EUROPEAN

POLICYBRIEF

REIMAGINING SCIENCE SPACES FOR THE NEW EUROPEAN BAUHAUS

The New European Bauhaus (NEB) initiative envisions educational spaces that are sustainable, inclusive and beautiful. The SENSE. project brings this vision to life in the context of science education by integrating empathy and aesthetics into STEAM. Redesigning our classrooms and embracing flexible learning environments is a key factor in the momentum to train knowledgeable and compassionate citizens.

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INTRODUCTION

The vision of the New European Bauhaus (NEB) initiative advocates for innovative educational frameworks that combine sustainability, inclusivity and aesthetics. The SENSE. project aligns with this vision by promoting a holistic approach that equally integrates empathy and aesthetics into STEAM (Science, Technology, Engineering, Arts and Mathematics) education.

Current educational spaces often have a segregating and disciplinary function. Underlying this is a common understanding of spatial design as a kind of behaviourist blueprint that aims towards predictable and measurable outcomes, much as a cake recipe promises a sweet result. Schooling has long favoured predictability, but such control over fixed educational spaces can work counter to the development of inclusive environments for learning. SENSE. set off to disseminate its educational approach and spatial vision in 13 living labs.

Drawing on the success of these innovative STEAM Labs across Europe, this policy brief presents a strategy for developing sustainable STEAM spaces in line with the New European Bauhaus vision. By rethinking traditional classroom structures, incorporating flexible learning environments and integrating the arts, we aim to dismantle outdated perceptions and foster a new generation of scientifically literate and socially aware citizens.

METHODOLOGY

The methodology for the policy recommendations within this brief is structured to provide a clear, analytical, and coherent approach that aligns with the overarching goals of the New European Bauhaus initiative. We draw evidence from across the 13 Labs and provide specific examples from a range of selected case studies. This approach will ensure that each recommendation is grounded in the NEB's core values and working principles while illustrating the specific contributions of the SENSE. project.

THE NEW EUROPEAN BAUHAUS

The New European Bauhaus initiative connects the European Green Deal to our daily lives and living spaces. It is a creative, transdisciplinary movement that:

- Bridges science, technology, art and culture.
- Uses green and digital challenges to change our lives for the better.
- Invites co-creation to solve complex societal problems.

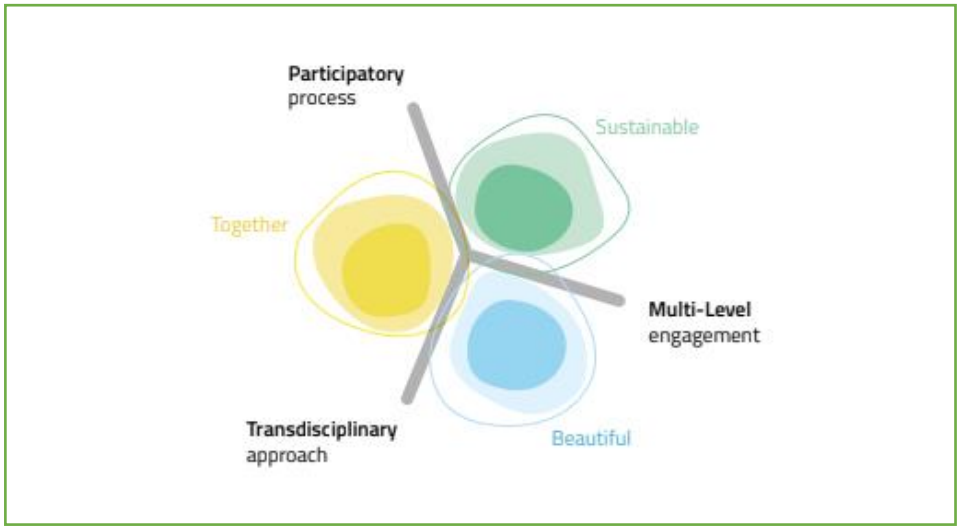
At the heart of NEB are three core values: beauty, sustainability and togetherness. These values emphasise the creation of solutions that are functional, aesthetically pleasing and socially inclusive. Beauty promotes meaningful experiences and a sense of community; sustainability focuses on climate goals, circularity, zero pollution and biodiversity; and togetherness advocates for diversity, equity, accessibility and affordability in design. Both NEB and the SENSE. project advocate rethinking traditional structures in the fields of sustainability, inclusivity and aesthetics.

The NEB follows three guiding principles: participatory processes, multi-level engagement and a transdisciplinary approach. It involves a wide range of stakeholders, from businesses to community initiatives, and encourages collaboration across sectors and disciplines. This comprehensive framework aims to address interconnected challenges such as climate change and social inequality.

With its emphasis on cultural and social transformation, NEB complements the green agenda by rethinking economic frameworks, power dynamics and social behaviours. It highlights compassion, empathy and creativity as essential to envisioning real change. The quality of our living environment, enhanced by art and culture, is crucial to shaping a sustainable future.

To support these ambitions, the European Commission has developed the NEB Compass. This framework guides decision-makers in incorporating NEB principles into projects, detailing core values and their application at different levels of ambition, integrating aesthetics, sustainability and social inclusion.

By aligning NEB principles with the goals of the SENSE. project, we have a unique opportunity to redefine educational spaces and foster a new generation of scientifically literate and socially aware citizens. This policy brief catalyses this transformation and offers actionable strategies for creating innovative, inclusive and sustainable STEAM spaces in line with the NEB vision.



The NEB Compass depicting the interconnection of the core principles and working values of the New European Bauhaus initiative.

POLICY RECOMMENDATIONS

Following the core values of the New European Bauhaus and its working principles, the SENSE. partnership has developed policy recommendations specifically dedicated to the spatial design of STEAM spaces within the framework of the New European Bauhaus.

Aesthetics and Beauty: Flexibility and Adaptability

According to the SENSE.STEAM report, the physical appearance of learning environments significantly impacts student engagement and motivation. This aligns with the NEB's core value of beauty, which advocates for creating environments that are not only utilitarian but also enrich the educational experience. Partnerships with cultural and artistic institutions can facilitate the inclusion of creative design elements, transforming learning spaces into environments that support and encourage creative exploration.

Policies should promote the integration of jointly reflected design strategies, such as innovative spatial configurations or interactive re-configurations of learning spaces. These environments should inspire creative exploration and engagement and create a sense of familiarity, which is essential, especially for the inclusion of vulnerable participants. Findings from the SENSE.STEAM Labs highlight the significant impact of visual and sensory elements on student motivation. Many Labs reported the beneficial effects of “familiar”, “cozy” and “safe” environments on the motivation and engagement of the participants.

For Example in the STEAM Lab held at University of Edinburgh researchers worked alongside the teacher and a group of 10 students (9 girls + 1 boy) in the Home Economics class to experiment with practical STEAM activities designed to connect food preparation indoors with food growing in the school garden. Participants in this group are vulnerable youngsters in a context of high socio-economic deprivation. The Lab was designed to enable inter- and transdisciplinary connections around the topic of food. The students explored geographical origins, growth and biological characteristics of plants but they also engaged with a range of sensorial and aesthetic activities connecting the outdoor and the indoor spaces.

Outside, the garden became a space for the students to observe and make new discoveries about the natural world and collect specimens, and to re-configure the space by planting, weeding and re-organising its features to make it a space of their own, where it was quiet to sit and be together. Inside, the Home Economics class was the space for trying out new recipes using the produce of the garden, but the students also used kitchen equipment to experiment with soil painting and extraction of natural inks to print cards and decorate plates and tablecloths, thus bridging new knowledge with vocational and aesthetic skills.

Over the course of the Lab, many of the students took initiative in caring for the garden and contributed to the work of the group by sharing photos and telling other teachers about their work. Through the SENSE.STEAM approach, both the indoor and the outdoor spaces were progressively connected through actions of future-making that transformed the two environments into highly imaginative settings which encouraged scientific inquiry, inclusion and creativity.



Recommendation 1: Encouraging the design of STEAM spaces that consider the overall quality of experience alongside functionality, and promoting participatory, reflective design strategies that create spaces reflecting the views and feelings of all participants.

Sustainability

There is a strong relationship between education, sustainability and the environment that is highlighted also in the 2030 Agenda for Sustainable Development and promotes the inclusion of key sustainable development issues into teaching and learning. The NEB Compass describes regeneration as the final ambition of the sustainability core value. Focusing on behavioural change and a paradigm shift, regenerative sustainability considers the influence of contexts and environments in one's view. Policies should encourage not only the simple acknowledgment of the environmental crisis but more importantly they should enhance regeneration and reconnection with nature.

We advocate that any future policy should thus allow for maximum flexibility and adaptability and allow facilitators and participants to adjust the learning environment to the concrete aims of STEAM practices, accepting that the diversity of approaches needs to be reflected in the diversity of the environment; diverse pedagogies need diverse spaces.

The SENSE. Project aligns with the NEB prioritisation of a deeper behavioural change towards environmental sustainability, aiming at reconnecting students with the environment, raising their interest in issues of climate change through participation in experiential learning activities.

For example the Cròniques de la Calor (Heat Walks) with the Universitat de Barcelona STEAM Lab analysed local areas greatly affected by urban heat islands. The Lab organised outreach to local communities through schools, libraries, civic centres, and neighbourhood associations, representing a diverse demographic, from school children as young as eight-years-old to adults of all ages and backgrounds. The participants had active engagement throughout the activities and took on leadership roles such as collectively deciding on spaces and routes in which to measure temperature, collecting and interpreting data, and contributing their personal perceptions with a scientific protocol. In this STEAM Lab, civil society is engaged by identifying a community issue and involving the residents of the community in co-creating and designing approaches to understand and develop proposals for transformative change to public spaces.

RECOMMENDATION 2: Reinforcing STEAM education through community-based activities in climate change projects to empower participants to become themselves agents of change.

Inclusion and participatory process

The design and creation of educational spaces has evolved in recent years to abide by national and international laws and norms on accessibility and inclusion, such as the universal design principles. However, ensuring only physical accessibility or applying simply a gender lens to educational spaces is no longer sufficient. When considering STEAM education environments, inclusivity does not only refer to the education of students with disabilities or a specific gender, but also to those who are underrepresented in STEAM due to ethnicity, age, belief or any other vulnerability factor. As such, an intersectional approach is vital for battling stereotypes and encouraging diversity of participation in science education through the design of space. More specifically, there needs to be a thoughtful use of each space used to host STEAM educational experiences,

taking into consideration all the unique characteristics of learners. All barriers – such as linguistic, technical and structural – need to be eliminated as it should be accessible and respectful towards different cultures.

RECOMMENDATION 3: Designing and using spaces to be inclusive and accessible to everyone, particularly marginalized groups, is essential to facilitate transformative STEAM education.

The implementation of SENSE.STEAM Labs focused on this inclusive approach. Despite the different contexts of the Labs in all the countries involved, the common vision and principles were to offer a safe space for participants, an inviting space where they could connect the knowledge acquired in the classroom to their daily lives through a "learning by doing" educational approach.

An Example of that type of space is Odyssea and its Academy where most of the STEAM Labs took place in Greece. Odyssea has received an award for its space design that incorporates the core values and the working principles of the New European Bauhaus initiative. The Odyssea Academy represents a nurturing environment for personal growth, and a melting pot that includes all races, genders, religions and social backgrounds in the participation of the learning, thus ensuring that all voices are heard equally. Accessibility is ensured in all the physical spaces that are designed to simulate real-life professional workspaces through careful design that incorporates universal design principles. Gender-specific modifications in the use of physical space have been made to ensure the elimination of barriers in the educational process. Odyssea has modified a space in its premises for hosting the children of its beneficiaries during the learning process, mostly women, recognising that in vulnerable groups such as migrants and refugees in Greece, female participants in training programmes are often the main or sole primary carer of the children.

Together through multi-level engagement

The notion of the multi-level engagement, where various agents engage in continuous learning inside an educational ecosystem, although innovative as a pedagogical method (Daly et al, 2020; Law & Ko, 2023), is more effective when it is combined with the multiscale model of connected learning (Law et al., 2015). Aligning with the NEB working principle on multilevel engagement across scales, fields and time, the multilevel and multiscale model of learning highlights the need to attend to learning at various levels vertically but also highlights that interacting entities involved in the learning interactions can be of different scales, such as individuals within the same unit, or organizational units at the same level (Law et al., 2015). In a STEAM context, the active engagement of stakeholders in the implementation of the educational activities can enhance the learning experience itself as to its relevance and impact. Following the NEB rationale on multilevel engagement, the stakeholders involved share a similar purpose – to become scientifically literate – but also different viewpoints depending on their scale.

During the SENSE. Project, the consortium involved stakeholders that belong to the wider but nevertheless same educational ecosystem as well as external stakeholders. Out of the 244 implementation activities, the consortium involved parents, schools' teachers, cultural and artistic institutions . The methodology and implementation varied (the type of activities) to include experiential education mostly in the form of Labs, university-community partnerships such as the Cròniques de la Calor (Heat Walks) with the Universitat de Barcelona STEAM Lab, and community engagement and outreach events that brought together diverse groups of stakeholders. In all contexts, the stakeholders worked together, which led to empowerment as they shared a common vision for improvement of the learning process. Taking as an example the case study with the Bergen Christi Krybbe Skole (see below), multilevel engagement and the participatory process go hand in hand as stakeholders involved at various scales and levels are more likely to commit and become themselves active agents of change.

RECOMMENDATION 4: Facilitating multi-level engagement. Foster the engagement of a variety of stakeholders operating across different levels in the implementation of educational activities that promote STEAM.

Diversifying Learning Spaces

Research has shown that the appearance and shape of physical environments are often accepted as unchangeable. However, to promote diversity and inclusion in science education, it is essential to provide alternative pathways that meet the specific needs of different groups, such as women and underrepresented minorities. We recommend the implementation of participatory design processes that actively involve all stakeholders in the creation of science education spaces.

RECOMMENDATION 2: Future policies should encourage learning environments that can both adapt and be adapted to create a sense of familiarity and allow participants to connect with a positive emotional experience.

For example, schools should be encouraged to organise workshops and forums where pupils and staff can contribute ideas and feedback on spatial designs. By involving a wide range of participants in the design and development of educational environments, we can ensure that these spaces are accessible, inclusive and adaptable to the needs of diverse learners. This approach will not only encourage greater participation from historically underrepresented groups, but also create a more enriching and supportive learning environment for all students.

For Example let's take a closer look at Bergen Christi Krybbe, a school in the heart of the historic city centre of Bergen, Norway, which is due to undergo significant renovation changes over the next few years. The study takes into account the municipality's policy on school development, which, for example, sees schools as community hubs. At the same time, through participatory research and STEAM inquiry, the case study conducted by the SENSE. partnership emphasises the importance of student involvement in school development processes. Despite its many strengths, Bergen Christi Krybbe faces some notable challenges: limited indoor sports facilities, anti-social behaviour in the schoolyard outside school hours, inadequate accessibility, insufficient green spaces and the physical separation of its sites.
Our participatory research resulted in a list of recommendations that we shared with both the school and the City of Bergen. Based on our expertise in architecture and planning, these recommendations aim to improve the educational environment and strengthen the school's role within the community.

RECOMMENDATION 5: Diversifying pathways into science education through inclusive spaces, by creating platforms and opportunities for students and the school community to contribute to the design of learning environments.

Transdisciplinary Spaces

The New European Bauhaus (NEB) initiative emphasises a multidisciplinary approach, bringing together different fields of knowledge to create enriching educational experiences. This ambition aligns seamlessly with the principles of STEAM education, which thrives at the intersection of these disciplines. To further these goals, we recommend promoting a transdisciplinary approach to the design and use of STEAM educational spaces.

The SENSE. project exemplifies the benefits of such a transdisciplinary approach through its innovative activities involving diverse stakeholders and crossing traditional disciplinary boundaries. To build on this success, we propose to create flexible and neutral learning environments that support different educational practices. Rather than specialised facilities such as art rooms or science laboratories, these adaptable spaces will encourage creative inquiry and facilitate the acquisition of knowledge through different sensory experiences.

To implement this recommendation effectively, we advocate the design of educational facilities that are easily adaptable to multidisciplinary activities. This involves creating neutral spaces that can be transformed to meet the needs of different disciplines. Involving a wide range of stakeholders - including educators, students, employers and community members - in the design and implementation process will ensure that these spaces meet diverse educational needs. It is also important to encourage the dynamic and creative use of these

spaces. Providing opportunities for students to engage in activities that bring together different subject areas will foster a deeper understanding of the connections between them.

In addition, the development of spatial ecosystems where students can experience multi-sensory approaches to learning is crucial. Incorporating elements that stimulate different senses, such as visual, auditory and tactile learning tools, will enhance knowledge acquisition.

An example of how the transdisciplinary approach operates in the use of a space for STEAM activities is the realisation of Odyssea's labs. The Labs' 'Gender Portraits & Bios' activity took place in a basketball court as part of the students' summer camp for sports activities. A space initially designed for another use was transformed effortlessly so the youth can engage in the activity that aimed to tackle gender stereotypes in STEAM education. The basketball court as an educational environment was used during the activity as a means to enhance the overall experience.

PROJECT IDENTITY

PROJECT NAME	SENSE. The New European Roadmap to STEAM Education [SENSE.]
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FURTHER READING	Heuling, Lydia Schulze; Bean, Justin; Van Nes, Akkelies; Saman, Saeed Moghadam; Riebel, Michael (2024). Engaging Voices. How Participatory Research Transforms School Development at Bergen Christi Krybbe. HVL notat, 24(10) https://hvlopen.brage.unit.no/hvlopen-xmlui/handle/11250/3160493. Riebel, Michael; Venkateswaran, Sonali; Zheng, Xuhong (2023). Scoping Report on Cross Cutting Issue: Space. https://sense-steam.eu/wp-content/uploads/2024/03/D5.1_Scoping-Report-on-Space-in-STEAM_v1.0.pdf