SENSE. The New European Roadmap to STEAM Education

D6.1 – Scoping report on social inclusion and gender in STEAM

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Abbreviations and acronyms

Abbreviation or acronym used in this document	Explanation
EU	European Union
SDG(s)	Sustainable Development Goals
STEAM	Science, Technology, Engineering, Arts and Mathematics
STEM	Science, Technology, Engineering, Mathematics
UN	United Nations
WP	Work Package

Glossary

Term	Definition used or meaning in the SENSE. project	Reference or source for the definition if applicable
Access	In this deliverable, access refers not only to physical accessibility, such as resources, objects, and places, but also to intellectual access, such as ideas and knowledge.	This deliverable
Activity	An activity in education is a distinct and specific task or action undertaken as part of a larger educational practice.	D.3.4
Agency	Agency within a space refers to individuals' capacity to make choices, exert control, and influence their environment. In inclusive spaces, individuals, regardless of their background or identity, should feel a sense of agency over their surroundings.	This deliverable
Artistic practices/Art intervention/Art-infused practice	A creative and sensory process encompassing research, exploration, translation, or production. An artistic practice can also be an artistic intervention if it transcends conventional artistic boundaries and deliberately engages with contexts, issues, or spaces with the aim of catalyzing meaningful impact or provoking critical discourse.	D.3.2, D3.4, D3.5
Co-Creation	Non-hierarchical knowledge exchange and co-production, recognizing that learning is not one-directional, but benefits all involved. Co-creation and collaboration promote collective and participatory practices and recognizes the importance of shared ownership and meaningful engagement.	This deliverable
Community	In the context of social inclusion, we determine the community to represent a holistic and comprehensive set of identities that conform groups, collectives, and communities.	This deliverable
Citizen science	The term is commonly used to describe different forms of participation in scientific knowledge production and	(Haklay *et al.*, 2021)

	even to describe various forms of participatory action research and digital volunteerism.	
Citizen social science	The term can be defined as co-designed research driven by groups sharing a social concern.	(Perelló, 2021)
Gender Inequality	A persistent and multifaceted social issue that affects individuals within all spheres of life, including education, employment, health, and other societal interactions. It reflects historical injustices and marginalization that individuals have experienced based on their gender identities.	(European Institute for Gender Equality, 2013)
Identity	Identity refers to qualities, beliefs, personality traits, appearance, and can encompass elements such as gender, sexual orientation, religious affiliation, nationality, and ethnicity, among others.	(Covington, 2015)
Individual	In the context of social inclusion, we determine the Individual to represent the lived experiences of a person shaped by the interplay of various social identities.	This deliverable
Persons or groups in a vulnerable situation	Individuals or groups that might be in a vulnerable situation such as women and girls; children and young people; refugees; stateless persons; national minorities; migrant workers; sick or disabled persons; elderly persons; and LGBTQIA+. This is not an exhaustive list, but it demonstrates a range of vulnerable situations that any person might face.	This deliverable
Roadmap	Step-by-step process for providing an implementation for future STEAM education. There are three phases of the Roadmap: Awareness, Action, and Advocacy.	D.3.4
SENSE. Manifesto	A living document that succinctly articulates the partners' shared principles, values, and goals, serving as a guiding framework that unifies members' efforts and communicates their distinctive perspective or transformative vision to a broader audience. This manifesto provides a clear direction that fosters cohesion and resonance within the collective, while	D.3.4

	signaling its distinctive contribution to STEAM to the larger discourse.	
STEAM practice	A STEAM practice in education refers to a comprehensive and systematic approach that includes activities and strategies based on principles used to achieve STEAM educational impact.	D.3.4
Social Inclusion	Social inclusion is a multidimensional concept that refers to the fair and equitable engagement of all individuals in society, regardless of their background, abilities, or identities. Social inclusion, social cohesion, and social justice are intertwined concepts that seek to create equitable and inclusive societies. Social inclusion relates to complex topics such as power relations, social justice, non/hierarchical decision-making, identity, public visibility, stigmatization and even accessibility.	(Silver, 2015) (Cornwall and Jewkes, 1995) (Bisson *et al.*, 2022)
Society	In the context of social inclusion, we determine the society to represent cultural norms, institutions, las and public policies.	This deliverable
School segregation	School segregation is commonly referred to as differences across schools in students' ability, socioeconomic background, or ethnicity.	(European Commission, 2021)

The SENSE. project

There is a widespread understanding that the future of a prosperous and sustainable Europe depends to a large extent on the quality of science education of its citizens. A science-literate society and a skilled workforce are essential for successfully tackling global environmental challenges, making informed use of digital technologies, counteracting disinformation, and critically debunking fake news campaigns. A future-proof Europe needs more young people to take up careers in science related sectors.

Research shows that interest in STEM subjects declines with increasing age. This effect is particularly pronounced among girls and young women; even those of them who take up science studies gradually forfeit their motivation. But despite all image campaigns and efforts to remove the awe of science only “one in five young people graduates from STEM in tertiary education” and only half as many women as men, according to the European Skills Agenda.

The disinterest in science is striking and evokes the question of its causes. Stereotypes and lack of female role models seem to be only a part of the explanation. Nor is there a lack of career prospects that could explain a reorientation despite initial interest.

SENSE. has identified two major problems in current science education that need to be addressed: a) A distorted teaching logic that progresses from abstract models to procedural applications (“reverse ontology”) and b) The inability to implement a learner-centred pedagogy linking students’ everyday knowledge to science-based knowledge, thus promoting motivation, self-directed and life-long learning.

SENSE. advocates for the development of a high-quality future-making education that is equally accessible to all learners and promotes socially conscious and scientifically literate citizens and professionals. SENSE. aims at radically reshaping science education for a future-making society. By promoting the integration of all human senses into exploring and making sense of the world around us we will challenge conventional ideas of science and science education. Considering the pitfalls of current science education practices and the advantages of artistic and aesthetic activity, this innovative approach also considers social inclusion and spatial design as core components for a new STEAM education paradigm. With ‘SENSE.STEAM’ future science learning will be moving away from the standardized classroom shapes and furniture layout entering new learning landscapes.

The project seeks to develop an accessible educational roadmap promoting socially conscious and scientifically literate citizens and professionals. It addresses outdated perceptions of current science education as well as gender stereotypes by integrating the arts, social inclusion and spatial design as its core components. SENSE. will establish 13 ‘STEAM Labs’ across Europe to develop and evaluate the

‘SENSE. approach’ to STEAM subjects alongside students, educators, teachers, businesses, and other stakeholders.

The ‘New European Roadmap to STEAM Education’ will take the shape of a STEAM learning companion to support tomorrow’s educators and learners – be it in the classroom, in a museum or on a drilling rig. A digital hub will be established, where practitioners from all ages and backgrounds across Europe will be able to access tried and tested educational practices to increase engagement within these subjects.

The SENSE. consortium

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Executive Summary

This document provides the results of a scoping report focused on social inclusion and gender dimensions as cross-cutting dimensions of the SENSE.STEAM methodology developed in “WP3 - SENSE.STEAM pedagogy”. This deliverable constitutes the first outcome from the “WP6 - Cross-cutting issue: Social Inclusion”. The report examines the multifaced dimensions inherent to social inclusion. It sets a framework and general guiding principles, identifies strategies, provides cases with several learning practices and guidelines, along with recommendations on how to support and develop practices which amplify the inclusion of all people in SENSE. activities planned within the STEAM Labs.

Key ideas related to social inclusion, gender, and intersectionality are introduced to set general guiding principles to SENSE.STEAM. A general framework is described, and an awareness-action-advocacy infrastructure is proposed as a continuation of previous efforts in WP3. The alignment of inclusivity with the space cross-cutting issue in SENSE. is also carefully discussed and suggests the overlap of SENSE. spatial dimensions with four key social dimensions: co-creation, access, agency, and most importantly identity. Also, the representation of both gender and social inclusion and their intersection with citizen science and art-infused practices are exampled in a crowd-sourced manner; thus, the corresponding sections collect different perspectives and experiences within the consortia and beyond. Quotes from a wide variety of voices are included to pinpoint key ideas and respect the plurality of approaches that might be possible in social inclusion within STEAM education.

The effort is complemented with seven inspirational cases, which help to better imagine the different potential options to address social inclusion and gender within the SENSE. model and the STEAM Labs. Some of the documented experiences come from the SENSE. consortia and is aimed to facilitate mutual learning and capacity building within the consortia. The descriptions include concrete key learnings to increase transferability and knowledge exchange. Additional examples of other European projects are included to reflect the ethos of a network of STEAM Labs at an operational level by focusing on women in STEM disciplines and skills.

This document is not intended to be a comprehensive toolkit as this will be a future deliverable (D6.3), but instead it offers a dedicated section on practical recommendations to operationalize gender and social inclusion, which synthesizes key ideas. It first presents a self-reflection exercise for the STEAM Labs based on individual, community, and society levels as concentric spheres that strongly correlate when considering social inclusion, gender, and intersectionality. Second it delivers a set of 20 points addressing practical aspects to effectively guide the STEAM Labs in their task in considering social inclusion as a fundamental aspect of STEAM education, recognizing the need for tailored strategies based on project requirements and societal contexts. The integration of co-creation, access, identity, agency, participatory practices, gender equality, and intersectionality is emphasized as interconnected pillars of a more inclusive and equitable educational landscape.

This transformative approach aims to shift from passive assimilation to active engagement and dismantle exclusionary norms, ultimately leading to a more just, equitable, and inclusive STEAM education and future.

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1. Introduction

1.1. Purpose of the document

This document establishes a framework and general guiding principles, identifies strategies, provides cases with several learning practices along with guidelines and recommendations on how to support and develop practices which amplify the inclusion of all people in SENSE. activities planned in WP4. This document is not intended to be a comprehensive toolkit as this will be a future deliverable (D6.3), but instead is a scoping report with the aim to provide more practical insights and approaches to those already provided in Deliverables 3.4 and 3.5. The primary aim is to provide means to incorporate social inclusion and gender as a key aspect in the SENSE.STEAM educational model and pedagogy. Guidelines and recommendations are provided in a crowdsourced manner to include the plurality of visions within the consortia and beyond.

1.2. Intended readership

The report will be publicly available and, as such, accessible by the stakeholders and beneficiaries. The intended readership is primarily the SENSE. consortium, in which to apply these approaches and perspectives into the development of SENSE.STEAM educational activities and STEAM Labs. The aim is to be mindful of a variety of needs and perspectives of all persons involved, particularly in increasing the inclusivity of groups that might be in a vulnerable situation such as women and girls; children and young people; refugees; stateless persons; national minorities; migrant workers; sick or disabled persons; elderly persons; and LGBTQIA+. This is not an exhaustive list, but it demonstrates a range of vulnerable situations that any person might face.

1.3. Structure of the document

After the introduction in Section 1, the deliverable is divided into 3 main sections. Section 2 builds the connection between what has been discussed in WP3 in relation to the understanding of social inclusion and gender within SENSE. Nuances between inclusion and space as cross cutting issues, inclusion and citizen science, and inclusion and art-infused practices are particularly highlighted with a set of recommendations collected in a crowdsourced manner. Section 3 collects a limited list of experiences to better imagine STEAM Labs and their educational activities through the lenses of social inclusion, gender, and intersectionality. Examples of other European Projects are also included to reflect the ethos of a network of STEAM

Labs. Each experience description incorporates a list of reasons regarding why the experience might be of relevance for the STEAM Labs. Section 4 is about operationalizing gender and social inclusion, where some practical measures and guidelines are synthesized in moving forward. They are set under the basis of the learnings taken from Section 2 and Section 3. The Conclusions section closes the deliverable with final thoughts and considerations.

1.4. Relationship with other deliverables

This deliverable builds from WP3 and highlights potential context-specific challenges in relation to social inclusion and gender. More specifically, it relates to deliverable "Deliverable 3.4 - Report on knowledge and practices for a New European STEAM education" which collects knowledges and practices and identifies elements such as space and inclusion as an integral part of SENSE.STEAM. It also relates to "Deliverable 3.5 - The SENSE.STEAM educational model and pedagogy" which outlines the SENSE.STEAM model and highlights existing challenges related to gender in contemporary STEM spheres. This deliverable D6.1 serves as a basis for upcoming deliverables from WP6 which will be focused on implementing strategies, monitoring social inclusion and gender, delivering a toolkit, setting evidence to support further recommendations, and contributing to the STEAM roadmap that motivates the SENSE. project. This deliverable also relates with the cross-cutting deliverable "Deliverable 5.1 - Scoping report on Cross-Cutting Issue: Space" and together, will contribute to all STEAM Labs.

2. Inclusion guiding principles

2.1. Background

A central objective within SENSE. is to reorient and rebuild current STEAM educational practices by integrating social inclusion as a cross-cutting issue. Within SENSE.STEAM, social inclusion and equity builds upon the UN Sustainable Development Goal 4, which is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."

SENSE. advocates for the development of a different model of science education, one that is equally accessible to all learners, while simultaneously developing socially conscious and scientifically literate citizens. In this context, this focus on gender can adopt the prerogative to deconstruct the gender normative stereotypes which are often prevalent within traditional perspectives of STEM disciplines, historically leading to multiple forms of exclusion from science and scientific careers.

Education and training play a pivotal role in shaping well-rounded and socially conscious students who possess a strong commitment to sustainability (Skowronek *et al.*, 2022). Additionally, the UN 2030 Agenda for Sustainable Development underscores the importance of including minority groups affected by poverty, gender inequality, and inequity in discussions surrounding environmental challenges and sustainability concerns (UNESCO, 2019)

In the previous "Deliverable 3.4 – Report on knowledge and practices for a New European STEAM education" and "Deliverable 3.5 – The SENSE.STEAM educational model and pedagogy", the basis on how to consider social inclusion and gender was established. These insights on social inclusion and gender helped to build the SENSE. Manifesto from deliverable D3.4 provided here again, in Figure 1. The Manifesto is a central element of the SENSE. model, especially when considering practical aspects. However, it is a "living" approach, as the blank boxes indicate spaces to adapt and modify its content along the evolution of the SENSE. project and to add other perspectives and visions acquired during the SENSE. project journey.

The Manifesto is a guide to the design of the learning sequences which will be implemented in the STEAM Labs. The Manifesto shares a common transformative vision on STEAM and instills an active attitude towards STEAM education. This sense of agency is also a fundamental aspect when the issue of social inclusion, gender, and intersectionality is addressed.

Considering this background, Section 2 of this deliverable further develops the concepts of social inclusion and gender, which are highly relevant within the Manifesto. Section 2 maintains a certain level of abstraction, yet with the intention to

directly influence the learning sequences to be developed in the STEAM Labs. In parallel, these characteristics shall be considered alongside the Manifesto and will guide the design of the educational interventions. First, some ideas related to social inclusion, gender, and intersectionality are expanded. Second, the alignment of inclusivity with the space cross-cutting issue in SENSE. is explored. Finally, both gender and social inclusion and their intersection with citizen science and art-infused practices are considered. Within the subsections, specific visions and recommendations in the form of quotes from crowdsourced voices are included. The aim is to highlight key ideas in a crowdsourced manner and respect the plurality of approaches that might be possible in social inclusion within STEAM education. The effort allows the imagining of potential scenarios to address social inclusion and gender within the SENSE. model.

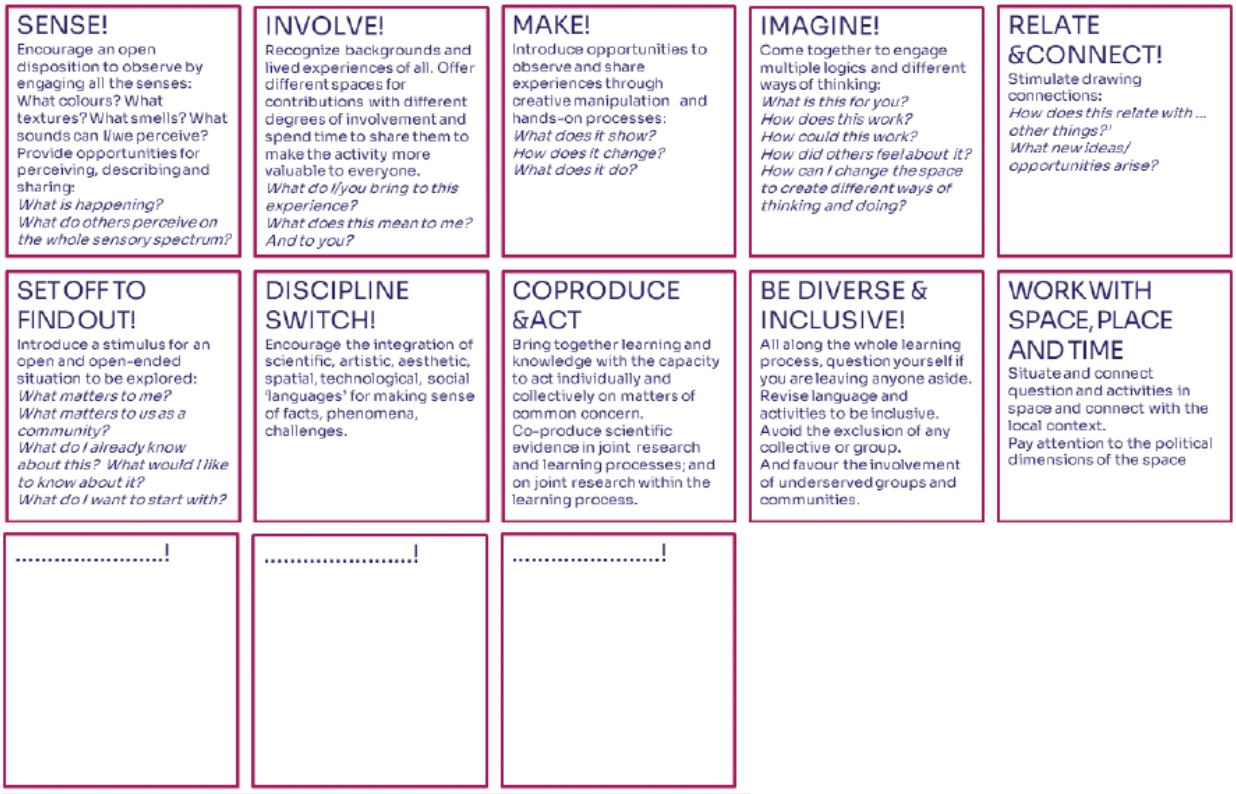

Figure 1: Living SENSE. Manifesto in its version from Deliverable 3.4.

2.2. Social inclusion

Social inclusion is a multidimensional concept that refers to the fair and equitable engagement of all individuals in society, regardless of their background, abilities, or identities (Silver, 2015). Social inclusion, social cohesion, and social justice are intertwined concepts that seek to create equitable and inclusive societies (Cornwall

and Jewkes, 1995). Social inclusion relates to complex topics such as power relations, social justice, non/hierarchical decision-making, identity, public visibility, stigmatization and even accessibility (Bisson *et al.*, 2022).

In education, inclusion focuses on expanding an individual's capabilities and opportunities (Winzer, 2009). Social inclusion is crucial for community engagement and directly impacts the participant's well-being and overall sense of belonging (Dickes, Fusco and Marlier, 2010). Inclusive environments are often characterized by decentralized decision-making, diverse representation, and creating a space for participation, for making, for acting together (Durga Prasad Chhetri, 2013) (Qatawneh, 2023).

Social inclusion is often related to context-based conditions. A paradigmatic phenomenon widely present in the education policy agenda is school segregation. A recent EU report warns that "School segregation has potential consequences for both economic efficiency and equity. School segregation is commonly referred to as differences across schools in students' ability, socioeconomic background, or ethnicity. Student sorting into schools based on these dimensions may affect student outcomes in several ways" (European Commission, 2021).

Accessibility of content and format in materials and activities is another important factor in an inclusive approach. Accessibility needs to involve the use of plain language and the provision of content in a variety of formats that avoids leaving anyone aside. Language and communication are how we interact within our educational communities. Language inclusiveness therefore plays a crucial role in the creation of materials related to SENSE. STEAM activities. Inclusive language avoids expressions that its proponents perceive as expressing or implying ideas that are sexist, racist, or otherwise biased, prejudiced, or insulting to communities in a vulnerable position. Inclusive learning activities shall then carefully be examined in terms of the language used to not only avoid offense but also to favor the participation and free expression of the most vulnerable, by fostering safe environments.

With the risk of oversimplification, but with the intention to provide effective support to the SENSE.STEAM Labs, social inclusion can take a holistic perspective with three self-contained circles (see Figure 2). These circles represent three different spheres surrounding any person participating in an educational activity. Figure 2 sets a foundation in which to analyze and reflect on learning sequences and other educational activities in the STEAM Labs from the perspective of social inclusion. The analysis can start from an individual level and by looking at the identity of the learner, the micro-sphere. In a broader level, it is possible to focus on a community level which can be a class group or any other community that perform a learning activity together, the meso-sphere. Finally, it shall not be dismissed, the broader view of society at the largest scale, the macro-sphere. Social norms, specific policies and laws, or simply the *zeitgeist* spirit of our times are altogether part of the contextual nuances and constraint systems that affect the individual and community levels. The macro-sphere

may be related to spatial contexts as well: a neighborhood, a city, a country, a culture, or any other environmental conditions in which any learning activity is situated. All spheres shall be observed holistically as together they influence social inclusion, with non-trivial interactions occurring among the three different spheres.

Figure 2: Individual, community, and society spheres.

Within SENSE.STEAM and the STEAM Labs, it is not only necessary to set a framework considering Figure 2, but it is also relevant to establish an infrastructure of awareness-action-advocacy perspective to recognize and accommodate diverse needs. This infrastructure can provide an environment which empowers learners to reach their full potential. “D3.4 - Report on knowledge and practices for a New European STEAM

education" has already provided and described the elements of a possible infrastructure inspired by most inclusive citizen science practices. Figure 3 visualizes its elements within the form of a wheel. These are elements to be considered in a dynamic manner and integrated within efforts to be done by the STEAM Labs. They can serve as guidance to organizers, facilitators or any person or group involved in implementing STEAM activities and the STEAM Labs. These are listed as: (1) Inclusiveness, (2) Reciprocity, (3) Reflexivity, (4) Trust, (5) Equity, (6) Empowerment, (7) Open Science (or Openness and Access in its broadest understanding, while remaining in relation to science), (8) Co-ownership, (9) Horizontality, and (10) Respect.

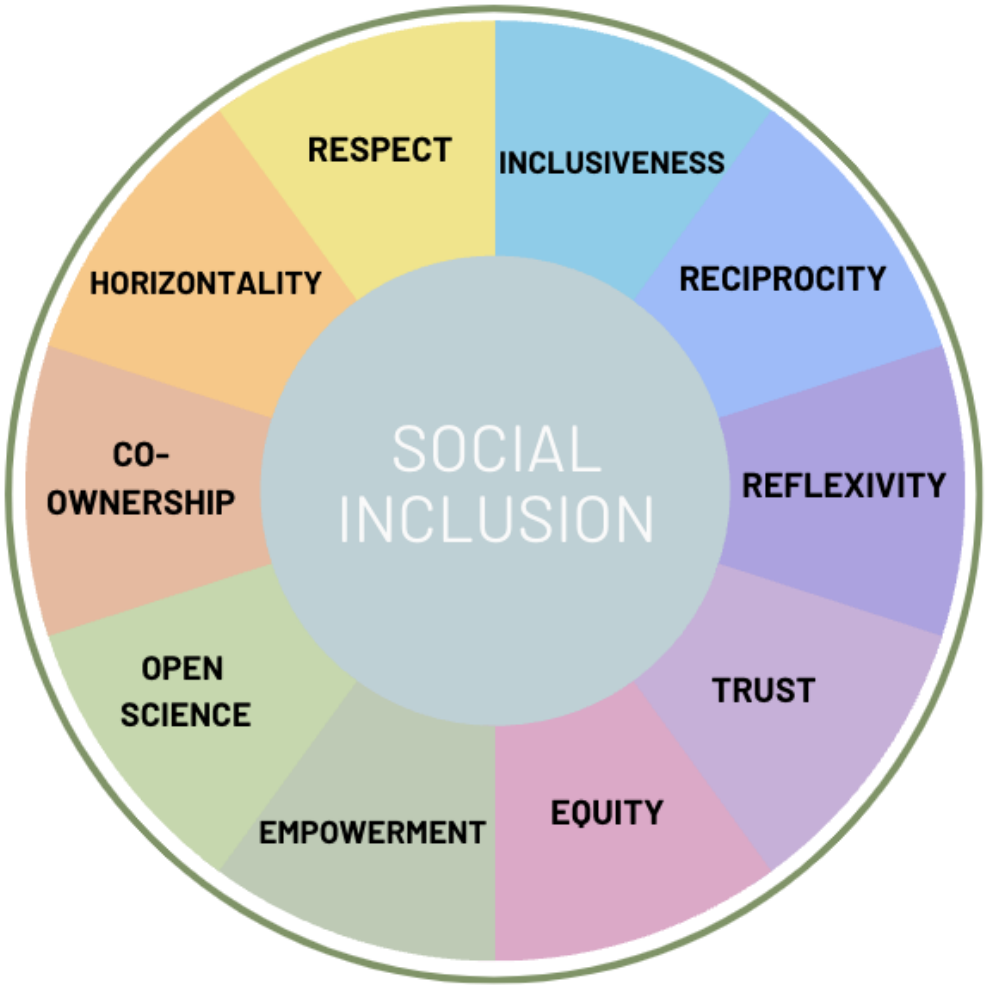

Figure 3: Awareness-action-advocacy wheel for social inclusion.

2.3. Gender and intersectionality

Gender and intersectionality within the STEAM Labs fit into the established narrative developed in Section 2.2. However, it is necessary to dedicate further reflections on gender and intersectionality as they both reveal specific challenges and problems that exist within our societies, both within a broader context, and more particularly in STEAM education contexts.

Gender inequality is a persistent and multifaceted social issue that affects individuals within all spheres of life, including education, employment, health, and other societal interactions. It reflects historical injustices and marginalization that individuals have experienced based on their gender identities (European Institute for Gender Equality, 2013).

Gender equality seeks a profound reimagining of relationships, opportunities, and cultural narratives, and signifies a transformative shift where all individuals, regardless of their gender, have equal access to resources, rights, opportunities, and decision-making power. This involves deconstructing the binaries that have historically confined individuals within rigid gender roles, liberating them to express their identities authentically and without fear of discrimination (Mehta, 1987). Gender equality challenges the pervasive notion that certain qualities or characteristics are inherently linked to specific genders, thereby undermining the hierarchy that sustains systemic inequality (Davies, 2014).

This perspective recognizes that achieving gender equality will extend simply beyond implementing a legal framework but will also challenge deeply entrenched norms that have perpetuated a culture of privilege and marginalization (Sen, 2009). It envisions a society where individuals are free from the constraints of traditional gender expectations, where their identities are celebrated, and their contributions are valued equitably.

Achieving gender equality requires a commitment to addressing intersecting oppressions that affect individuals differently based on their gender identities, race, class, and other factors (Crenshaw, 1991). In this, gender equality is not a distant ideal, but a process that requires confrontation of systemic biases, structural inequalities, and cultural narratives that uphold the status quo. It calls for a collective dismantling of oppressive systems and the creation of a world where every individual can thrive authentically. There are many dimensions of gender inequalities, such as discrimination and unequal opportunities in the labor market, which is often coupled with unpaid child and household labor which is thus reflected in the gender pay gap. Inequality is also represented in biases in education, representation at policy levels, and access to healthcare.

It is also of interest to look at intersectionality as it is a concept that is highly relevant in younger generations. Intersectionality refers to a theoretical framework that

recognizes how various social identities of an individual intersect and interact, which then shapes experiences and opportunities within different social spheres. Intersectionality emerged from several theories, black feminist, Indigenous feminist, third-world feminist, queer, post-colonial; and was coined by American sociologist Kimberlé Crenshaw in 1989 (Kapilashrami and Hankivsky, 2018). Intersectionality moves beyond examining singular factors, but instead how various social categories intersect and contribute to unique experiences of oppression and privilege (Crenshaw, 1991). Acknowledging intersectionality is crucial for addressing social injustices faced by individuals with multiple marginalized identities, emphasizing the need for nuanced understanding and inclusive and tailored approaches (Urwin, 2014). Recognizing existing or created power dynamics and participatory decision-making processes can help mitigate oppressive effects of intersectionality and help to implement effective strategies to promote social inclusion, equality, and justice.

A gender-responsive lens in SENSE.STEAM designs and implements educational practices and policies that are sensitive to gender dynamics, promote gender equality, and ensure equitable access and opportunities for all genders. Furthering this, a gender responsive educational structure aims to eliminate gender-based discrimination, stereotypes, and biases, while continually fostering an inclusive and supportive learning environment. The holistic, interdisciplinary approach of STEAM recognizes the value of diverse thinking within education, and therefore upholds intersectionality, and recognizes the complexities of an individual's experiences and identities and avoids oversimplification of social issues. Furthermore, the perspective of intersectionality challenges essentialism by showing that no single aspect of identity can predict future experiences or outcomes. SENSE.STEAM actively challenges traditional gender stereotypes and traditional norms.

Addressing the interconnections between different forms of bias and privilege is crucial for designing activities and more broadly an effective curriculum (and policies and interventions) that address the diverse needs of learners, individuals, and communities. An intersectional approach prevents the erasure of certain groups' experiences and ensures inclusivity, thereby promoting equal opportunities and thus more equitable outcomes for all. By adopting an intersectional perspective, society can work towards dismantling systemic barriers and creating a more inclusive and just environment that embraces the diversity of human experiences.

2.4. Aligning inclusion and space cross-cutting issues

The SENSE. model integrates another crosscutting issue into its approach: the spatial component of education. "Space" is often framed as a multisensory environment that has the potential to influence behavior in a variety of manners; a dynamic construct that plays a crucial role in shaping human experiences, interactions, and social

structures. This section is a brief insight into space creation and the role of non-hierarchical systems of equality in fostering inclusive and empowering environments (for a deeper exploration of this topic, see "Deliverable 5.1 - Scoping Report on Cross-Cutting Issue: Space").

Deliverable 5.1 lays out the different dimensions about how a physical environment is structured and provides a method to analyze and reflect the impact of a space, referred to as "hacking the space". The four dimensions identified to do this are space, function, appearance, and environmental control, where each element can be represented across a coordinate plane. The ambition in this section is to locate aspects of inclusivity among these dimensions, namely by examining the following elements:

1. Co-creation
2. Access
3. Identity, and
4. Agency.

These elements are intertwined, shaping the experiences and opportunities of individuals within a given space. This is represented in the diagram of Figure 4, with these elements further described in the following paragraphs.

Co-creation refers to the collaborative process of designing and shaping a space, involving the active participation of diverse stakeholders, including community members, planners, and policymakers. This collaborative approach empowers individuals to have a voice in how their environment is shaped. In the context of STEAM education, co-creation involves the active participation of students, educators, and community members in the design and structure of educational spaces. It encourages students to become active participants in shaping their learning environment, fostering a sense of ownership over their education. This can lead to more engaging and effective learning spaces where students feel valued and motivated. In the Spatial Awareness Kit in D5.1, this co-creation is reflected through "hacking the space", which converts a passive into an active space.

Access in space pertains to the ease with which individuals can navigate and utilize the resources and amenities available within a space. Inclusive spaces ensure equitable access, which is fundamental for social inclusion. Accessible spaces are designed to accommodate a wide range of needs, from physical access to the availability of resources. Within the realm of STEAM education, access involves ensuring that all students have equal opportunities to engage with and excel in STEAM subjects. This means addressing barriers, which can be physical or digital, to make educational resources, tools, and facilities readily and equally available to all students. In doing so, all learners can access and benefit from the educational space, promoting equity and social inclusion.

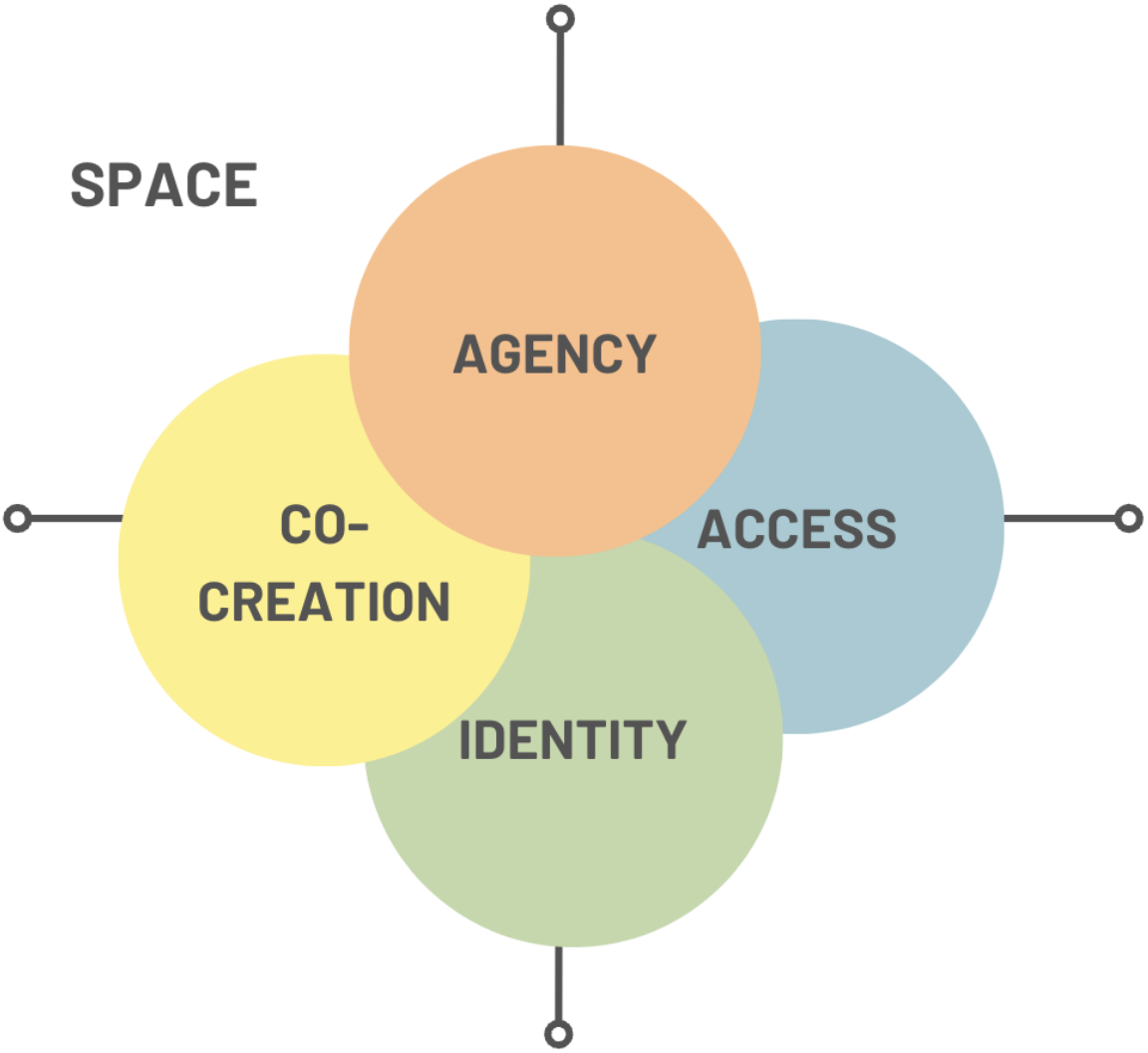

Figure 4: Elements of Social Inclusion within a Space.

The concept of identity in space relates to how individuals perceive themselves and their sense of belonging within a particular environment. Learning spaces (whether in or outside the classroom) can either reinforce or challenge existing social identities. The design and use of public spaces can influence individuals' sense of safety, comfort, and belonging. SENSE.STEAM recognizes and celebrates the diverse identities of students, including cultural backgrounds, gender identities, and individual interests. It is important to create learning environments that affirm and embrace these identities, by incorporating diverse perspectives, cultural symbols, and inclusive curricula. By doing so, students and participants can see themselves reflected in the learning environment, which promotes a positive self-identity as learners.

Agency within a space refers to individuals' capacity to make choices, exert control, and influence their environment. In inclusive spaces, individuals, regardless of their background or identity, should feel a sense of agency over their surroundings which can be adopted with, for instance citizen science practices (see next section). Research indicates that spaces that empower individuals to participate in decision-making processes lead to greater community engagement and social cohesion (Carpiano, 2009). In STEAM education, agency encourages students to take ownership of their learning and actively engage in learning and exploration. It fosters a sense of empowerment, which is fundamental as it encourages students to take initiative and engage in scientific inquiry, critical thinking, and creative problem-solving.

The active use of space as part of social emancipation and empowerment is a profound concept that challenges the status quo and holds the potential for transformative change, particularly for marginalized communities who often face a dual form of exclusion (physical and social) from mainstream spaces. The physical aspect relates to limited access to public spaces, safe neighborhoods, and basic amenities, which restricts their ability to move freely and comfortably within an environment. Social exclusion, on the other hand, refers to the isolation and discrimination marginalized individuals encounter due to prejudices, stereotypes, and systemic biases.

In this context, (re)creating space takes on a vital role. It is an act of reclamation, where individuals and communities assert their agency over the physical environment. It's not merely about shaping a physical landscape but also about challenging existing power structures thus becoming an empowering act, which allows marginalized groups to defy oppressive norms and discrimination they encounter daily (Lefebvre, 1991). Inclusivity that is (re)created in these spaces can be a function of amplifying the dimensions of co-creation and access which are directly reflected to an individual’s agency and identity. The participants consciously overcome spatial affordances to “hack the space” when the provision of tools and resources become available to all involved.

When marginalized communities (re)create space, they transform it into a platform for resistance and self-determination (Harvey, 2003). This transformation not only empowers individuals to challenge existing structures but also provides sanctuaries where they can find solace and acceptance amidst the broader society's prejudices (Soja, 2010). In essence, the act of (re)creating space becomes a vehicle for social emancipation and empowerment, serving as a means to challenge and reshape the spatial landscape to better suite their needs.

2.5. Citizen science and inclusion

In establishing a socially cohesive SENSE.STEAM, a student-centered approach is crucial - where participants are not passive recipients of knowledge but are active contributors to the learning process. This can be shaped in several ways; with project-based learning, where students are engaged in hands-on projects to solve complex problems. In this, collaborative problem-solving can be enhanced through an interdisciplinary perspective and citizen science practices (Perelló *et al.*, 2017). Diverse individual and collective backgrounds can become contributors to knowledge creation under the form of co-creative set of activities in school contexts (Senabre *et al.*, 2018). In its more co-creative vision, participatory practices involve engaging individuals and communities directly in decision-making, problem-solving, and development processes that affect their lives and those around them (Senabre Hidalgo *et al.*, 2021).

Also, a key problem identified in the didactics of science in schools is what can be called the primacy of the model over the phenomenon (Schulze Heuling and Schulze Heuling, 2023). The primacy of the model might be particularly problematic in the context of inclusion where diversity is claimed. As described in the "Deliverable 3.5 - The SENSE.STEAM educational model and pedagogy, the SENSE. model opts for 'practical' engagement and reflective feedback in fostering meaning and understanding. Participatory practices such as citizen science can again be an option to center attention towards phenomenon with a wide array of sensorial strategies in the students' neighborhoods (Perelló *et al.*, 2020) (Larroya *et al.*, 2023) and outdoor public spaces (Perelló, 2021).

Citizen science increasingly embraces the principles of inclusion, collaboration, and empowerment (Vohland *et al.*, 2021). This effort can be framed to what is called the ethics of inclusion in science (Strauss *et al.*, 2021). Additionally, transformative approaches have also gained prominence in citizen science, for instance in relation to sustainability and education (Sauermann *et al.*, 2020).

Taking all these considerations, citizen science can shift the linear mold of conventional approaches to education, research, and involvement as it focuses on a process of sequential reflection and action, which is designed and executed alongside the local people, rather than "on" or "for" them. Citizen science emphasizes active involvement, respect for diverse voices, and collaborative efforts to create inclusive spaces for co-creation, knowledge exchange and knowledge coproduction.

Therefore, the citizen science practices planned in the STEAM Labs can potentially highlight the competencies of the participants rather than deficits by recognizing and appreciating diverse perspectives and contributions (Winzer, 2009) (Perelló *et al.*, 2017). This approach suits the so-called citizen social science which has a specific focus on the social aspects of citizen science. Citizen social science generally involves

citizens in the design and/or conduct of social research, including engagement in some or all research processes, such as ideation, research design, data collection, analysis, dissemination, and impact (Albert *et al.*, 2021).

In this extended understanding of citizen science, the research is often driven by those sharing a concern and are in a vulnerable position. Participants involved are often termed as co-researchers because they are experts in the field, and actively contribute with their own lived experience to the research activity. During the citizen science project, the participants have opportunities to self-reflect about themselves and their position in society and within their own community, through the co-produced knowledge (Bonhoure *et al.*, 2023).

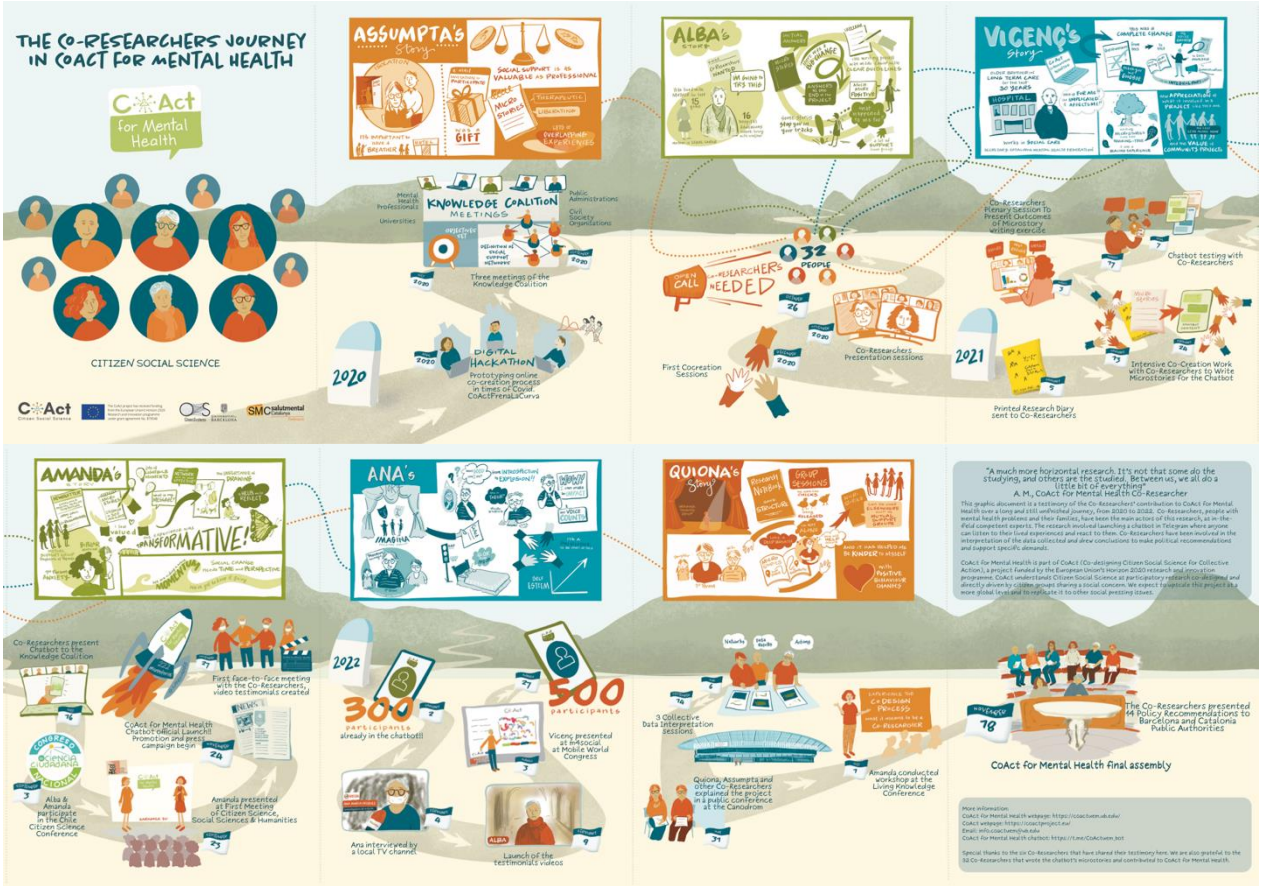

Figure 5: Co-Researchers journey. Source: Harrison (2022).

This is illustrated in Figure 5, where co-researchers belong to the mental health community, whose participants can be any citizen and may or may not be experiencing mental health problems. The research was formed by a community of participants who wanted to share and give value of their own experiences in current research in the mental health field, an approach that transcends typical biomedical

perspectives on mental health problems. Their aim was to learn from others and to contribute to a holistic and transdisciplinary understanding of their own experiences and conditions.

The following sections of this deliverable represents crowdsourced quotes, which are insights to better identify potential driving forces when implementing citizen science practices within SENSE. STEAM. Represented in these quotes is the perspective of participants of citizen science projects, with their voice amplified as the most salient of information to consider. In bold, some key ideas are highlighted. In some of the cases we refer to educational context where participants are in a vulnerable situation and/or lacking inclusive STEAM education opportunities. Other cases refer to the need of providing specific training to favor social inclusion in research practices.

What can motivate citizen science practices in the context of social inclusion and/or gender within STEAM education?

> *"Motivation comes from a real issue that needs to be addressed and the desire to think differently about the future. Not as given but in the making."* Laura Colucci-Gray, University of Edinburg. SENSE. partner

> *"We are now doing 'real' science."* 16-year-old student, participating in the Beepath citizen science project from Institut Bellvitge, L'Hospitalet de Llobregat (Spain)

> *"We like to work together. It is great that everyone can find out a distinct role in a common scientific project and share responsibilities."* 15-year-old student participating in Ciència ciutadana: Recerca I Educació. Institut Enric Borràs, Badalona (Spain)

> *"The students go out of class and become visible in their own neighborhood. They say hello to people they know, and they explain what they do··· They share their lived experiences; they reflect on their daily context with scientific tools."* Teacher from Institut La Ribera Secondary School, Montcada I Reixac (Spain)

> *"I am happy today because I have a new friend and is a scientist, from a university. We are friends, right? Are you coming again to the school?"* 14-year-old student from Institut La Ribera, Montcada I Reixac (Spain)

> *"As a library, we offer [library users and neighbors] ways to respond to a matter of their concern"* . Librarian from Josep Janés public library, L'Hospitalet de Llobregat (Spain) participating to Heat Chronicles citizen science project.

> *"The collaborative method helped to integrate the local concerns. I value the sense of awareness of the immediate surroundings that can be prompted, and which can, in turn, facilitate the building of relationships."* Librarian involved in

a citizen science hands-on training program from Olesa de Montserrat public library (Spain)

"I have learned which are the temperatures in my neighborhood and I now understand why some places are hotter than others··· But there are not many outdoor places in my neighborhood to avoid suffering these extreme temperatures. And the place, the urban garden where we spend so many hours ··· It is the hottest spot!" Young participant recently arrived to the neighborhood of La Ribera (Barcelona, Spain) participating to Heat Chronicles citizen science project

"[This is] much more horizontal research··· It's not that some do the studying, and others are the studied. Between us, we all do a little bit of everything." CoAct for Mental Health co-researcher

"I've always been very involved in school. I did not hesitate to be part of the project and learn about air quality sensors" Mother involved in xAire citizen science project. Sagrada Família Primary School from Barcelona (Spain)

"When kids see that behind an activity there is a reason and an intention, they feel fulfilled." Mother involved in xAire citizen science project. Joan Miró Primary School from Barcelona (Spain)

2.6. Art-infused practices and inclusion

The SENSE. model described in deliverable "Deliverable 3.5 - The SENSE.STEAM educational model and pedagogy" highlights the education 'doings' of arts as particular forms of knowing and learning. The experiences they may produce, as well as what they make possible for learners.

These aspects can be complemented here with a crowdsourced description on the key role of art-infused practices in the STEAM Labs when social inclusion is particularly addressed and on specific recommendations concerning the learning activities and the STEAM Labs. The quotes below were retrieved with email exchange and/or through voice transcription of online interviews. The aim is to show the plurality within and beyond SENSE. project. In bold, some key ideas are highlighted.

In this, ideas that emerge reflect that the early adoption of STEAM principles beginning at the earliest stages of education would be a major step forward in terms of raising awareness and overcoming social and gender inequalities. Equally important is to go beyond stereotypes and gender disparities regarding both sciences and the arts, the transmission and education models being still very strongly related to the respective images of science and the arts: today, the antiquated binary of male and female transmission is still culturally bound to differing individual and

social values and representations held by both students and their families. Along the same lines, collective and individual stereotypes concerning gendered expectations and abilities perpetuates a reluctance to pursue scientific careers are built on opinions and values that must be addressed in schools' curricula from an early age.

Those interviewed are also sharing the plurality and richness of individual and social expected benefits of an "intimate" and sustainable association of arts and sciences. Sensorial, participatory, non-discriminatory, and do-to-learn principles should be at the core of the arts and sciences intersection:

How do you think that artistic practices can play a role in the context of social inclusion and/or gender within STEAM education?

> *"Gender and social inclusion shall be considered since kindergarten... and including parents' awareness to these questions and challenges. Then, arts can open to systematic sensorial practices and including aesthetic approaches at the heart of early pedagogy."* Anne Krebs, Musée du Louvre. SENSE. partner

> *"Expected benefits are a more comprehensive understanding of the role and values of the arts in society, and very importantly, in careers. It is linked to positive changes in gendered notions of social roles."* Anne Krebs, Musée du Louvre. SENSE. partner

> *"It is important to consider that the Arts are not an easier way to involve girls in science because they engage the emotions more or because they provide aesthetic value. This way of looking at women and STEM belies a stereotypical and false division between Science and Emotions, solving which needs the input from the Arts."* Laura Colucci-Gray, University of Edinburg. SENSE. partner

> *"If a gender difference is to be considered, this may be more to do with the way girls are being socialized and sexualized in contemporary societies, especially via Science and Technology."* Laura Colucci-Gray, University of Edinburg. SENSE. partner

> *"I would see the role of the arts here as a means to take a critical stance, raise awareness, provoke and even engage women and girls in denouncing this and showing their own, legitimate role as designers, makers and experimenters."* Laura Colucci-Gray, University of Edinburg. SENSE. partner

> *"To enrich any educational initiative with a sensory, aesthetic, and cultural dimension. To work specifically on the level of representations, both in terms of gender and the construction of social roles, and to develop a critical view of how they are shaped, maintained, and transmitted."* Inés Moreno. Musée du Louvre. SENSE. partner

"To challenge commonplaces, transforming the widespread perception regarding disability, gender identities, sexual orientation, minorities…" Daniela Conti. CREDA. SENSE. partner

"To make room for thoughts, relationships, connections, encounters, and paths that help recognize and develop the value of each person and the values that each person brings." Daniela Conti. CREDA. SENSE. partner

"As a performer, it is necessary to address the body and I believe that this is an essential aspect in inclusive STEAM education." André Lepecki, New York University. SENSE Advisory Board member

"In performing arts like dance, we need to work together. The sense of togetherness can be brought by performing arts." André Lepecki, New York University. SENSE Advisory Board member

"The performing arts very directly raise questions regarding disability, accessibility, interpretation and translation –for practitioners, for teachers, and for the public." André Lepecki, New York University. SENSE Advisory Board member

"In a world of turbulence and uncertainty, tradition and creativity, artistic practices reconnect with social values and appreciate novelty, diversity, and authenticity." Frédérique Thureau, Textile and Clothing Business Labs network service company. Shemakes EU project coordinator

"In the search for new solutions to complex problems, we can find inspiration from a range of cultural roots and the hidden and tacit knowledge embedded in the practices of previous generations. We work both to systematize textile and clothing heritage as well as to help companies meet artists and creatives to see possible solutions with new eyes." Frédérique Thureau, Textile and Clothing Business Labs network service company. Shemakes EU project coordinator

Which are the recommendations you would give to STEAM Labs to further develop artistic practices in the context of social inclusion and/or gender within STEAM education?

"Mainly to consider the sensorial experience at the core of any pedagogical principle." Anne Krebs, Musée du Louvre. SENSE. partner

"To design sensitive pedagogical "bricks" build on autonomous exploratory "try and test" principles supported by discreet guidance." Anne Krebs, Musée du Louvre. SENSE. partner

"To focus on design and making. These are part of a repertoire of artistic practices that value problem-solving, teamwork, accuracy, and close correspondence with a real context." Laura Colucci-Gray, University of Edinburg. SENSE. partner

"To focus on issues that are pertinent to society and to the children themselves." Laura Colucci-Gray, University of Edinburg. SENSE. partner

"To open up a debate or a conversation about how some designs may reflect the needs and concerns of a particular gender category, but also how the design of some spaces may include or exclude particular individuals because of their gender or race, language or ethnicity." Laura Colucci-Gray, University of Edinburg. SENSE. partner

"To give a chance to re-think and re-view common assumptions and to include other perspectives." Laura Colucci-Gray, University of Edinburg. SENSE. partner

"To allow the development of learning and knowledge production situations that go beyond social frameworks and conventions." Inés Moreno. Musée du Louvre. SENSE. partner

"To provide adequately sensitive space for participants to explore their own identity contours, its possibilities, and limitations." Inés Moreno. Musée du Louvre. SENSE. partner

"*To implement participatory protocols that increase bodily and sensory engagement.*" Inés Moreno. Musée du Louvre. SENSE. partner

"To introduce elements of critical analysis of the construction and circulation of images, data, and objects." Inés Moreno. Musée du Louvre. SENSE. partner

"*To concentrate on the creative learning process rather than on the results in terms of artistic production*." Daniela Conti. CREDA. SENSE. partner

"To facilitate collaborations with whom can bring expertise/content/issues in humanities, communication, arts, creativity, design." Daniela Conti. CREDA. SENSE. partner

"To recognize the contributions and the results from each person joining in the STEAM Lab." Daniela Conti. CREDA. SENSE. partner

"To gather feedback from students and educators/teachers regularly and use them to adjust activities and practices." Daniela Conti. CREDA. SENSE. partner

"To think about intersectionality. Gender identity cannot be defined in a bureaucratic manner." André Lepecki, New York University. SENSE Advisory Board member

"To make space welcoming for the most vulnerable. Often, their relationship with institutions is with suspicion and fear. Fear of being in a body which is not accepted, which is generally not present in these spaces." André Lepecki, New York University. SENSE Advisory Board member

These crowdsourced responses reflect keys elements (Table 1) of artistic infusion within STEAM education. In this, it is evident that sensory and aesthetic approaches are integral to artistic practices within early pedagogy, which adds depth and richness to the educational experience, and emphasizes the importance of sensory learning. It allows students to explore and understand the world around them through their senses, fostering a deeper connection to their learning journey. Aesthetic approaches also help students appreciate the cultural and artistic dimensions of their studies, adding an element of creativity and personal expression to their education.

Artistic practices in STEAM education introduce innovative learning methods and encourage a more inclusive and diverse educational experience. Through early integration, sensory exploration, and the promotion of inclusivity, they create a dynamic environment where students can challenge stereotypes, celebrate their individuality, and engage with STEAM disciplines more effectively through creative learning processes.

Table 1: Key Elements of art-infused practices and social inclusion.

1. Early Integration	Addressing gender and social inclusion from the earliest stages of education, including family awareness, can shift embedded cultural and societal stereotypes
2. Sensory and Aesthetic Approaches	Places the "do-to-learn" approach and sensorial experience at the core of pedagogical principles, making these essential aspects of learning
3. Challenging Stereotypes	Artistic practices provide a platform to challenge assumptions, such as existing societal and gender stereotypes
4. Promoting Inclusivity	Artistic practices contribute to transforming perceptions about disability, gender, and identity
5. Creative Learning Processes	Art in STEAM enriches education by encouraging creativity and diversity, learning beyond conventions, and fosters open-mindedness and learning beyond societal norms

2.7. Confluences of citizen science and art-infused practices in inclusion and STEAM

Looking at the quotes on citizen science and art-infused practices, it is possible to observe several commonalities among these practices in the STEAM context. Those are related to sensory experiences, to body, to human-scale in relation to the surrounding space, critical stance, reflection and self-reflection or togetherness to just name few of them. The STEAM Labs can potentially further explore these confluences.

A recent EU-funded project on citizen science, called Doing It Together science (DITOs, 2016-2019) and coordinated by the University College of London delivered a policy brief on these lines which can be of interest to SENSE.STEAM. Its executive summary says:

> *"[···] p(P)rogrammes in the arts, in science, and to a limited extent in technology include actions targeting the interaction of artists with research projects. [...] There are clear synergies between these concepts and the benefits of considering them together. [···] The document concludes by recommending to consider citizen science and the arts jointly, to strengthen synergies by building on existing initiatives, to launch targeted actions regarding education and training, and to launch art-science initiatives."*
>
> Source: DITOs consortium (2019), Citizen Science and Art/Science: Synergies and Future Potential. DITOs policy brief 10.

To expand upon this, Table 2 produces a set of recommendations regarding inclusion and empowerment within the context of education. The report also shows several examples from the arts that can be understood as a citizen science initiative. Additionally, it focuses on infrastructures which can be valid for both developing an artistic project and a citizen science project; this interweaving of artistic and citizen science projects is illustrated by the example of Melbourne Science Gallery. These infrastructures can become common spaces for artistic and scientific practices (or can be framed to adapt to a less formal science practice, or in the frame of citizen science). For example, these spaces can be hacker spaces, fab labs or living labs or more.

A commonality that the previously mentioned Policy Brief by DITO partially addressed is that both the participatory approach of citizen science and the art-infused practices within STEAM confront the preeminent STEM education perspective. A clear message regarding this aspect is best exemplified through a quote that was sourced from the interviews performed to complete this deliverable. The quote may serve as a source of inspiration on the possible ways to further explore this confluence within STEAM Labs:

"Science tends to be prioritized because of its intimate relationship to industry and profit - while art opens dimensions of combining and relating to matter and materials that would otherwise be impossible to imagine within a logic of profit. Art gives a different dimension and possibility for humanity. [...] Citizen science looks for a common good [...] A "citizen art" could bring together body and materiality in a more radical sense. This is not necessarily a non-utilitarian approach, it is not "art for art sake"; on the contrary, it is perhaps art's most utilitarian approach: creating modes of life worth living, creating more democratic relations to the world, to matter... This is something that citizen science and arts have in common."
-André Lepecki, New York University. SENSE Advisory Board member

Table 2: Citizen Science and Art/Science: Synergies and Future Potential. Source: DITOs policy brief 10

INCLUSION AND EMPOWERMENT	A. Expand the involvement of citizen science volunteers beyond data collection by opening all stages of the art/science concept to participation and enabling more co-creation of research results and works of art. B. Promote global-level dialogue and cooperation between citizens and artists while at the same time increasing local awareness through exhibitions or round tables to broaden public interaction. C. Inform industry about the potential benefits of citizen science and art/science interaction for innovation and the early adoption of new technologies. These advantages range from the creation of durable artworks that support sustained dialogues to the power of artists to co-create innovation in cooperation with citizens and novel feedback loops from artistic interaction with citizens to research.
EDUCATION	A. Include art/science training in research education and training on current artistic practices. B. Ensure means for science education and communication to accompany art/science initiatives and vice versa. C. Build citizen science and art/science concepts into teacher training.

3. Inspirational cases

The following section reports different cases which may serve as inspiration for the SENSE. STEAM Labs, and exemplify relevant approaches to amplify social inclusion, some of them with the specific initiative for vulnerable populations. These cases are:

1. Magnet Alliances - Fundació Bofill in Catalonia, Spain: The program sustains a long-term regional network to reverse school segregation and by establishing alliances between schools and institutions of excellence.

2. Empowering Refugees - Odyssea in Greece: The initiative provides refugees with relief interventions, and resources such as tailored vocational and life-skills training and employability services.

3. Tech girls club - WECF in Georgia: The club conforms a community of girls developing technological skillsets enrooted in a local context and adapted to local needs and realities while maintaining a global perspective.

4. *Mini Louvre des animaux* - Musée du Louvre in Paris, France: The case is an educational device for art-infused STEAM activities with sensorial practices and aesthetic approaches at the heart of early pedagogy, for the youngest.

5. *Cròniques de la Calor* - UB in Barcelona metropolitan area, Spain: The case is a citizen science project that addresses climate vulnerability in outdoor public spaces of disadvantaged neighborhoods.

6. SHEMAKES - European project: The project is a network of labs that creates "opportunity structures" to enable women to move into roles of increasing power and income through access to hard skills, technology, and innovation.

7. EQUALS-EU - European project: The project is offering an array of innovation camps over 25 countries, where teams will collaborate to devise innovative solutions promoting gender equity in the digital inclusion of women and girls.

The list has been created in a crowdsourced manner throughout a series of conversations with partners of the SENSE. project (particularly those involved in Task 6.1) and beyond (other European projects included in the Document of Action of the SENSE. project). It does not aim to be exhaustive nor complete, however it does want to serve as a source of guidance to further develop in practical terms strategies to both the settlement of the STEAM Labs and the implementation of learning sequences. Final learnings from each case are shared to reinforce internal capacity building within the SENSE. consortia and across the STEAM Labs.

3.1. Magnet program – Fundació Bofill in Catalonia, Spain

The Magnet program[1] accompanies schools in developing a transformative project in partnership with an institution of excellence. The program is led by Fundació Bofill, in partnership with the Department of Education of the Generalitat de Catalunya (which is the primary governing body responsible for public schools in Catalonia, Spain) and the Consorci d'Educació de Barcelona (Educational consortia within the Barcelona municipality). These institutions have been joining forces for nearly a decade to tackle the problem of school segregation. In most of the cases, they work with municipalities, as the school segregation problem is deeply intertwined with well-being and health, housing, local economy among many other issues.

The collaboration between the school and the institution of excellence gives opportunities to the school (Primary schools, in terms of the Spanish system, 6-12 years old) or college (Secondary schools and High School, in terms of the Spanish system, 13-18 years old) to develop an innovative educational project in the context of STEAM education (artistic practices included). The institution of excellence can be a public university, a research center, a museum, an opera house, a school of design or even other types of institutions such as a FabLab. The final aim is to build an attractive project during an academic year. The project becomes a benchmark project in its small-scale geographical area (a neighborhood or the village), families and educational community included. The program is inspired by the Magnet Schools in the United States, which have been operating since the 1970s.

The program has approximately 40 established alliances and works in several levels with the logic of creating alliances in pairs. At the local level, the program has an educational center and an institution of excellence in interaction. The joint effort is encouraged to increase visibility outside of the school, so that other local actors might be involved. Periodically, mutual learning events for teachers with all schools are organized. The experiences are showcased in the webpage of the Magnet program (in Catalan). Magnet alliances have been widely analyzed the complex phenomena of school segregation. Fundació Bofill has delivered different reports evaluation school segregation for the period between 2012-2017. Figure 6 shows the school with which an alliance Is being set years ago with the Universitat de Barcelona (partner of SENSE. project).

Why are the MAGNET alliances relevant for the STEAM Labs?

Magnet:

[1] https://magnet.cat

1. Articulates the effort to reverse school segregation in partnership with public administration.
2. Facilitates mutual learning spaces for schools and teachers sharing social inclusion issues.
3. Creates opportunities to connect segregated schools with institutions of excellence in the region.
4. Increases visibility of the school to the neighbors and to the neighborhood expecting to create impact in a broader level and to be a recognized organization within the local context.
5. Periodically evaluates long-term effects of the program in the school identifying successes and challenges.

Figure 6: Institut La Ribera in Montcada i Reixac (Spain). Source: agora.xtec.cat/ieslaribera

3.2. Empowering refugees – Odyssea in Greece

In an increasingly interconnected world, the global movement of people has become a defining feature of our time. For a multitude of reasons, millions of individuals have been forced to leave their homes in search of better opportunities, safety, and a chance at a brighter future. This journey for migrants is often filled with peril, uncertainty, and a lack of resources. In this, the Greek nonprofit Odyssea provides support, guidance, and resources to individuals and families navigating the complexities of migration.

Odyssea[2] welcomes migrants, refugees, asylum seekers and unemployed and vulnerable Greek citizens, going beyond just providing immediate relief, but recognizes the multifaceted challenges that migrants face and adopts a holistic approach to address their needs - primarily language barriers, accessibility to housing and medical services, cultural differences, and prejudice and racism.

Figure 7: Cooking training program for refugees. Source: Odyssea

[2] https://odyssea.com

In identifying these issues, Odyssea adapts a problem centered approach, identifying "academy, employability, relief, and entrepreneurship" as the primary pillars in which to support vulnerable people to have access to inclusion opportunities in society. In this, Odyssea provides refugees with relief interventions, and resources such as tailored vocational and life-skills training and employability services that connect these individuals with the world of work (see Figures 7 and 8).

Additionally, Odyssea focuses on creating a sense of community-building, and facilitates social and cultural integration by organizing events, support groups, and cultural exchange activities to foster a sense of belonging.

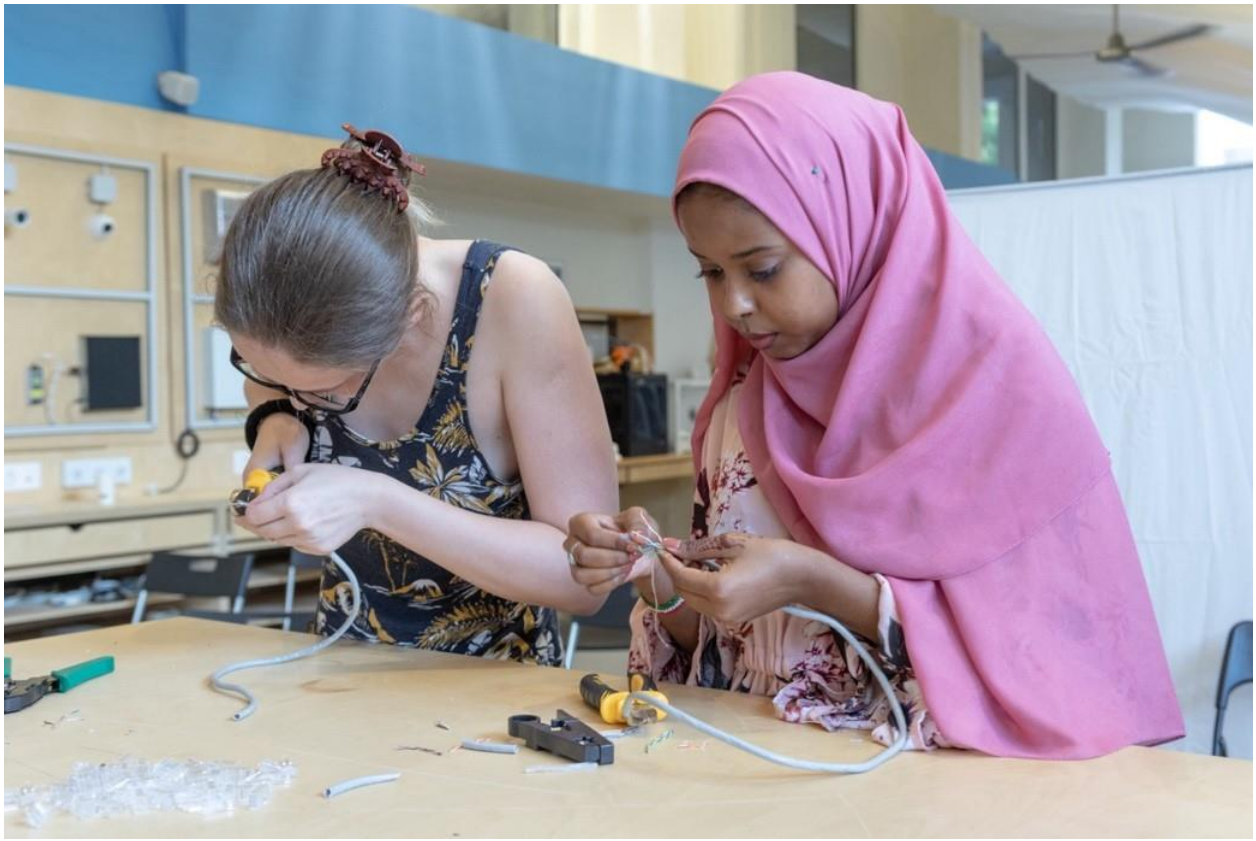

Figure 8: Electrician training program for refugees. Source: Odyssea

Why are the Odyssea training programs relevant for the STEAM Labs?

Odyssea:

1. Has a mission that is grounded in social impact, focusing on improving the lives of vulnerable individuals and communities.
2. Approaches helping vulnerable people through the lens of empowerment by increasing social inclusion.

3. Supports migrant populations come from diverse cultural backgrounds.
4. Recognizes the value of diverse experiences and perspectives and incorporates these perspectives within their integration approach.
5. Takes an interdisciplinary approach to aiding migrants, across various fields, from legal assistance to healthcare, language education, and vocational training.

3.3. Tech girls club - WECF in Georgia

In Akhmeta, Georgia the Akhmeta Innovation Center has the mission to help local people, companies, and local government to increase knowledge in the fields of innovation, business, and technology. The center offers opportunities for people of all ages to access modern, cutting-edge technologies, through courses and workshops. The center provides people with the necessary training and funding to turn ideas into reality. This institution provides a space for co-creation and sharing of knowledge, while playing a vital role in fostering creativity and excellence among people in the community. Collaborating with the center is Women Engage for a Common Future (WECF), and ecofeminist international organization committed to using an intersectional feminist approach when fighting structural barriers that prevents equality.

Together, WECF and Akhmeta Innovation Center hosts the “Tech Girls Club”. The club focuses on enhancing technology skills for girls and young women. These girls can share a space and create a connection not only amongst themselves, but also with the greater community. They analyze problems that they perceive from their own local environment and create technological solutions with how to address these issues. These projects range from building robots with sensors that can measure humidity levels in the soil to learning advanced coding and hackathons. Figure 9 shows one of the activities withing the Tech Girls Club facilities.

The Tech Girls Club aims to identify challenges and barriers that young people, especially girls, face when interacting with STEM subjects, and aims to find solutions and strategies to overcome these barriers. For instance, in a recent workshop, the Tech Girls Club’s participants envisioned a “greener, ecologically clean environment, where young people get a good education, and that their community will have a means of development and will be free from stereotypes that harm people”. Overall, learning these innovation and technological skills is just a modality for these girls to have an influence. “They want to feel valued and connected to their community, and to feel seen and recognized outside of their own bubble” -Ana Muradashvili, GEYC.

Figure 9: Tech Girls Club working together. Source: WECF

Why the Tech Girls Club may be relevant for the STEAM Labs?

The Tech Girls Club:

1. Provides hands-on experiences and exposure to cutting-edge technology.
2. Helps to develop the skills and mindset required to become future innovators.
3. Is deeply rooted in its local community and addresses local challenges and opportunities.
4. Encourages students to consider the interconnectedness of their work in a global context.
5. Focuses on a typically underrepresented field by girls, thereby promoting equality and breaking gender stereotypes.

3.4. Mini Louvre des animaux – Musée du Louvre in Paris, France

Made available free of charge to partner nursery schools, the *Mini Louvre des animaux*[3] (Mini-Louvre of animals, in English) is an educational device that allows the handling and display of approximately twenty reproductions of works, thus bringing the Musée du Louvre into schools in an engaging and dynamic way. The general objective is to educate the youngest members of society about art and to introduce them to the value of visiting museums. Regarding the theme of animals, the Mini-Louvre allows

[3] https://www.louvre.fr/en-ce-moment/vie-du-musee/le-mini-louvre-des-animaux-fait-sa-rentree-a-l-ecole-maternelle

children to familiarize themselves with the works of the museum, arousing curiosity and appetite for learning.

The *Mini Louvre des animaux* includes reproductions of renowned works and furniture to display them, but also objects such as picture books and soft toys. There are reproductions of paintings, along with child-versions of these objects and toys to encourage fun and play within the Musée du Louvre. The scale is reduced, the storage-boxes arrive in the classroom, and are labelled "fragile", "work", "Musée du Louvre". The children then interact with these boxes, and then can then open them and have the ability to manipulate, interact, and play with the cuddly toys and reproductions. Imagery of this is shown in Figure 10.

Figure 10: Mini Louvre des animaux device in action. Source: Musée du Louvre

For teachers, this furniture is supplemented by resource files and training. The practice is designed to offer various educational tools for teachers and facilitators, which ultimately and naturally leads to a visit to the museum and an encounter with the works. The duration of the loan of the *Mini Louvre des animaux* (at least one semester) is a key factor to enabling a close bond that is established between the children and the works.

The aim for those in the Paris region, is to come visit the Musée du Louvre; for educators to bring their students and show them the works in real life. For those who can't come, a goal is to encourage students to be present at the *Nuit des Musées*, which is a major national event; and in this space, students can be present at the Musée du Louvre through videos, and photos. The primary objective of *Mini Louvre des animaux* is for these young students to go to the cultural establishments near them and to be made aware of culture, art or works of art. In this sense, Anne Krebs (SENSE. project partner) sees this art-infused STEAM practice from Musée du Louvre as an activity that is "designed to really get young audiences in disadvantaged areas. The children invent and distribute the scientific activities that a professional curator oversees. They positively deconstructed their initial representations of scientific professions in museums."

Why is the Mini Louvre des animaux relevant for the STEAM Labs?

The Mini Louvre des animaux:

1. Considers the sensorial experience at the core, in a way that it is explicitly aligned with SENSE.STEAM Manifesto.
2. Brings the museum to the schools, in disadvantaged areas.
3. Introduces creative aspects and uses toys, and it leaves freedom to those using the device.
4. Is a portable and flexible device with additional support to teachers such as specific training.
5. Provides a possible way on how art-infused practices can be connected to STEAM and being connected to museums.

3.5. Cròniques de la Calor – UB in Barcelona area

Also, cities and metropolitan areas like the Barcelona metropolitan area are currently elaborating heat (or climate) vulnerability indices based the urban configuration and on socio-economic factors among many other macroscopic statistical variables. The resulting maps are already identifying highly vulnerable neighborhoods. In Barcelona, Spain "The Heat Chronicles" (*Cròniques de la Calor* in Catalan) is a project that works with local communities and schools in areas that have been identified as being areas with high or very high climate vulnerability. The climate vulnerability index being developed by the metropolitan area policy makers (Metropoli Institute[4]) shows vulnerability in a very high spatial resolution. These areas are thus especially affected by the urban head islands (UHI) phenomenon. This phenomenon arises due to the increased heat absorption and re-emission of solar energy by man-made structures

[4] https://www.institutmetropoli.cat

such as buildings and roads, which exceeds that of natural environments such as forests and bodies of water, thus forming localized 'islands' with noticeably higher temperatures in comparison with their neighboring areas.

Cròniques de la Calor is a citizen science project that pivots on participatory practices and open science and is designed to measure highly localized temperatures and local perceptions of the heat within the environment and works with maps and other visual materials to make sense of temperatures. The participants are referenced as experts in their own communities and are thus able to provide valuable insight into their own diverse needs and perceptions. They are actively engaged as co-creators that design fundamental elements of the practices.

Cròniques de la Calor analyzes areas greatly affected by UHI, and organizes outreach to local communities, through schools, libraries, civic centers, and neighborhood associations. This represents a diverse demographic, including school children as young as ten years old, to adults of all ages and backgrounds. Self-awareness about the heat and sense of agency to mitigate the extreme temperature effects on well-being are the principal motivations from the perspective of the participants.

Figure 11: Group in their neighbourhood during one of the heat walks. Source: Jordi Casañas

Additionally, the participants have active engagement throughout the activities, and take on leadership roles such as collectively deciding on spaces and routes (heat walks, see Figure 11) in which to measure temperature, collecting and understanding data, and contributing their personal perceptions with a scientific protocol, thereby providing mental maps of the sensations and feelings experienced throughout the process.

This input and their local knowledge are a valuable contribution and formulates a more holistic perspective of these communities. From the information collected, new geo-localized and open data can be accessed to make proposals to improve the well-being of the community. Specific learning activities like identifying and reasoning why some outdoor public spaces are hotter than others is one of the learning sequences (see Figure 12). It is planned to further deepen in the sensory experiences related to heat which sensibly differ depending on person identities and use art-infused practices for expressing them. Future-making sessions to plan actions to respond to the knowledge obtained are also planned.

Figure 12: Learning sequence identifying hottest places in a neighborhood. Source: OpenSystems

Why are the Cròniques de la Calor relevant for STEAM Labs?

The Cròniques de la Calor:

1. Actively engages students, community members, and stakeholders in decision-making and problem-solving in real-world issues and contexts.

2. Integrates the efforts of different communities in the Barcelona area, this approach can lead to promote integration of STEAM Labs configuration around a thematic area.
3. Utilizes an approach of Open Science and Open Data practices to emphasize transparency, accessibility, and collaboration with scientific research.
4. Mixes individual human and sensor-based perceptions in direct relation to a context where participants are experts in-the-field.
5. Puts the body and the person living in a concrete space at the center of the learning activity.

3.6. SHEMAKES – European project

The Shemakes[5] project (2021-2022, Opportunity Ecosystems Bridging the Gender Gap) has been funded by the European Commission's Horizon 2020 Science with and For Society program. It was launched with the overall objective of promoting gender parity through innovative initiatives in the textiles and clothing sector.

The project addresses various age groups, communities, and businesses. It identifies multi-faceted business ecosystems that focus on building alternative, circular and sustainable paths to over-production and diminishing value. Shemakes.eu focuses on moving through collaboration in scientific sectors towards innovation in business sectors, through structured learning paths, networked projects, and validating new business concepts.

This is done by creating what the project term “opportunity structures”. These structures were built to enable women to move into roles of increasing power and income through access to hard skills, technology, and innovation as well as through community and business engagement activities. The model of using labs to test innovations, as well as centers for learning, is combined with the experience of Fabricademy, a transdisciplinary educational program that focuses on the development of new technologies and approaches in the textile industry. See Figure 13 to get a better idea on the labs developed by the Shemakes project.

Shemakes.eu has focused the efforts on empowering future female innovators of the sustainable fashion industry through inspiration, skills, and networks. The challenge is that, within the textile and clothing industry, women find themselves predominantly concentrated in the least remunerative positions. Their roles are influenced by deep-seated gender norms ingrained in systemic structures, leading to the devaluation of their inherent and acquired skills within conventional business frameworks. To address this challenge, it is imperative to establish supportive frameworks and business ecosystems, exemplified by circular, sustainable, and locally situated models.

[5] https://shemakes.eu

Figure 13: Textile and Dress lab in action. Source: shemakes.eu

The built environments have facilitated the advancement of women into higher-paying roles by granting them access to critical hard skills, technological advancements, and innovative practices. These models have provided opportunities for networking, business model development, and the presence of inspirational role models. In two years, more than 2,000 girls and women from 16 European countries were trained in tech-based innovation though 100 activities, documented in a fully accessible open toolkit, and supported by 9 lab mentors, 30 ambassadors and 9 advisors that supported the development of a methodology, all actively supported by communication. An impact evaluation has also captured evidence of a change-making ecosystem following the theory of change.

Why is the Shemakes project relevant for the STEAM Labs?

Shemakes:

1. Shows that inclusive business practices lead not only to social benefits but also greater innovation capacity and market competitiveness.
2. Is based on an existing lab-based model to support the cultural shift towards an industry that is “open to diversity”.
3. Finds that women, minorities, and the socially excluded are the best-placed figures to innovate and bring us towards a more sustainable future.
4. Has operationalized the strategy with labs as “opportunity structures”.
5. Uses an evaluation approach that uses theory of change and shows success with compelling arguments.

3.7. EQUALS-EU – European project

The EQUALS-EU[6] project (2021-2023, Europe's Regional Partnership for Gender Equality in the Digital Age) is a Horizon 2020 EU project within the Science with and For Society program. The project started its work with an analysis and assessment of social innovation ecosystems and gender inclusive innovations in 20 EU countries. The primary goal of the research is to develop a new methodology for mapping gender inclusion in social innovation ecosystems. EQUALS-EU is a still active project. It currently faces its last phase and not all results have been delivered yet.

EQUALS-EU revolves around 4 pivotal activities that harness the collective expertise of global leaders in gender-inclusive innovation, with the fresh perspectives and dedication of emerging female leaders. The first endeavor generates a comprehensive map highlighting pivotal stakeholders and gender-inclusive innovations within ICT products, services, and policies.

The second activity concentrates on hosting an array of hackathons and innovation camps spanning over 25 countries. This includes a comprehensive training guide to facilitate the smooth execution of these events, where teams will collaborate to devise innovative solutions promoting gender equity in the digital inclusion of women and girls. Tailoring each event to cater to the specific needs of the local cultural context is a pivotal aspect. Figure 14 shows the announcement of one innovation camp for invigorating women entrepreneurship in the context of science communication in Santiago de Compostela (Spain). The event had the structure of a Hackathon. Initially, two successful experiences were shared. Three mentors then selected and evaluated the most innovative proposals which were designed by the participants of the event in small groups. The winning proposal opted to a specific incubation program.

The third activity is devoted to administering a six-month online incubator and mentorship program with a focus on gender-inclusive entrepreneurship. This program has furnished comprehensive business development training for the teams identified during the innovation camps and hackathons. Expert mentors and advocates have been on hand to provide tailored guidance for each startup.

The fourth activity centers on organizing an intensive one-month boot camp designed for future leaders in gender-inclusive innovation. The curriculum of these boot camps will zero in on critical areas such as women' s digital rights, transformational leadership, and STEM proficiency.

Why is EQUALS-EU relevant for the STEAM Labs?

EQUALS-EU:

[6] https://equals-eu.org

1. Develops innovation camps to harness collective expertise.
2. Favors the work in small groups and in a challenge-based model.
3. Utilizes the power of successful experiences of women in different sectors.
4. Creates a network across many countries, even though they may have strong disparities in terms of gender presence and visibility.
5. Promotes leadership of women.

Figure 14: Innovation camp in Santiago de Compostela (Spain). Source: EQUALSEU

4. Practical guidelines for the STEAM Labs

Considering the context of application for SENSE.STEAM, whether within a STEAM Lab, workshop, learning sequence or activity, this deliverable D6.1 wants to create practical guidelines that can structure reflection and action for creating a socially cohesive environment within SENSE.STEAM.

Section 4.1 provides a self-reflection exercise to create potential awareness-action-advocacy dynamics along the STEAM Labs activity. The exercise relies on the guiding principles of Section 2 and Figure 2. In turn, Sections 4.2 and 4.3 deliver possible actions for social inclusivity and gender mainstreaming. These actions are structured in 20 points. They are extracted from the case studies from Section 3 and from the different insights provided in the guiding principles of Section 2 such as the awareness-action-advocacy wheel (see Figure 3) or the different interviews.

4.1. Self-reflection exercise

Based on the general social inclusion guiding principles, Section 4.1 offers an exercise that, in practical terms, supports a self-reflection process during the SENSE activities in each of the STEAM Labs. The exercise consists of formulating four general questions using the lenses of social inclusion.

These questions need to be addressed in the three different levels presented in Figure 2: the individual level (e.g., students or participants), the community level (the group with which the STEAM Lab is working), the society level (the environmental conditions and context of the STEAM Labs). They shall be formulated by the STEAM Labs organizers and answered by themselves, as a self-reflection exercise. They shall be answered in the following sequential order:

WHY? At the individual level, it is important to consider personal motivations, values, and the impact each student is wanting to achieve through the STEAM Lab. Within the community level, it is important to consider why community engagement is essential to the STEAM Lab, and how do these activities align with community needs and aspirations? Reflect on the community's role as a partner in fostering inclusion and innovation. At a societal level, consider why is it vital for the STEAM Lab to align with broader societal goals, policies, and values, and what societal impact does the STEAM Lab aim to achieve? Reflect on the role of the STEAM Lab in driving equity, innovation, and education within society.

WHO? On the individual level, everyone can and should be welcome to be an active participant! Reflect on the diverse range of backgrounds, abilities, and learning

styles of all individuals. There should be outreach designed to include typically underrepresented groups, with continual initiatives to build and retain an inclusive environment. Within the community, educational centers, libraries, civic centers, neighborhood associations, etc. can all be potential participants within the STEAM Labs. There is no limitation to who can be involved, especially those with the potential to host workshops, provide resources, or collaborate on projects. At the societal level, consider the network of policymakers, industry leaders, and advocacy groups that take part in influencing societal decisions to advance equality and address the needs of a diverse and representative group of individuals and community.

WHAT? At the individual level, what is the concern? What is the topic of concern? Personal interests, values, experiences, and skills are being contributed to the STEAM Labs, and how do these shape the lab's content and approach? Also examine how individual attributes influence the STEAM Labs' design and objectives. At the community level, what are the shared concerns? What collaborative efforts are in place to ensure that community input and expertise can provide perspective for the STEAM Lab? What specific community resources are leveraged to support the STEAM Lab, and how might that affect decision-making processes? What actions can be taken to create cohesion amongst various stakeholders to address a community need? Examine how the STEAM Labs incorporate community knowledge and support. At the societal level, what is the policy agenda? What are societal policies and resources allocated to support the STEAM Labs in public spaces and institutions, and how do these reflect broader societal values and goals? Examine the broader societal context and support structures that can potentially shape the STEAM Labs' scope and potential.

WHERE? At the individual level, where and in which types of spaces do individuals from all backgrounds can feel comfortable, feel free to express themselves, and able to have positive, active engagement within the STEAM Labs? Where do potential barriers or opportunities for personal agency emerge within a socially inclusive environment? Within the community, consider where interactions and collaborations can take place to involve multiple participants within the STEAM Labs. In the level of society, where do societal decisions regarding equity, inclusion, and decision-making in public spaces and institutions impact the design and implementation of STEAM Labs? Reflect on the interconnectedness between broader societal factors and the objectives of the STEAM Labs.

Throughout the planning, implementation, monitoring, and evaluation, it is necessary that organizers periodically formulate this set of questions to themselves with critical self-reflection (see Figure 15). It is also important to adopt an active listening attitude towards participants' during the development of the activities and use their insights to better address the self-reflection questions in future steps. Each STEAM Lab could find within the questions ways to better adapt or redesign actions to further promote social inclusion and gender and intersectionality mainstreaming. However, specific guidelines are also provided in Sections 4.2 and 4.3.

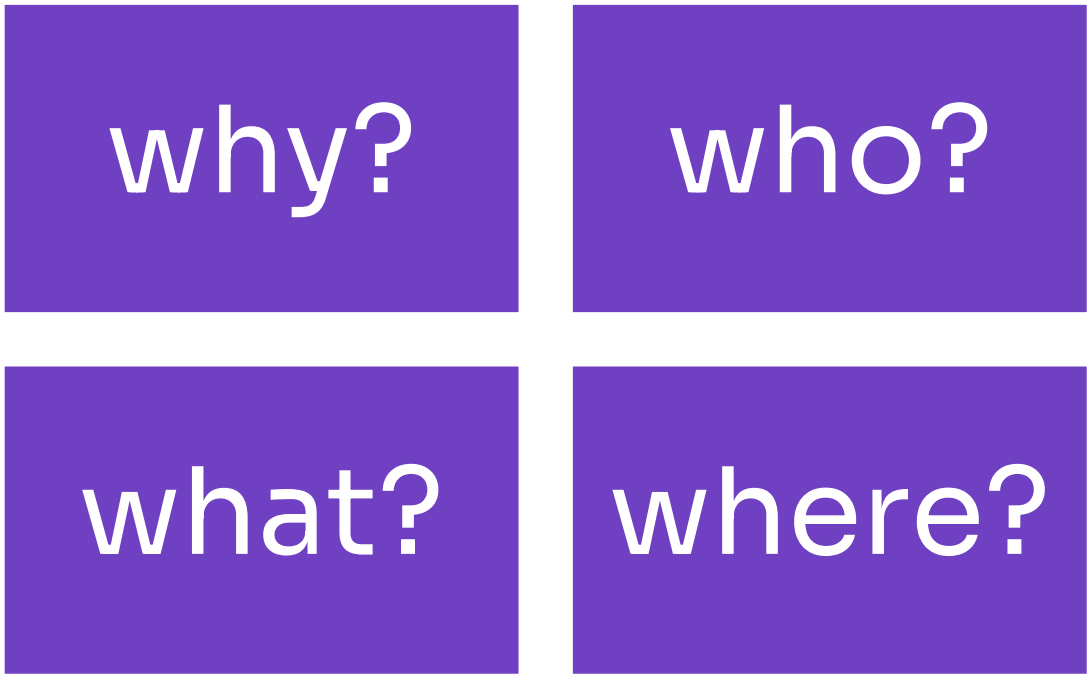

Figure 15: The four questions of the self-reflection exercise.

4.2. Guidelines for social inclusivity

Considering the context of application for SENSE.STEAM, whether within a STEAM Lab, workshop, learning sequence, or activity, the guidelines from this Section 4.2 wants to create conditions that might be emblematic of a STEAM society, that gives access to active participation, co-creation, and cultivates knowledge building. To create a social inclusivity approach, SENSE.STEAM recommends the measures reported in Table 3.

Table 3: Practical guidelines for social inclusivity in STEAM Labs

6. DIVERSE REPRESENTATION IN CURRICULUM AND LEARNING SEQUENCES	• Ensure that curriculum and learning sequences include diverse perspectives and voices. • Enhance multidisciplinary and transdisciplinary approaches. • Recognize the value of varied perspectives, especially those traditionally underrepresented in STEM.
7. CO-CREATION AND COOPERATION	• Promote active, creative, and participatory approaches: art-infused and citizen science practices. • Focus on shared ownership on knowledge and learning.

	• Prioritize clarity and communication where all participants understand the process and the goals during all stages. • Be flexible and attentive to the needs and concerns of the participants. • Collaborate with local organizations and initiatives that focus on gender equality and social inclusion, leveraging external expertise and resources. • Celebrate the achievements of all students.
8. MUTUAL LEARNING AND KNOWLEDGE EXCHANGE	• Collect insights into what advances and promotes initiatives. • Expertise from all participants is acknowledged and respected. • Take horizontal approaches to learning, that benefits all involved. • Promote Open Science principles. • Find hands-on, creative, and playful manners that trigger curiosity and interest and knowledge seeking.
9. INCLUSIVE TEACHING ACTIVITIES	• Employ a variety of teaching methods and participatory/engagement strategies that cater to different learning styles and activities. • Encourage collaborative learning, flipped classroom techniques, or peer teaching. • Respond to needs and concerns of specific communities, they can in a vulnerable situation. • Work in small groups to make sure that no one is left aside. • Find different roles for each student involved.
10. EQUITABLE ACCESS TO RESOURCES	• Ensure all participants have access to necessary resources such as technology or materials.
11. MENTORSHIP AND SUPPORT GROUPS	• Include diverse role models, especially women and individuals from marginalized groups to share experiences in STEAM fields. • Establish support groups, parallel training for teachers and trainees, workshops that create a sense of belonging to the STEAM Labs and mentorship opportunities.
12. FLEXIBLE ASSESSMENT	• Use a variety of assessment methods such as rather than relying on standardized tests. • Combine quantitative assessments with qualitative observations to favor that cannot be observed in large numbers or averages.
13. INCLUSIVE LANGUAGE	• Before planning the learning sequences, prepare specific definitions and terminology that uses inclusive language.

	• Encourage students to use inclusive language that respects gender identities and communities in a vulnerable situation. • Create safe spaces for discussion on gender and identities
14. STEREOTYPES AND BIAS	• Include discussions on gender stereotypes, unconscious bias, and discrimination in STEAM fields. • Raise awareness about these issues and when possible, measure the impact along the learning sequences.
15. INTERSECTIONALITY CONSIDERATION	• Recognize that students have intersecting identities (e.g., gender, race, disability). • Tailor support to address unique needs and challenges. • Enhance the presence of the body and the intersected identities in every learning activity.
16. COMMUNITY ENGAGEMENT	• Engage with the local community to foster interest in STEAM participants. • Organize outreach programs that involve parents, guardians, and community members to support students. • Celebrate the achievements publicly of all students. • Run activities out of the school contexts and in public spaces. • Encourage active participation and knowledge seeking with the community.
17. FEEDBACK AND ADAPTATION	• Encourage open feedback from students and participants regarding their experiences. • Use this feedback to continuously adapt and improve teaching methods and materials. • Establish feedback mechanisms that allow students and stakeholders to contribute ideas and suggestions for continuously improving the inclusivity and gender responsiveness of STEAM practices and activities.
18. CONTINUOUS PROFESSIONAL DEVELOPMENT	• Provide opportunities for educators in gender-responsive teaching methods and the importance of social inclusion. • Find activities suitable for different stages of a professional career, and for all education levels. • Offer training to those professionals that can be key in transforming STEAM education (e.g., teachers, policy makers, academic researcher⋯)
19. SENSORIAL EXPERIENCES	• Put the body and the human-scale at the center of every learning activity and in context with Space.

	• Confront scientific sensors and other scientific artifacts with individual experiences. • Start conversations between qualitative and quantitative data and knowledge and critically reflect on them. • Activate sense of agency in learning spaces. • Explore art-infused and citizen science practices as ways to perceive and reformulate perception.
20. FUTURE MAKING	• Learn about the expectations of the learners. • Open doors to imagine future making throughout the learning sequences. • Leave spaces for speculation and imagination. • Offer ways to increase sense of knowledge ownership. • Work with transformative science and technology with real effects on learners' local contexts and beyond.

4.3. Guidelines for gender mainstreaming

Gender mainstreaming means integrating a gender perspective in all stages of a project, curricula, workshop, activity, etc. Guidelines provided for social inclusivity from previous section are also applicable to gender mainstreaming. However, specific particularities must be highlighted and additionally aspects may need to be explicitly addressed and emphasized. In effort to create a gender responsive approach, SENSE.STEAM recommends the measures reported in Table 3 structured around five main ideas: Equal participation, Gender balanced representation, amplification of some voices, flexibility and accommodation needs, and gender sensitive data collection.

Table 4: Practical guidelines for gender mainstreaming in STEAM Labs

21. EQUAL PARTICIPATION	• Create a safe, no-judgement environment. • Prioritize mentorship and leadership for women and non-binary individuals to make sure they have equal participation in activities.
22. GENDER BALANCED REPRESENTATION	• In decision-making processes and project design, strive for gender-balanced representation in leadership roles, project teams, participants, and advisory boards.
23. AMPLIFICATION OF SOME VOICES	• Seek the voice and highlight perspectives of groups in most vulnerable situation (e.g., LGBTQIA+ individuals).

24. FLEXIBILITY AND ACCOMODATION NEEDS	• Create activities in schedules, locations and conditions which can accommodate such as caregiving or work scheduling.
25. GENDER SENSITIVE DATA COLLECTION	• Be mindful of gender specific impacts, perspectives or patterns with data, evidence, or testimonials. • Decide when it can be of value to collect gender disaggregated data and whether this data can deepen stigmatization and stereotypes.

5. Conclusions

In developing this scoping report, SENSE. seeks to add to a framework that amplifies social inclusion and gender equality for STEAM Labs. This deliverable intends to amplify the voices of the individual within the sphere of their community and within the even greater sphere of their societies. In this, it is essential to recognize that individuals possess multidimensional identities shaped by a multitude of factors. In STEAM education, fostering these diverse perspectives not only empowers and validates the experiences of marginalized individuals - representation matters - but it is vital for innovation and progress. By incorporating a wide range of perspectives, STEAM education becomes richer and more adaptable, addressing complex problems from multiple angles.

This document provides the results of a scoping report focused on social inclusion and gender dimensions as cross-cutting issues of the SENSE.STEAM methodology developed in "WP3 - SENSE.STEAM pedagogy". This deliverable constitutes the first outcome from the "WP6 - Cross-cutting issue: Social Inclusion". In shaping inclusivity, access to education (along with healthcare, employment, information, and more) can be considered as a right, not a privilege, and SENSE.STEAM aims to eliminate barriers, particularly women and minorities.

Key ideas related to social inclusion, gender, and intersectionality are introduced to set general guiding principles to SENSE. STEAM. The alignment of inclusivity with the space cross-cutting issue in SENSE. is discussed suggesting the overlap of SENSE. spatial dimensions with other four key social dimensions: co-creation, access, agency, and most importantly identity. In this, the concept of space is something that transcends physical locations, and encompass the environments, both physical and virtual, where individuals live, work, and interact; depending on intersectionality of identities and lived experiences, these perceptions of space are varied. Therefore, we want to be conscious of existing spaces and learning environments, and cognizant of the levels and nuances and how people use the space in which they interact.

Gender and social inclusion and the intersection with citizen science and art-infused practices are provided in a crowd-sourced manner. The corresponding sections collect different perspectives and experiences within the consortia and beyond. Quotes from a wide variety of voices are included to pinpoint key ideas and respect the plurality of approaches that might be possible in social inclusion within STEAM education.

Citizen science practices can potentially lie at the core of transformation towards social inclusion and gender equality. These practices focus on making and sensing the surrounding environment, which aligns with the SENSE. perspective, and focuses on phenomena rather than on models from a didactics of science perspective. Citizen science recognizes that communities and individuals should be active participants in the decisions that impact and shape their lives. A fundamental aspect of this is the

concept of co-creation, where diverse voices contribute to the design and implementation of their own futures and work together towards that goal.

Other relevant aspects that are to be considered are in relation to art-infused practices. Recommendations are to take a systematic sensorial approach, to go beyond stereotypes art and science division when gender perspective is considered, to intensify artistic practices because they take a critical stance, to open up the perspective as "art gives another possibility for humanity" (A. Lepecki), and to embrace the dimensions of the body with all identities intersected and the human scale as a strong entrance points for the STEAM learning activities, among many others. And finally, in a broader perspective, recommendations that could be emphasized here are to make a welcoming space for the most vulnerable, and even can address specific issues such the problem of school segregation and language exclusivity.

The crowdsourced effort is complemented with seven inspirational cases to better imagine the different possible options to address social inclusion and gender within the SENSE. model and the STEAM Labs. The documented experiences belong to some of the SENSE. consortia, as the case studies are aimed to facilitate mutual learning and capacity building within the consortia. The descriptions include concrete key learning insights to increase transferability and exchange. Also, examples of other European Projects are included to reflect the ethos of a network of STEAM Labs in an operational level by placing the focus on women in STEM disciplines and skills.

It is imperative that the STEAM Labs take an adaptive attitude throughout their design and implementation efforts, being mindful that there is no one-fits-all solution as the social and cultural context in each neighborhood, city, region, or country across the consortia members may show a high variance in identified parameters to local elements of social inclusion. However, this deliverable still offers a dedicated section on practical recommendations to operationalize gender and social inclusion. Section 4 that synthesizes key ideas in an operational manner. The social inclusion guiding principle asks that, when applicable, the SENSE.STEAM Labs to be able to dynamically react and make any necessary revisions within the planned activities. This adaptability is necessary as the STEAM Labs are not static processes and will need to be flexible to reflect the needs of the group and learning sequence. For this reason, this scoping report introduces the self-reflection exercise for the STEAM Labs based on individual, community, and society levels as concentric spheres that strongly correlate when considering social inclusion, gender, and intersectionality.

Throughout the planning, implementation, monitoring, and evaluation, it is necessary that organizers periodically revisit the series of questions around of the *whys*, *whos*, *whats*, and *wheres* in relation to the STEAM Lab activities. The self-reflection exercise in Section 4.1 asks to critically review the answers. In this process, it is also important to adopt an active listening attitude towards participants' during the development of the activities and use their insights to better address the self-reflection questions in future steps. Each STEAM Lab could find within the questions ways to better adapt or

redesign actions to further promote social inclusion and gender and intersectionality mainstreaming.

Section 4.2 delivers a set of 20 points addressing practical aspects to effectively guide the STEAM Labs in their task on considering social inclusion as a fundamental cross-cutting in STEAM education. The applicability of these suggestions may differ according to the distinct circumstances of the STEAM Labs. It is important to recognize that not all endeavors will demand the same approach or the inclusion of every element. However, maintaining an understanding of potential norms that promote inclusivity or exclusivity remains highly valuable. The aim of SENSE.STEAM is not to establish rigid regulations but rather to offer guidelines that can serve as a foundation. These guidelines should be adaptable, allowing for the creation of effective actions that enhance inclusiveness. In our pursuit of cultivating an inclusive environment, Section 4.2 recommendations that can steer the development of strategies tailored to specific project requirements and societal contexts.

Integrating social cohesion into SENSE.STEAM education is marked by the recognition that co-creation, access, identity, agency along with participatory practices, gender equality, and intersectionality are not isolated concepts but interconnected pillars of a more inclusive and equitable society. Ensuring access and embracing co-creation and participatory practices empowers individuals to actively shape their learning environments, furthering a sense of belonging and ownership. Recognizing the importance of identity and adopting a gender equality approach ensures that opportunities are not limited by preconceived notions of capability. Intersectionality reinforces that everyone is a complex tapestry of identities, that should be recognized and valued.

In this reimagining of STEAM education, social inclusion is possible when these elements are interwoven into a coherent whole. It can propel a dynamic shift from passive assimilation to active engagement, from perpetuating the status quo to collectively dismantling exclusionary norms, and from one-dimensional teaching to multidimensional learning that addresses the ethical cultural and social implications of scientific advancement. As we put these principles at the forefront SENSE.STEAM, we pave the path to a more socially inclusive and just educational landscape.

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7. Annex: List of interviews, communications and feedback

Date	Name, institution	Interaction
09/06/2023	Thodoris Kostoulas, Odyssea	Feedback and Interview
12/06/2023	Adelina Dragomir, GEYC	Feedback and Interview
01/09/2023	Anna Samwel, WECF	Interview
01/09/2023	Anna Samwel, WECF	Feedback and Interview
06/09/2023	Ana Muradashvili, WECF	Feedback and Interview
10/10/2023	Ana Muradashvili, WECF	Feedback and Interview
11/10/2023	Thodoris Kostoulas, Odyssea	Feedback and email exchange
11/10/2023	Michael Riebel, H/B	Feedback and Interview
11/10/2023	Sonali Venkateswaran, H/B	Feedback and Interview
11/10/2023	André Lepecki, SENSE. Advisory board member	Feedback and Interview
11/10/2023	Laura Colucci-Gray, UEDIN	Email exchange
12/10/2023	Anne Krebs, Musée du Louvre	Email exchange
12/10/2023	Jo Cramer, EQUALS-EU coordinator	Email exchange
12/10/2023	Frédérique Thureau, SHEMAKES coordinator	Email exchange
13/10/2023	Inés Moreno, Musée du Louvre	Feedback and Interview. Email exchange
16/10/2023	Daniela Conti, CREDA	Email exchange
16/10/2023	Roser Argemí, Fundació Bofill	Feedback and interview

7.1. Questionnaire

The questionnaire was general, and respondents could choose which questions shall they answer.

Questionnaire:	
1.	In your opinion what are the key aspects when considering social inclusion and gender in STEAM education?
2.	How do you think that artistic practices can play a role in the context of social inclusion and/or gender within STEAM education?
3.	Which are the recommendations you would give to other STEAM Labs to further develop artistic practices in the context of social inclusion and/or gender within STEAM education?
4.	Could you share an example of a project where artistic interventions had a significant impact on the context of social inclusion and/or gender within STEAM education?
5.	What in your opinion can motivate to combine artistic practices and citizen science, in the context of social inclusion and/or gender within STEAM education?
6.	Which are the recommendations you would give to STEAM Labs in relation to the combination of artistic practices and citizen science?
7.	Could you share an example of a project where artistic interventions had a significant impact on the context of social inclusion and/or gender within STEAM education?

7.2. Answers to the questionnaire

Responses*:

Shemakes - Frédérique Thureau Interviewed on October 11, 2023	
1.	The focus of gender and diversity has for the last 10 years been focused on increasing the number of women in tech and science education and research,

	and in the large industries and corporations as an obligation to report of ESG issues (notably on the % of leaders at all levels). This has now to be completed with greater emphasis on mainstream issues that are experienced by "ordinary" women, whose professional work remains invisible in manufacturing and retail professional sectors. This is true of the Textile & Clothing sector, where 74% of European employment is female, where difference of earnings gap with men is still huge (36%) and where their innovation and leadership values remain ignored in a general context of world turbulences (pandemic, wars, overconsumption of planet resources, anti-democracy movements etc.), and the comeback of anti-gender menaces after two years of home confinement, distance working or job losses. Challenges and barriers come from deeply rooted stereotypes regarding the respective roles of women and men, in industries that still follow hierarchical and patriarchal models. a still dominant take-make-waste production ecosystem, that is uneasy to change (as dependent on high volumes and low margins, whatever costs on planet large scale organisations (derived from the above) and that are still "blind" to alternative business models, mostly prompted by women and younger generations (to reach more equality and harmony in the society)
2.	In a world of turbulence and uncertainty, tradition and creativity allow us to reconnect with social values and appreciate novelty, diversity, and authenticity. In the search for new solutions to complex problems, we can find inspiration from a range of cultural roots and the hidden and tacit knowledge embedded in the practices of previous generations. TCBL is working both to systematize textile and clothing heritage as well as to help companies come into contact with artists and creatives to see possible solutions with new eyes. The CreativeWear project (2016-2019) and the CreativeWear PLUS (2016-2019), brought new attention to creativity, personalized design, and artisan and small-scale production for territorially specific value chains for the Textile & Clothing (T&C) industry.
3.	Inclusive business practices lead not only to social benefits but also greater innovation capacity and market competitiveness. The TCBL lab-based innovation model is well placed to support the cultural shift towards an industry that is "open to diversity". Indeed, we are finding that women, minorities, and the socially excluded may be the best-placed figures in the textile and clothing industry to innovate and bring us towards a more sustainable future.

	Shemakes has the goal of empowering female innovators in the T&C industry using a three-pronged approach of inspiration, skills acquisition and networking. This is done by creating what we call "opportunity structures" and business environments (that may be circular, sustainable and near-shored) that enable women to move into roles of increasing power and income through access to hard skills, technology and innovation as well as through community and business engagement activities. The TCBL model of using labs to test innovations, as well as centres for learning, is here combined with the experience of Fabricademy, a transdisciplinary educational program that focuses on the development of new technologies and approaches in the textile industry
4	The project. In two years, more than 2000 girls and women from 16 European countries were trained in tech-based innovation though 100 activities, documented in a fully accessible open toolkit, and supported by 9 lab mentors, 30 ambassadors and 9 advisors that supported the development of a methodology (defined in Q9), all actively supported by communication. An impact evaluation also captured evidence of a change-making ecosystem (following the theory of change)
5	—
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Laura Colucci-Gray, University of Edinburg. SENSE. partner Interviewed on October 11, 2023	
1.	It is important to consider that the Arts are not an easier way to involve girls in science because they engage the emotions more or because they provide aesthetic value. This particular way of looking at women and STEM belies a stereotypical and false division between Science and Emotions, solving which needs the input from the Arts. Rather, if a gender difference is to be considered, this may be more to do with the manner in which girls are being socialized and sexualized in contemporary societies, especially via Science and Technology. Hence, I would see the role of the arts here as a means to take a critical stance, raise awareness, provoke and even engage women and girls in denouncing this and showing their own, legitimate role as designers, makers and experimenters.

2.	---
3.	My view would be to focus on design and make. These are part of a repertoire of artistic practice that value problem-solving, teamwork, accuracy and close correspondence with a real context. It can focus attention on issues that are pertinent to society and to the children themselves. It goes someway to open up a debate or a conversation about how some designs may reflect the needs and concerns of a particular gender category, but also how the design of some spaces may include or exclude particular individuals because of their gender or race, language or ethnicity. Design and make can give a chance to re-think and re-view common assumptions and to include other perspectives.
4	I found this useful resource here: Citizen Science & Art/Science Synergies and Future Potential - UCL Discovery. There is a short report you can download which includes a set of case-studies. https://discovery.ucl.ac.uk/id/eprint/10073928/1/Haklay_CS-Art.pdf
5	Motivation comes from a real issue that needs to be addressed and the desire to think differently about the future. Not as given but in the making.
6	---
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CREDA, SENSE. partner Interviewed on October 16, 2023	
1.	Considering social inclusion and gender in education in general, and thus also in STEAM education, means to have a constant tension in our work towards creating learning community (school communities, neighbourhood communities, etc.) that believes in the social value of people. Taking into account the needs of diverse social multiplicities imply believing in and aiming for a more just community (in terms of quality of life and opportunities) for everyone. Considering social inclusion in STEAM education implies recognizing that every individual should have equal possibilities and opportunities to develop as a critical thinker and a prepared citizen capable of addressing his or her issues while considering other complex and urgent issues, including healthcare, urban revitalization, the climate crisis, and justice, among others, providing opportunities for full participation in matters that truly count. A central point of inclusive education is to start from individuals and their context, rather than imposing a one-size-fits-all curriculum from above, to create an environment where people can discover and develop their own

	creative potential. This means a change of the educational system and more resources to education in terms of people, time, money, infrastructure, space, tools.
2.	Artistic practices can: • Challenge commonplaces, transforming the widespread perception regarding disability, gender identities, sexual orientation, minorities and immigrants, youth and elder just to name some. • Make room for thoughts, relationships, connections, encounters, and paths that help recognize and develop the value of each person and the values that each person brings.
3.	• Concentrate on the creative learning process rather than on the results in terms of artistic production. • Encourage students/participants to work on projects that address social issues. • If it is feasible in your context, facilitate collaborations with whom can bring expertise/content/issues in humanities, communication, arts, creativity, design. • Think to have activities for promoting the sharing of ideas and perspectives and the collaboration between participants. • Recognise the contributions and the results of each person joining in the Lab. • Gather feedback from students and educators/teachers regularly and use them to adjust activities/practices
4	• GENDERS – Science Gallery London and Genders exhibits – Science Gallery London Science Galley London exhibition "GENDERS: SHAPING AND BREAKING THE BINARY" - 13.01.20 - 28.06.20 https://london.sciencegallery.com/genders https://london.sciencegallery.com/genders-exhibits From the exhibition description: "GENDERS presented a playful and kaleidoscopic view of genders and its relationship with science, as well as factors like class, culture, race, age and sexuality. The season aimed to open conversation through personal perspectives on and beyond the female and male 'binaries'. Drawing on the latest research from King's College London, the season examined ideas of gender in contemporary society.The exhibition featured artworks, scientific research and collaborative projects, and invited

	audiences to interact with and speculate upon the factors that shape our behaviour and our understanding of genders. Science Gallery London aims to offer a safe space to discuss, debate and connect with others on this most personal of subjects. In particular, the "Work Out Play Charter" Work Out Play Charter – "is an ongoing research project exploring consent, masculinity and male privilege led by artist Phoebe Davies and sex educator Gareth Esson. In 2017 they worked with sports medicine specialist Alex Bowmer, and historians Dorothée Boulanger and Alana Harris from King's College London to research sexual politics in universities and the structures that perpetuate male privilege. Co-written by male athletes and designed by Phoebe Davies, the Work Out Play Charter sets out tools that athletes can use to challenge oppressive behaviours on campus. During the GENDERS: Shaping and Breaking the Binary season, the artist will run a three-part workshop with Kings Sport and KCLSU for male-identifying students, focusing on consent on campus and bystander intervention. They will create a new print work and poster campaign to be distributed across Kings campuses." Our comment: we find this project is particularly interesting for the context itself (Science Gallery network) and for the strong transdisciplinary approach, bringing together art, science, ethics, sociology, sex education and sport medicine. The role it has in education is mostly reached by the outreach potential of the project, beyond the local engagement with the students.
5	The motivation to integrate artistic practices and citizen science in the context of social inclusion and gender within STEAM education lies in their potential to create relevant learning experiences. Artistic practices along with a citizen science context can foster active participation in scientific and artistic research while promoting participation, diversity, creativity, and empathy and addressing pressing social challenges.
6	--
7	We share what we are bearing in mind for the In*Visible Lab (the Italian STEAM lab at CREDA): • The research content will be relevant to the participant. • In the lab we will try to make the room/time to craft/create/design/make/do/sense. • In the lab we will try to make room for sharing ideas and perception, for discussing and feedback.

	• in the lab we will offer multiple languages of expression (so not only words).

Ines Moreno, Musée du Louvre. SENSE. partner interviewed on October 15, 2023	
1.	Highlighting the dimensions of openness, experience, creativity, and co-construction of meaning inherent to STEAM education in order to develop social links that propose new ways of apprehending the world.
2.	In general, the role of artistic practices would be to enrich any educational initiative with a sensory, aesthetic, and cultural dimension. In terms of inclusion, artistic practices make it possible to work specifically on the level of representations, both in terms of gender and the construction of social roles, and to develop a critical view of how they are shaped, maintained, and transmitted.
3.	Implementing artistic methodologies that allow the development of learning and knowledge production situations that go beyond social frameworks and conventions while providing tools for the critical analysis of the visual culture that surrounds us. From the point of view of those who design and conduct STEAM education practices, it is important to provide adequately sensitive space for participants to explore their own identity contours, its possibilities, and limitations.
4.	(Outside STEAM education but still relevant I believe) - *Dançando com a diferença*, inclusive dance project collaborating with different choreographers, for example La Ribot: https://en.danca-inclusiva.com/trabalho/71/happy-island - Suzanne Lacy, almost any project, for instance: https://www.suzannelacy.com/performance-installation#/the-oakland-projects/
5.	Exploring and testing the common areas of work between participatory and socially engaged art practices and citizen science in order to determine their respective specific approaches.
6.	- Implementing participatory protocols that increase bodily and sensory engagement.

	- Introducing elements of critical analysis of the construction and circulation of images, data, and objects.
7.	--

Anne Krebs, Musée du Louvre, Interviewed on October 12, 2023	
1.	A very early consideration of gender and social inclusion since kindergarten...and including parents' awareness to these questions and challenges.
2.	Opening up to systematic sensorial practices and including aesthetic approaches at the heart of early pedagogy.
3.	Mainly considering the sensorial experience at the core of any pedagogical principle and designing sensitive pedagogical "bricks" build on autonomous exploratory "try and test" principles supported by discreet guidance.
4	Example: a Musée du Louvre activity designed for young audiences in disadvantaged areas; children have to invent and distribute the scientific activities of a curator and they positively deconstructed their initial representations of scientific professions in museums.
5	Expected benefits are a more comprehensive understanding of the role and values of the arts in society, and very importantly, in careers. It is linked to positive changes in gendered notions of social roles.
6	---
7	

*Not all questions had responses: those without responses are indicated with a "–".

8. Annex: Other inspirational cases

8.1. Genders exhibition — Science Gallery London

“GENDERS: SHAPING AND BREAKING THE BINARY” - 13.01.20 - 28.06.20
https://london.sciencegallery.com/genders
https://london.sciencegallery.com/genders-exhibits

From the exhibition description: “GENDERS presented a playful and kaleidoscopic view of genders and its relationship with science, as well as factors like class, culture, race, age and sexuality. The season aimed to open conversation through personal perspectives on and beyond the female and male ‘binaries’. Drawing on the latest research from King’s College London, the season examined ideas of gender in contemporary society.

The exhibition featured artworks, scientific research and collaborative projects, and invited audiences to interact with and speculate upon the factors that shape our behaviour and our understanding of genders. Science Gallery London aims to offer a safe space to discuss, debate and connect with others on this most personal of subjects. In particular, the “Work Out Play Charter” Work Out Play Charter – “is an ongoing research project exploring consent, masculinity and male privilege led by artist Phoebe Davies and sex educator Gareth Esson. In 2017 they worked with sports medicine specialist Alex Bowmer, and historians Dorothée Boulanger and Alana Harris from King's College London to research sexual politics in universities and the structures that perpetuate male privilege. Co-written by male athletes and designed by Phoebe Davies, the Work Out Play Charter sets out tools that athletes can use to challenge oppressive behaviors on campus.

During the GENDERS: Shaping and Breaking the Binary season, the artist will run a three-part workshop with King’s Sport and KCLSU for male-identifying students, focusing on consent on campus and bystander intervention. They will create a new print work and poster campaign to be distributed across King’s campuses.”

This project is particularly interesting for the context itself (Science Gallery network) and for the strong transdisciplinary approach, bringing together art, science, ethics, sociology, sex education and sport medicine. The role it has in education is mostly reached by the outreach potential of the project, beyond the local engagement with the students.

8.2. The roof is on fire — Suzanne Lacy in Oakland

The Roof is on Fire (1993-1994) is a collaboration of Suzanne Lacy, Annice Jacoby, and Chris Johnson.
https://www.suzannelacy.com/performance-installation#/the-oakland-projects/

Texts from Suzanne Lacy:

The Roof Is On Fire featured 220 public high school students in unscripted and unedited conversations on family, sexuality, drugs, culture, education, and the future as they sat in 100 cars parked on a rooftop garage with over 1000 Oakland residents listening in. Like other productions in The Oakland Projects, this one had an extensive preparation period featuring coalition building, youth development and arts education.

Over the course of two years, Lacy and Chris Johnson worked weekly with teachers at Oakland Technical High School to create a media literacy curriculum on teen identity and politics and subsequently created an advanced training program for teachers from eight Oakland public high schools. Distinguished faculty including educator Herb Kohl and sociologists Todd Gitlin and Troy Duster worked with teachers to develop and apply media literacy lessons.

Forty students from various schools attended bi-monthly after-school planning sessions for the performance. Students were trained in all aspects of the production and media coverage. The Roof Is On Fire was aired as a one- hour documentary by the Bay Area's local NBC affiliate and was covered extensively on local news and national CNN. Oakland projects were distributed on television, through lectures, in galleries, on documentary videos, and in articles and books.

This project is particularly interesting as it takes crowdsourced conversations on social inclusion and gender topics as a crude material to work together in a high school context The project took several forms motivated by the production of a performance where many students were involved. The project had strong visibility out of the school context and triggered different activities.

8.3. Case Studies and Referenced Projects

Magnet Alliances - Fundació Bofill in Catalonia, Spain	The program sustains a long-term regional network to reverse school segregation and by establishing

	alliances between schools and institutions of excellence.
Empowering Refugees - Odyssea in Greece	The initiative provides refugees with relief interventions, and resources such as tailored vocational and life-skills training and employability services.
Tech girls club - WECF in Georgia	The club conforms a community of girls developing technological skillsets enrooted in a local context and adapted to local needs and realities while maintaining a global perspective.
Mini Louvre des animaux - Musée du Louvre in Paris, France	The case is an educational device for art-infused STEAM activities with sensorial practices and aesthetic approaches at the heart of early pedagogy, for the youngest.
Cròniques de la Calor - Universitat de Barcelona in Barcelona metropolitan, Spain:	The case is a citizen science project that addresses climate vulnerability in outdoor public spaces of disadvantaged neighborhoods.
SHEMAKES - European project:	The project is a network of labs that creates "opportunity structures" to enable women to move into roles of increasing power and income through access to hard skills, technology, and innovation.
EQUALSEU - European project	The project is offering an array of innovation camps over 25 countries, where teams will collaborate to devise innovative solutions promoting gender equity in the digital inclusion of women and girls.
The CreativeWear project and the CreativeWear PLUS (2016-2019)	The CreativeWear brought new attention to creativity, personalized design, and artisan and small-scale production for territorially specific value chains for the Textile & Clothing (T&C) industry.
Making Sense - Citizen Sensing Toolkit	The Making Sense initiative within the European Union demonstrated the potential for local communities to employ open-source software and hardware, maker techniques, and open design principles to create their own sensing devices, allowing them to tackle environmental challenges such as air pollution and noise. Drawing from successful pilot projects conducted in Amsterdam, Barcelona, and Prishtina, Making Sense formulated a toolkit for participatory sensing, fostering collective awareness and action towards sustainability.
Science Gallery Melbourne: From art exhibition to living lab	Science Gallery Melbourne was established with the aim of delving into the intersections of art and science, with a special emphasis on engaging the demographic of individuals aged 15 to 25. The institution curates specialized exhibitions and extends invitations to artists to draw inspiration from the realm of science. The

	artistic creations typically manifest as tangible objects. Annually, the gallery draws in excess of 250,000 visitors, presenting an opportunity for the examination of user interactions and the collection of user-generated feedback. Consequently, it transforms the museum space into a dynamic laboratory, thus contributing to the advancement of the scientific process.
GENDERS, *Science Galley London exhibition "GENDERS: SHAPING AND BREAKING THE BINARY" - 13.01.20 - 28.06.20*	GENDERS offered a vibrant and imaginative exploration of gender and its intricate connections with science, in addition to various influencing factors such as social class, culture, race, age, and sexuality. This thematic season was designed to foster dialogue by presenting personal viewpoints that extend beyond the traditional female and male binary concept. Grounded in the latest research from King's College London, the season critically examined contemporary notions of gender within society. The exhibition showcased an array of artistic creations, scientific investigations, and collaborative initiatives, encouraging visitors to engage with and contemplate the myriad factors that shape our behavior and our understanding of gender. Science Gallery London is committed to providing a welcoming and secure platform for discussing, debating, and connecting with others on this deeply personal and important subject.
Work Out -- Play Charter led by artist Phoebe Davies and sex educator Gareth Esson	Work Out is an ongoing research project exploring consent, masculinity and male privilege; there is a strong transdisciplinary approach, bringing together art, science, ethics, sociology, sex education and sport medicine. The role it has in education is the outreach potential of the project, beyond the local engagement with the students.
Dançando com a Diferença Happy Island, La Ribot, 2018	Happy Island was a dance project that aimed to create a more inclusive society by breaking down barriers and challenging preconceived notions about people with disabilities. The project specifically worked with dancers with disabilities, emphasizing their talents, creativity, and artistic expression. By doing so, it promoted social inclusion by highlighting the capabilities of individuals who are often marginalized in society. Through dance, it demonstrated that people with disabilities can actively participate in and contribute to the arts and culture

The Oakland Projects, Suzanne Lacy (1991-2001)	Oakland, California, known for its rich history of political activism, diversity, and cultural vibrancy, served as the backdrop for the emergence of a youth culture and political movement during the 1990s. Spanning the decade from 1991 to 2001, Suzanne Lacy collaborated with numerous young individuals and adults to create extensive and large-scale public initiatives. These endeavors encompassed educational workshops and classes for the youth, media interventions, and the development of programs and policies within various institutions. The Oakland Projects stand out as a prominent and well-elaborated exploration of community, youth leadership, and public policy within contemporary visual and public arts practice.
Bergen civil scene - Bürgerbühne	This is a complementary case to *Mini Louvre des animaux* for adults and elder kids. A low-level artistic practice which gives citizens the opportunity to express themselves artistically with their own stories and experiences. It brings together people who would not have met in "normal life" and sees itself as a cosmopolitan, diverse meeting place for generations, social groups, and cultures. It intervenes in current social debates, provides a forum for unheard or marginalized voices, and promotes the development of new aesthetic languages and forms. It is a practice that it is becoming quite popular in some European countries. One of the most famous is the Bergen civil science. It gives personal stories an artistic framework that puts the stories in a new perspective about being human. https://www.fleslandhavre.com/borgerscenen.html
The ROMACTED project, implemented by the Council of Europe, 2021	The project operates in several European countries and supports local authorities in developing inclusive policies and practices, with the objective of "building political will and sustained policy engagement of local authorities to enhance democratic local governance and to build up capacity and stimulate the empowerment of local Roma communities to contribute to the design, implementation and monitoring of plans and projects concerning them". This objective is aimed for capacity-building and empowerment of Roma communities on the individual levels by helping people understand their rights and expanding their skillsets, as well as on the community level by expanding the notion of good governance and increasing community problem solving.

EmpowerMed, 2021-2027	The EmpowerMed approaches the issue energy poverty and to help improve the health of people in the coastal areas of Mediterranean countries, with a particular focus on women. The foremost goal is to raise public consciousness regarding the issue of energy poverty and its potential solutions. This includes a particular focus on addressing the unique challenges faced by coastal regions, recognizing the gender dimension, and considering health-related aspects. EmpowerMed implements pragmatic solutions designed to empower households grappling with energy poverty. The solutions are customized to meet the specific needs and circumstances of affected households, after engaging in collective assemblies and energy advice training for capacity building of actors and partners. Finally, EmpowerMed intends to formulate a set of gender-just policy recommendations at the local, national, and EU level
Europeana, European Union, 2008-2021	Europeana is a digital platform that provides access to millions of items from European museums, galleries, libraries, and archives. It offers a wealth of educational resources, including digitized artworks, historical documents, and cultural heritage materials, making them accessible to educators and learners across Europe. The resources can be used to create lessons, and there is an open-source API to make games, to make gifs, and to tell stories through digital avenues. There is a collaboration with a network of aggregators of over 4,000 institutions like galleries, libraries, archives, and museums that make these resources available - therefore increasing access to cultural heritage that empowers people and benefits society as a whole.
DIVERSE, Romania, Erasmus+ Programme of the European Union, 2019-2021	The DIVERSE project seeks to foster democratic principles and inclusivity in educational institutions by way of the "Creative Drama and Fairy Tales" initiative. The primary objective is to enhance the handling of diversity within the classroom environment. The project places emphasis on the implementation of three key methodologies: creative drama, activities rooted in folklore, and digital storytelling. These methods aim to cultivate emotional learning, non-verbal communication skills, and knowledge acquisition, while also facilitating positive interactions among refugee children and those from diverse ethnic backgrounds.

Catching the Moment – Evaluating community theatre Erasmus + Strategic Partnership KA2 Artistic Citizenship Education Through Community Theatre Practice Project period February 2020 - August 2022	The main objective of Catching the Moment is to create and share an evaluation methodology in a democratic system (in the equal relation of theatrical and sociological professional) which are acceptable and sound from sociological perspective but are also applicable by theatre practitioners - without the necessary involvement of sociologists. Catching the Moment has targeted non-formal educational forms (community theatre projects) through which participants (the audience/participants of the projects) learn indirectly (e.g. active citizenship, democratic citizenship, personal skills etc.). In this context, other practicing experts creating community theatre projects can be also considered as subjects of adult education.

9. Annex: List of key contributors

Anne Krebs, Musée du Louvre Inés Moreno, Musée du Louvre André Lepecki, Tisch School of the Arts, NYU	Provided perspectives regarding art-infused practices, and how these are intertwined and add value with citizen science practices
Thodoris Kostoulas, Odyssea Adelina Dragomir, GEYC	Input regarding work-readiness, and vulnerable persons, migrants, refugees
Anna Samwel, WECF	Engaged in discussions about gender, gender mainstreaming, and intersectionality; how to establish a gender reactive lens of CS/CSS practices, enhancing social inclusion.
Ana Muradashvili, WECF	
Laura Colucci-Gray, UEDIN	Input regarding STEAM education, with examples of best practices when considering building STEAM Labs
Michael Riebel, Hawkins\Brown Sonali Venkateswaran, Hawkins\Brown	Engaged in dialogue regarding space creation, and how this might be framed within context to social inclusion to amplify marginalized voices.