultural industries help overcome cognitive and cultural barriers, making learning more inclusive and comprehensible for all students. Finally, professionals from the cultural sector can serve as mentors and sources of inspiration for students, motivating them to explore careers in both STEM and the arts. Interaction with artists, designers, and scientists serves as a powerful catalyst for student engagement, sparking passion for learning and innovation. In conclusion, the discussion highlighted the critical role of the cultural and creative industries in enriching STEAM education. Their contribution fosters creative thinking, supports the development of essential transversal skills, and ensures that learning experiences are dynamic, inclusive, and engaging. By facilitating interdisciplinary collaborations, these industries help prepare students for a multidisciplinary and rapidly evolving future. **What technologies or methodologies are revolutionizing teaching and learning in STEAM?** The discussion on the technologies and methodologies reshaping teaching and learning within the STEAM (Science, Technology, Engineering, Art, and Mathematics) context revealed a shared vision among participants regarding the effectiveness of innovative tools and strategies. A particular focus was placed on technologies like augmented and virtual reality, which are considered highly effective in making learning more interactive and engaging. These tools enable students to explore complex concepts in simulated environments, offering a visual and practical approach that significantly enriches the educational experience. Gamification emerged as another key methodology, with broad consensus on its effectiveness in increasing student engagement. Participants highlighted how gamified learning not only makes education more enjoyable but also more stimulating, fostering a deeper connection with the material. Active learning methodologies, such as Problem-Based Learning (PBL) and Design Thinking, were identified as essential strategies for encouraging critical thinking and creative problem-solving. These approaches promote practical, collaborative learning experiences that challenge students to think critically and

	apply their knowledge in real-world contexts. Artificial Intelligence (AI) and machine learning were also noted for their potential to revolutionize the learning process. These technologies can personalize learning by analyzing student data and developing tailored educational content, thereby improving the overall learning experience. Additionally, the importance of collaborative learning was emphasized as a fundamental aspect of creating a dynamic, inclusive educational environment. By encouraging group work and idea sharing, this approach helps students develop essential social and communication skills, which are vital for success in both academic and professional settings. Taken together, the discussion highlighted a shared vision for the future of STEAM education, characterized by a strong orientation towards interactivity, personalization, and collaboration. These technologies and methodologies are instrumental in shaping a more engaging and effective learning environment, ensuring that students are equipped with the skills and knowledge needed for the challenges of the future. **Topic 3: Challenges, opportunities, and future trends** **What are the biggest challenges faced in integrating STEAM education at a regional or local level?** During the focus group many participants highlight several major challenges in integrating STEAM education at the regional and local level, with factors ranging from a lack of resources to infrastructural difficulties. Firstly, many Experts emphasise that schools, particularly those in economically disadvantaged areas, face serious difficulties in accessing advanced technologies and in financing quality educational programmes. This lack of resources significantly limits learning opportunities for students, depriving them of fundamental tools for a modern and complete education. In addition, outdated school infrastructure is a significant barrier to the adoption of innovative teaching methods. In many schools, the lack of adequate laboratories and up-to-date technological tools prevents the effective integration of technologies, hindering the adoption of a dynamic and practical STEAM approach. Another central problem that all of them are concerned about is the inadequate training of teachers, who often have not received the necessary preparation to use STEAM technologies and methodologies effectively. The scarcity of specific skills among educators can lead to resistance to change, making it difficult to introduce new teaching methods and technological integration. At the same time, socio-economic inequalities, which create disparity in access to educational resources and technologies, further amplify the gap between schools and students, contributing to the perpetuation of social and educational inequalities. Important is also the cultural and institutional resistance to the adoption of technological and methodological innovations. They were saying that many educators and institutions are reluctant to change established practices, and public opinion can be adverse to new teaching methods. Furthermore, the lack of collaboration between schools, universities, cultural institutions and companies limits the opportunities to create synergies and integrated projects, which could alleviate the difficulties related to the lack of resources. The creation of collaborative networks is a fundamental step to overcome these challenges and promote a more effective diffusion of STEAM education. Finally, many participants highlight the absence of clear and coherent regional educational policies, which make it difficult to promote a structural and systematic change in STEAM education. The absence of regional guidelines hinders the development of integrated and sustainable educational strategies. Therefore, the responses indicate that in order to effectively address these challenges, a coordinated approach is needed that includes targeted investments in

infrastructure, continuous training for teachers and the creation of collaborative networks between institutions, with the aim of ensuring a more equitable and effective implementation of STEAM education in local communities.

How can local institutions and experts address gaps in STEAM-related resources or teacher training?

Several strategies emerge from the discussion that local institutions and experts can adopt to fill the existing gaps in STEAM resources and teacher training. A fundamental first step for all of them would be to conduct an in-depth analysis of the available local resources, including laboratories, equipment and teacher skills. This would make it possible to identify areas of insufficiency and define development opportunities. Furthermore, the organisation of refresher courses and specific workshops for teachers is considered an important measure to improve pedagogical and methodological skills, particularly in relation to innovative teaching practices and the integration of STEAM disciplines. The creation of targeted courses would therefore enable educators to acquire the tools necessary to implement interdisciplinary approaches and to adapt to new educational needs. Another crucial aspect concerns collaboration with local businesses and universities, as these institutions could provide financial resources, teaching materials and continuing education opportunities for teachers. Partnerships between schools, companies and universities could also foster the development of research projects and the sharing of resources, helping to create a more dynamic educational ecosystem. In addition, the creation of local innovation hubs is a promising strategy, as it brings together schools, universities, companies and non-profit organisations to promote the exchange of good practices and collaborative educational projects. The development of high-quality teaching materials, such as guides and tutorials, can make STEAM teaching more accessible and engaging for students, improving the learning experience. Similarly, the implementation of mentoring programmes, which provide ongoing support from local experts, could provide teachers with practical guidance on how to integrate STEAM methodologies into their daily teaching. In addition, encouraging the involvement of the local community through events and awareness-raising initiatives could increase interest in and access to STEAM resources, creating a more inclusive and participatory educational environment. A further step suggested would be to optimise the allocation of resources, ensuring that investments are distributed in a fair and targeted manner, so that schools can access the tools necessary to develop quality STEAM programmes. Finally, the creation of travelling and shared laboratories could be an innovative solution to reduce costs and amplify the educational impact, as it would allow multiple institutions to collaborate and share resources. By combining these strategies, local institutions could significantly contribute to reducing inequalities and fostering a more inclusive, accessible and cutting-edge STEAM education.

What funding or partnerships could be leveraged to advance innovative STEAM initiatives?

The discussion revealed that in order to promote innovative STEAM initiatives, it is essential to exploit a variety of funding sources and establish solid partnerships. The opportunities offered by European funds, such as Erasmus+, Horizon Europe and Creative Europe, are considered fundamental resources to support innovative educational projects, including interdisciplinary workshops and programmes, as well as collaborations between schools and other institutions. Similarly, national and regional funding, often managed by Ministries of Education and Merit, can be crucial for financing STEAM projects,

	with the National Recovery and Resilience Plan (NRRP) representing a strategic opportunity to finance cutting-edge educational activities. Collaborations with the private sector are seen as another important way to support STEAM initiatives. In fact, technology companies and start-ups can not only offer sponsorships and donations, but also provide essential equipment for educational activities, as well as offering expertise and technical support. At the same time, local universities and research centres play a key role in the development of STEAM projects, especially by supporting the creation of curricula and offering training programmes for teachers and students. Another useful resource is private foundations and benefactors, who can finance specific educational projects and support initiatives aimed at improving STEM teaching. In addition, crowdfunding is emerging as an interesting opportunity to raise funds for specific projects, actively involving the community and parents in the creation of resources for STEAM education. Collaborations with NGOs and social objectives are also considered an important source of funding, especially for programmes aimed at inclusion and accessibility. Finally, participating in innovation projects and incubators, which provide resources, mentoring and development opportunities for innovative STEAM projects, is seen as a further step to foster initiatives in practical and cooperative learning contexts. By combining these different sources of funding and partnerships, educational institutions can develop STEAM initiatives that respond to contemporary educational challenges and better prepare students in the areas of science, technology, engineering, art and mathematics. **What trends do you foresee shaping the future of STEAM education over the next decade?** The discussion revealed that the trends that will influence the future of STEAM education over the next decade are manifold and reflect a significant change in the way education is conceived and implemented. A central aspect concerns the integration of Artificial Intelligence (AI), which will enable more personalised and interactive teaching methods, adapting the educational experience to the individual needs of students. The use of AI will be particularly important for the predictive analysis of student performance and the creation of highly interactive learning environments, where each student can progress at their own pace and according to their own needs. At the same time, the growing use of Augmented Reality (AR) and Virtual Reality (VR) promises to transform education, offering immersive experiences that will encourage practical and contextualised learning, making lessons more engaging and stimulating. Another relevant trend mentioned was the integration of topics related to sustainability and cultural heritage into STEAM curricula, in response to a growing global focus on environmental sustainability. This approach will help to educate conscious and responsible citizens, raising students' awareness of issues that are crucial for the future of the planet. The interdisciplinary approach will become increasingly prominent, as the combination of art, science and technology will offer a variety of learning experiences capable of stimulating students' creativity and critical thinking. In fact, collaboration between different disciplines will emerge as a key element in addressing the complex problems of the future. The focus on developing transferable skills such as critical thinking, creativity and collaboration will be crucial to prepare students for the future challenges of work, in a world that requires greater adaptability and the ability to solve problems in innovative ways. At the same time, there will be an increasing commitment to ensuring that STEAM education is inclusive and accessible, with technologies and practices that respond to the different needs of students, guaranteeing access to quality educational opportunities for all. They think that there will be a move towards a more decentralised education, where

	students and teachers will interact on global platforms, collaborating on research and innovation projects. Digitalisation will continue to play a fundamental role in transforming teaching and learning, facilitating access to educational resources and collaborative learning opportunities through online platforms and interactive tools. These trends respond to the needs of a rapidly changing world, making STEAM education an increasingly relevant, innovative and accessible field, capable of preparing future generations for global challenges. **How can education systems adapt to emerging fields like AI, robotics, or environmental sciences through STEAM?** The discussion showed that education systems can effectively adapt to the new challenges and opportunities offered by emerging fields, such as artificial intelligence (AI), robotics and environmental sciences, by adopting the STEAM (Science, Technology, Engineering, Art and Mathematics) model. A first step in this direction is the development of interdisciplinary curricula that combine these advanced technologies with art and creativity. This approach allows students to understand the connections between different disciplines, stimulating the ability to solve complex problems in an innovative and multidimensional way. Another method proposed to encourage more integrated learning is project-based learning (PBL), which encourages students to work on real challenges using STEAM skills. This approach fosters critical and creative thinking, preparing students to face concrete situations in the world of work and everyday life. In parallel, the creation of experiential laboratories, such as maker spaces and innovation environments, is emerging as a fundamental practice. These spaces allow students to experiment directly with emerging technologies, developing practical skills and concretely applying the theoretical knowledge they have acquired. Furthermore, to guarantee the effectiveness of these approaches, continuous training for teachers is crucial. Constant refresher programmes will ensure that teachers are well prepared to integrate new technologies, such as AI and robotics, as well as sustainability issues into their teaching. Collaboration with universities, technology companies and research centres has been identified as a further strategic tool for providing opportunities for authentic learning and training internships, facilitating access to advanced resources and specific expertise. Immersive technologies, such as augmented reality (AR) and virtual reality (VR), have been identified as very promising tools for making learning more engaging and interactive, allowing students to explore complex concepts in dynamic and practical ways. Furthermore, the introduction of coding and machine learning courses starting from primary school is seen as an essential element for developing digital skills that will be fundamental in the future of work. Finally, sustainability has been recognised as a crucial topic that should be incorporated into STEAM curricula to raise students' awareness of environmental issues and promote a conscious approach to the use of green technologies. By adopting these strategies, education systems will be able to respond effectively to the needs of a constantly changing world, preparing students for a future full of innovation, opportunities and challenges. **How might collaborations between science, arts, and technology evolve to foster interdisciplinary education?** During the discussion, there was a strong consensus on the need to promote interdisciplinary education through collaboration between science, art and technology. A central point was the development of educational programmes that integrate these disciplines, creating curricula that address complex issues from different perspectives, with the aim of stimulating more comprehensive and

	critical learning. In particular, the importance of creating shared laboratories and innovative learning spaces, such as fab labs, was emphasised. These are places where students, artists and scientists can collaborate on projects that combine different areas of knowledge, promoting practical and interactive learning. Another important aspect concerns the adoption of projects based on real issues, such as climate change, which integrate art for communication and the use of technology to develop sustainable solutions. Such initiatives not only respond to global challenges, but also make learning more concrete and motivating for students. The interdisciplinary training of educators has been identified as a crucial element to ensure that teachers have the necessary skills to facilitate this type of integrated experience, using innovative technologies for a modern teaching approach. Furthermore, the discussion highlighted the relevance of events and festivals that celebrate the intersections between science, art and technology, offering opportunities to engage the community and stimulate curiosity and interest in these disciplines. Collaborations with external organisations, such as universities, museums and companies, were seen as an effective means of creating experiential learning programmes that exploit the skills and resources of different sectors, broadening educational and professional opportunities for students. The use of immersive technologies, such as augmented reality and virtual reality, was mentioned as a practice that can transform the learning experience, combining science with artistic practices in an engaging and innovative way. Furthermore, the need to stimulate creativity and innovation within educational environments emerged, favouring critical thinking and allowing students to explore original solutions to complex problems. In general, it was emphasised that the objective is to overcome the rigidity between disciplines, promoting a more flexible education, capable of stimulating students' interest and engagement through practical and collaborative experiences.
Points of contention	**Topic 1: Current practices and interdisciplinary collaborations** **Challenges in implementing STEAM in Arts and Culture.** During the discussion, several challenges emerged regarding the implementation of STEAM (Science, Technology, Engineering, Art and Mathematics) practices in the arts and culture sector, with multiple difficulties encountered especially in schools located in less privileged areas. One of the main issues is represented by limited resources and infrastructures, such as the lack of technological devices, art materials and adequate spaces for laboratories, which hinder the introduction of innovative educational approaches. Alongside these infrastructural difficulties, the importance of adequate training for teachers was emphasised. However, the lack of continuous refresher programmes for the teaching staff prevents the acquisition of the skills necessary to effectively integrate the various disciplines. Another difficulty concerns the creation of collaborative networks between schools, universities and industries. Although such collaborations are essential to promote interdisciplinarity, the differences in objectives and approaches between the institutions involved often make it difficult to build a solid and strategic network. Similarly, not all schools have access to emerging technologies, such as augmented reality or 3D printing, which limits the opportunities to create interactive and engaging educational experiences for students. Another obstacle that has emerged is the low level of awareness and limited interest in STEAM practices among students and families, which can reduce involvement in the proposed activities. Furthermore, the culture of

	integration between disciplines, which should be the basis of effective interdisciplinary education, is hindered by an educational tradition that tends to separate different areas of knowledge, making it difficult to create coherent programmes that unite art and science. Despite these challenges, practices and initiatives have also emerged that demonstrate how interdisciplinary collaboration can be achieved. Some institutions are already experimenting with laboratories that integrate art and science, such as artist residencies and workshops, in which students explore scientific concepts through artistic practices and vice versa. In addition, innovative educational projects, such as 'Progetto Start: PC!', introduce children to multimedia tools in a playful way, promoting familiarity with technologies in an educational context. Events and festivals that combine science, art and technology are another positive example of how to stimulate public interest and act as a catalyst for further collaborations. Local cultural and scientific institutions are also starting to integrate STEAM education more and more, creating immersive exhibitions and interactive installations that promote interdisciplinarity. Finally, collaborations are increasingly focusing on relevant topics such as climate change, which is addressed through the fusion of art and science, an approach that makes learning experiences more relevant and engaging for students. In summary, although the difficulties in implementing STEAM practices are complex and manifold, current initiatives show a growing commitment to the creation of interdisciplinary educational pathways that can integrate art in a scientific and technological context, contributing to the formation of a culture of innovation and creativity. **Topic 2: Innovative pedagogical methods** Challenges in implementing innovative pedagogical methods: There is broad consensus on the effectiveness of innovative approaches such as project-based learning and game-based learning, however Italian participants expressed concerns about their applicability on a large scale. The main difficulty concerns the need for substantial resources to adequately train educational staff and guarantee access to the necessary technologies. Another point of discussion concerns the balance between guided learning and self-exploration: while some argue for the importance of leaving students a wide margin of autonomy, others consider a more defined structuring of the learning path fundamental to guarantee its effectiveness. Limits and obstacles to technology integration: The integration of technologies such as AR, VR and AI is generally seen as an opportunity to improve learning, but concerns have been raised about the high cost and unequal access between schools with different resources. Furthermore, some participants highlighted the risk of excessive dependence on digital technologies, emphasising that traditional educational experiences, based on manual skills and direct interaction, should not be completely replaced. A further point for reflection concerns the ethical impact of the use of AI, especially in the creation of cultural and historical content, where there is a risk of bias and misleading interpretations. Topic 3: Challenges, opportunities and future trends Feasibility of integrating Arts and Culture into STEAM on a large scale Italian participants agree on the benefits of integrating the arts into STEAM programmes, but there are concerns about its feasibility on a large scale. In

	particular, there is a disparity between institutions with greater resources and schools located in disadvantaged areas, where there is a lack of means to implement interdisciplinary programmes. Some believe that the focus should remain on traditional STEM subjects, while others emphasise the importance of a broader approach that includes creativity and cultural heritage. Ethical and pedagogical implications of AI in education. The use of artificial intelligence in education generates conflicting opinions. On the one hand, its creative potential is recognised, on the other hand there are fears that it could compromise the development of students' critical thinking, pushing them to depend too much on automatically generated content. Some participants also expressed concerns about the historical and cultural distortions that could result from the use of AI in storytelling and history teaching. Balancing tradition and innovation. One of the main points of contention concerns the relationship between technological innovation and traditional methods. While some participants welcome the integration of advanced digital tools such as VR, AR and AI, others emphasise the need to preserve traditional artistic and cultural techniques. The discussion highlighted different perspectives: some believe that technology can expand expressive and educational possibilities, while others fear that excessive use can reduce the value of the manual and sensorial experiences typical of art and culture. The discussion revealed a certain diversity of opinion on various aspects related to the adoption of technologies in STEM teaching. A central topic of contention concerns teachers' familiarity with the use of new technologies. Although some participants believe that teachers are able to adapt without particular difficulty, others argue that continuous training is necessary to effectively integrate tools such as augmented reality, gamification or artificial intelligence into everyday educational practices. Furthermore, there is debate about the relationship between modern technologies and traditional teaching methods. Some consider the adoption of advanced technologies as an urgent necessity, while others suggest that innovation should proceed with caution, preserving and valuing traditional techniques that have proven their effectiveness over time. Another point of discussion concerns the sustainability of new technologies. Many participants express concern about the disparity of access to such resources, fearing that some schools or students may be disadvantaged, creating inequalities in learning. Finally, some raise concerns about the risks associated with the use of digital technologies, highlighting potential disadvantages such as distraction and dependence on devices, which could hinder active learning and compromise the effectiveness of the proposed methodologies.
List of challenges and opportunities lying ahead	Implementing STEAM education presents a number of challenges, but also offers numerous opportunities to innovate and improve the educational offer. Participants recognised the following challenges and opportunities: **Challenges** **Limited Resources:** Schools, particularly those located in less privileged areas, face difficulties in accessing the advanced technologies and equipment necessary to implement STEAM approaches. In addition, the funds allocated to education are not always sufficient to finance innovative projects, limiting the possibility of developing cutting-edge educational experiences. **Teacher Training:** Another significant obstacle is the inadequacy of educators' training, both initial and continuing, in the integration of STEAM disciplines. In

	addition, there is a certain resistance to change in traditional teaching methods, which do not always support the adoption of interdisciplinary approaches. **Difficulties in Collaboration:** poor communication and coordination between schools, cultural institutions and companies is problematic. Differences in objectives and approaches between the various institutions often lead to ineffective collaborations and a lack of a strategic network that favours integrated education. **Access to Technology:** In some areas, especially rural or disadvantaged ones, the disparity in access to high-speed internet and emerging technologies greatly limits the possibilities for educational interaction. Furthermore, the lack of dedicated spaces, such as innovative laboratories, prevents the optimal adoption of STEAM practices. **Limited Awareness and Interest:** Another major obstacle is the low level of involvement of students and families in STEAM initiatives. In addition, gender stereotypes, which often discourage girls' participation in STEM subjects, represent a significant barrier to be overcome in order to ensure equal educational opportunities. **Culture of Integration:** Finally, the sectoral educational tradition makes it difficult to integrate art and science. The division between disciplines tends to hinder the creation of educational pathways that unite these areas in a coherent and profitable way. **Opportunities** **Innovation and Creativity:** STEAM practices offer the opportunity to promote in-depth interdisciplinarity that stimulates critical thinking and creativity in students. The use of advanced technologies such as virtual reality, robotics and the metaverse allows for the creation of engaging learning experiences that attract students and motivate them to explore new solutions. **Interdisciplinary collaborations:** Projects that combine science, art and technology offer unique educational experiences, creating a deep connection between different areas of knowledge. Events, festivals and workshops can also act as catalysts to stimulate public interest and community involvement, promoting dialogue between disciplines and between people. **Funding and Institutional Support:** Initiatives such as the National Recovery and Resilience Plan (NRRP) represent an important opportunity to fund innovative projects in schools. There are also possibilities to collaborate with cultural organisations and institutions to enrich the STEAM educational offer, expanding the resources available to students. **Development of 21st Century Skills:** The STEAM approach is a privileged way to develop transversal skills crucial for the future, such as teamwork, problem solving and critical thinking. This type of education prepares students to be active and aware citizens, well equipped to face future challenges in an increasingly interconnected and technological world. **Inclusion and Diversity:** STEAM practices also have the potential to promote social inclusion, allowing for the involvement of different segments of the population, including the most disadvantaged. In addition, they offer opportunities to empower communities through education and cultural interaction, contributing to a more equitable and inclusive future.
Please include any questions raised during the event	What are concrete examples of STEAM projects that have had a positive impact in schools? How can schools effectively integrate STEAM subjects into their curriculum?

	What are the main obstacles that teachers face when adopting a STEAM approach? How can we overcome the gender stereotypes that influence the participation of girls in STEM subjects? Which technologies do you consider indispensable for an effective STEAM educational environment?	
Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	Educators with expertise in STEAM education	*4*
	Academics from HEIs	*1*
	Trainers, researchers, project managers, experts in Arts and CCIs	*5*
	TOTAL NUMBER OF ATTENDEES	***10 (+10 one to one)***

AGENDA

Esplorare l'istruzione STEAM: approfondimenti da parte di esperti in scienze, arti e industrie culturali e creative

Luogo Virtuale: Online Meeting (meet.google.com/gqt-gnpy-gjv)

Time: 11:00 -13:00

Agenda

- **11:00 - 11:10 Benvenuto e Introduzione**

Panoramica degli obiettivi della sessione

- Overview of session objectives and agenda

- **11:10 - 11:40 - Presentazioni dei gruppi di discussione**

Prof. Fabrizio Festa

Dott. Paolo Clemente

Dott. Mario Spada

- **11:40 - 12:20 Sessioni di approfondimento**

Pratiche attuali nell'educazione STEAM in Conservatorio.

Pedagogie innovative nel settore musicale.

Tendenze future nell'insegnamento delle materie Steam attraverso la Musica

- **12:20 - 12:50 Discussione**

Presentazione dei risultati principali

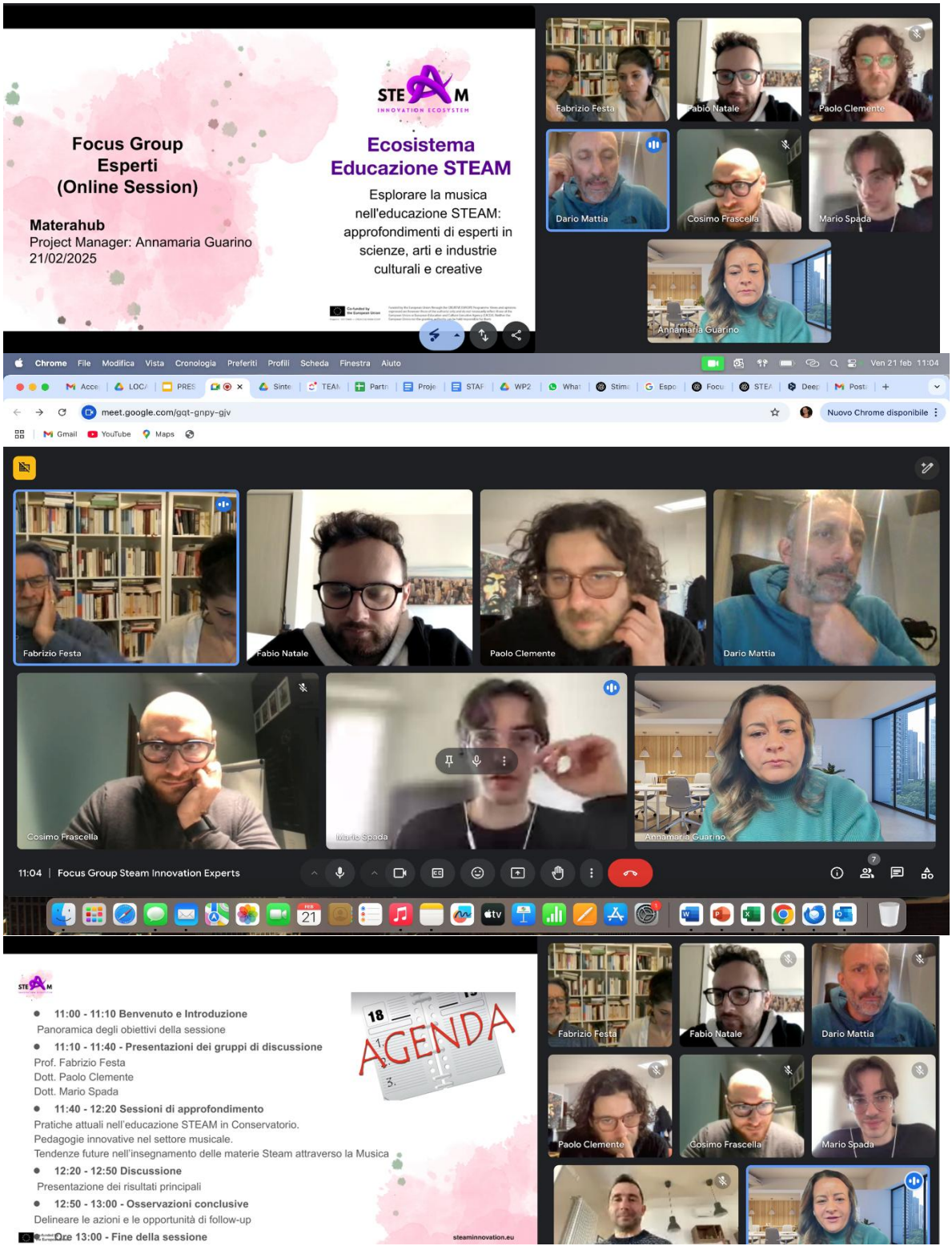
- **12:50 - 13:00 - Osservazioni conclusive**

Delineare le azioni e le opportunità di follow-up

- **Ore 13:00 - Fine della sessione**

Our project partners:

PHOTOS


Focus Group
Esperti
(Online Session)
Materahub
Project Manager: Annamaria Guarino
21/02/2025
Ecosistema
Educazione STEAM
Esplorare la musica nell'educazione STEAM: approfondimenti di esperti in scienze, arti e industrie culturali e creative
Fabrizio Festa
Fabio Natale
Paolo Clemente
Dario Mattia
Cosimo Frascella
Mario Spada
Annamaria Guarino
meet.google.com/gqt-gnpy-gjv
Nuovo Chrome disponibile
11:04 | Focus Group Steam Innovation Experts
AGENDA
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Panoramica degli obiettivi della sessione
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12:50 - 13:00 - Osservazioni conclusive
Delineare le azioni e le opportunità di follow-up
13:00 - Fine della sessione
steaminnovation.eu

4.4.4 Portugal

FORUM REPORT

Forum Event Info	
Title of activity (theme):	To the Rhythm of STEAM
Date / period of activity	February 6, 2025
Place of activity	Change Makers Cascais, Portugal
Responsible partner	NUCLIO
Description	NUCLIO organized the T2.2 expert forum on STEAM Education that brought together professionals, educators, and researchers from various disciplines to discuss the role of Science, Technology, Engineering, Arts, and Mathematics (STEAM) in education and professional practice. The forum aimed to explore interdisciplinary approaches, the impact of STEAM practices on learning and creativity, and ways to bridge the gap between academia and industry. Through interactive discussions, presentations, and panel debates, participants shared insights, raised critical questions, and identified both challenges and opportunities in STEAM education and professions. This forum provided valuable insights into the current state and future of STEAM education, highlighting both the challenges and opportunities that lie ahead. The discussions underscored the importance of collaboration between professionals, educators, and institutions to foster a more holistic and accessible STEAM learning environment. During the workshop, the following questions were asked of all participants: Question 1: What are the most relevant STEAM practices in your profession? Question 2: What do you consider to be the importance of art and culture in making STEM fields more accessible and motivating? Question 3: How can people working in STEAM fields contribute to addressing gaps in STEAM education and teacher training? Question 4: What trends do you foresee in the evolution of STEAM careers in the coming decades?

Target group(s)	Experts in sciences, arts, and CCIs (Cultural and Creative Industries); Representatives of cultural and scientific institutions.
Forum Results/Report Form	
Points of consensus	**Interdisciplinary Integration**: All participants agreed that integrating Science, Technology, Engineering, Arts, and Mathematics (STEAM) is essential in their professions and enhances problem-solving, communication, and public engagement. **Importance of Communication**: Effective communication of scientific and technical knowledge is crucial, with many highlighting the role of visualization and storytelling in making information accessible. **Real-World Application in Education**: Bringing real-life experiences into classrooms, whether through workshops, hands-on activities, interactive demonstrations, or guest lectures, was seen as key to fostering engagement in STEAM subjects. Connecting students with industry professionals, real-life case studies, and hands-on experiences enhance STEAM education. **Art as a Catalyst**: Art is not just a tool for expression but a means to make STEM subjects more engaging, relatable, and understandable. **Technology's Growing Role**: Automation and digital tools are playing an increasing role across all STEAM fields, requiring adaptability and continuous learning. **Focusing on Emotional Activation in Education**: Participants highlighted the importance of engaging learners emotionally and fostering a deeper connection with subjects through hands-on experiences, interaction with nature, and tangible materials rather than passive listening. This approach goes beyond the integration of arts, aiming to create meaningful and immersive learning environments.
Points of contention	● **Definition of Art in STEAM**: Some participants viewed art as an exploratory, unrestricted process, while others saw it as a structured means of communication within STEAM fields. ● **Technology's Impact on Creativity**: While some embraced automation and artificial intelligence as enhancers of creativity, others expressed concerns that reliance on these tools might reduce human ingenuity. ● **Future of STEAM Careers:** Opinions diverged on how STEAM careers will evolve. Some argue that interdisciplinary skills will become the most valuable asset, requiring professionals to adapt continuously. Others raised concerns that automation and AI could replace certain STEAM roles, potentially reducing job opportunities in traditional fields. There were also issues about whether future careers would demand more specialization or a broader, more integrative skill set while others feared a disconnect between creators and users, leading to a lack of deeper understanding. One participant suggested that due to AI, careers in the near future will require fewer people to work on creating things, leading to more people becoming users and fewer people becoming creators.
List of challenges and opportunities lying ahead	**Challenges:** ● **Bridging the Gap Between STEAM Professionals and Education**: One of the main challenges is integrating real-world STEAM professions into the classroom in a meaningful way. The participants emphasize the importance of bringing practical experiences to students, as learning is more effective through real-life applications rather than

traditional textbooks. It was suggested to invite professionals to schools for workshops, open days, and interactive presentations to demonstrate the relevance of their work. Additionally, interdisciplinary collaboration is essential—professionals and educators should work together to design integrated projects that showcase how different STEAM fields intersect. Encouraging teachers to step outside conventional education models and adopt hands-on, experience-based learning approaches is key.

- **Keeping Up with Rapid Technological Changes**: The rapid evolution of technology presents a significant challenge for both educators and professionals. Automation and user-friendly tools are making processes faster and more efficient, but they also create a growing divide between those who develop technology and those who simply use it. Many professionals highlight the need for ongoing adaptation, with the prediction that AI and automation will shape future STEAM careers. Educators must be prepared to incorporate new technologies into their teaching methods while maintaining critical thinking and problem-solving skills among students. A major concern is ensuring that learners and professionals can adapt to emerging technologies rather than merely becoming dependent on them.
- **Balancing Automation and Human Expertise**: As automation continues to advance, there is a concern that human expertise could be undervalued. Many professionals foresee a shift where AI assists in creative and technical tasks, leaving humans to interpret, adapt, and innovate. The balance between technology-driven efficiency and human creativity must be carefully maintained. While automation can optimize research and development, educators and professionals emphasize the importance of preserving skills that require human intuition, ethical judgment, and hands-on problem-solving. Some experts suggest that, over time, there will be a societal pushback against excessive automation, leading to a renewed focus on human-centered skills.

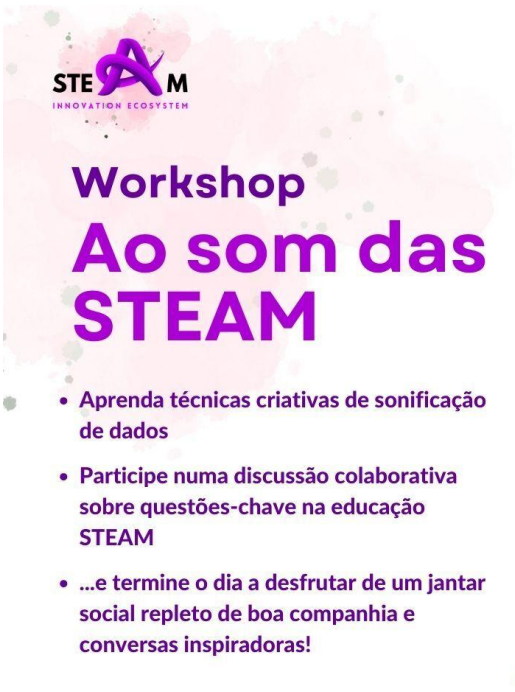
Opportunities:

- **Industry-Academia Collaboration**: Experts from various STEAM fields can participate in open days, workshops, mentorship programs and school visits to share their professional experiences with students and educators. This fosters meaningful real-world connections. Engineers, biologists, and scientists recognize the need for multidisciplinary skills. Industry can help academia bridge the gap by offering training in cutting-edge tools such as chromatographs, electrochemical sensors, and digital fabrication technologies. The collaboration should embrace STEAM as a holistic approach, where even the arts contribute to product design, science communication, and user experience.
- **Leveraging Art to Enhance STEAM Education**: Art serves as a crucial bridge between science and society, particularly in the communication and dissemination of scientific knowledge. Marine biologists, for example, highlight the importance of visually appealing representations—such as maps and graphical outputs—to make complex data more accessible to the public. Likewise, landscape architects incorporate multisensory artistic experiences to engage students with nature, demonstrating how art enhances scientific

	exploration. Moreover, other professionals view art as an experimental process that fosters creativity, sometimes leading to unexpected innovations. By integrating artistic expression into STEAM education, educators can develop more engaging and impactful learning experiences, ensuring that students not only understand scientific concepts but also connect with them on a personal level. ● **Advancements in Educational Technology**: Technology is at the heart of STEAM education, with ongoing advancements making learning more automated, user-friendly, and efficient. Researchers emphasize the increasing speed of monitoring systems and the automation of laboratory processes, reducing human intervention while improving precision. In educational settings, interactive platforms and digital fabrication tools, such as 3D printing and sensors, enable hands-on learning that bridges theoretical knowledge with real-world applications. However, there is a growing need to balance these technological advancements with human creativity, ensuring that students develop problem-solving skills rather than merely relying on automated solutions. Facilitators of STEAM education must, therefore, encourage educators to adopt these tools confidently, fostering an environment where technology enhances rather than replaces human intellect. ● **Cross-Disciplinary Learning Models**: STEAM education thrives on interdisciplinary collaboration, and experts from various fields emphasize the need to integrate multiple disciplines for a holistic learning experience. A marine biologist, for instance, applies science, technology, and engineering when using chromatography and electrochemical sensors, but also incorporates art to effectively communicate findings. Similarly, a professor designs learning scenarios—such as missions to Mars or environmental crises—where students must apply knowledge from different fields to solve complex problems. This cross-disciplinary approach fosters a sense of interconnectedness, demonstrating that no single subject operates in isolation. Additionally, professionals advocate for real-world engagement, such as workshops, school visits, and open days at research institutions, allowing students to experience the integration of STEAM disciplines firsthand. ● **Developing New STEAM Career Paths**: As technology evolves, traditional career paths are being reshaped, with new opportunities emerging at the intersection of STEAM disciplines. Engineers predict that automation and artificial intelligence will redefine roles, shifting human effort toward creativity and problem-solving. Landscape architects foresee a future where professionals act more as mediators, interpreting human needs while leveraging AI for design solutions. Additionally, the increasing accessibility of educational technology will lead to new roles for teachers, transforming them into learning facilitators and specialists in STEAM integration. While some fear a growing divide between content creators and passive users, others argue that humanity has always adapted to technological revolutions. The challenge lies in ensuring that students are not only prepared for future careers but are also equipped with the critical thinking skills necessary to navigate these evolving landscapes.

Please include any questions raised during the event	• How can we better integrate professionals from different STEAM areas into education to provide more hands-on and engaging learning experiences? • What strategies can be employed to help teachers feel more comfortable adopting technology in their teaching? • How can we ensure that technological advancements enhance rather than replace human creativity? • What will be the impact of AI on the quality of scientific research and validation processes? • How can we ensure AI is used ethically and responsibly in scientific and technological development? ◦ How can we maintain a balance between digital innovation and the human touch in education and professional practices?	
Attendees *(by category)*	***Description of category***	***Number of attendees by category***
	Scientific Researcher	***4***
	Marine Biologist	***1***
	Luthier	***1***
	Mechanical Engineer	***1***
	FabLab Coordinator	***1***
	Landscape Architecture	***1***
	Teacher	***1***
	CEO of a Technology Store	***1***
	Musician	***1***
	TOTAL NUMBER OF ATTENDEES	***12***

AGENDA



PHOTOS