

INCLUSIVE LEARNING ENVIRONMENTS: A RESEARCH IN TUSCAN SCHOOLS

Silvia Panzavolta¹, Lorenza Orlandini¹, Antonio Lezzi², & Pierpaolo Infante²

¹INDIRE - National Institute of Documentation, Innovation and Educational Research (Italy)

²Ufficio Scolastico Regionale (USR) della Toscana (Italy)

Abstract

In recent years, international pedagogical debate has increasingly highlighted learning environments as a key factor in the quality and equity of education. Research shows that the physical and organizational configuration of school spaces significantly affects teaching and learning processes, students' participation, well-being, and inclusion. Consequently, the design of educational spaces requires a close dialogue between pedagogy and architecture. In Italy, INDIRE has made a significant contribution by promoting a vision of the school as an integrated learning environment characterized by flexible and interconnected spaces. This approach was formalized in the 2016 *Manifesto 1+4 Learning Spaces for the New Millennium* and later expanded to explicitly address inclusion. Within this framework, learning environments are conceived as resources for collaboration, deep learning, differentiation, and participation, in line with Universal Design for Learning principles. Building on this theoretical background, the Regional School Office for Tuscany (USR Toscana) and INDIRE launched a research project to investigate the impact of PNRR-funded interventions on the transformation of learning environments in Tuscan schools.

Keywords: *Inclusion, learning environments, equity, well-being, Tuscan schools.*

1. Learning environments, inclusion, and educational innovation

Educational research has increasingly highlighted the deep interconnection between physical learning spaces and cognitive, social, and pedagogical processes. A substantial body of literature has demonstrated that the design and organization of educational environments influence not only learning outcomes, but also teaching practices, student engagement, well-being, and participation (Scott-Webber, 2004; Higgins et al., 2005; Manninen et al., 2007; Brooks, 2011, 2012; Cleveland, 2009). Within this perspective, learning spaces are no longer conceived as neutral containers for instruction, but as active components of the educational ecosystem, capable of shaping interactions, behaviors, and meanings. Building on this theoretical foundation, INDIRE's long-term research on Innovative Learning Environments (ILEs) has contributed significantly to reframing school space as a pedagogical device, deeply intertwined with curriculum design, inclusive teaching methodologies, and organizational practices. In continuity with the *Manifesto 1+4 Learning Spaces for the New Millennium*, INDIRE conceptualizes the school as a system of interconnected learning environments (formal, informal, individual, collective, and exploratory) designed to support diverse modes of learning and participation. More recently, this line of research has explicitly addressed the inclusive value of learning spaces, moving beyond a traditional focus on accessibility and architectural barriers. Drawing on the International Classification of Functioning, Disability and Health (WHO, 2001; Booth & Ainscow, 2016), INDIRE adopts a bio-psycho-social framework in which inclusion is understood as the result of the dynamic interaction between learners, educational activities, and environmental factors. Within this approach, space is conceived as a potential facilitator, or barrier, of participation, capable of either enabling or constraining students' opportunities to engage meaningfully in learning processes. INDIRE's empirical studies and professional development initiatives with schools highlight that inclusive ILEs are not designed for specific categories of learners, but aim to create "sufficiently good" conditions for all students, in line with principles of Universal Design and Universal Design for Learning (CAST, 2018). Flexibility, usability, symbolic value, and the possibility of multiple configurations emerge as key features of spaces that support inclusion, autonomy, collaboration, and well-being. In this sense, learning environments act as a "third educator", contributing to a broader cultural shift in which diversity is recognized as an educational resource and inclusion is embedded within everyday pedagogical practices, rather than treated as an exceptional or compensatory intervention.

2. INDIRE's research on inclusive learning environments

Since 2012, INDIRE has developed a sustained research focus on learning environments, highlighting their crucial role in fostering flexible, personalized, and innovative teaching and learning practices (Tosi, 2019). INDIRE's research is grounded in the assumption that the classroom cannot be considered the sole setting in which teaching and learning processes occur. Instead, it emphasizes the need to design educational spaces that go beyond the traditional model - originally conceived for mass schooling at the beginning of the twentieth century - in order to respond to the evolving needs of all learners and of contemporary society. This research trajectory has been consolidated in the *Manifesto 1+4 Learning Spaces for the new Millennium*, which outlines five distinct school spaces designed to accommodate different types of activities in relation to the teaching phase, educational goals and outcomes, class composition, and students' individual characteristics (e.g., talents, interests, vulnerabilities, and needs). The space identified as "1" is the *group learning space*, dedicated to collaborative learning. It represents an expansion of the traditional classroom, historically conceived as the sole locus of teaching and learning.

Over time, the focus on learning environments as a condition for inclusive schooling has been further developed (Caprino et al., 2022), drawing on the bio-psycho-social model proposed by the World Health Organization (WHO, 2007) through the ICF framework. Within this perspective, the *Manifesto* has been refined to provide guidelines, spatial settings, and design solutions aimed at promoting inclusive space design (Infante et al., 2023):

- The *group learning space* should ensure conditions that support physical well-being (adequate lighting, appropriate acoustics, ventilation, temperature control, and signage). It is the environment where students and teachers spend most of their time and should enable maximum participation by all learners and allow for the creation of cooperative work areas. Inclusivity in this space is reflected in its adaptability to individual students' needs, fostering collaboration, interaction, and spatial legibility for all users.
- The *individual area*. The individual area fosters students' autonomy and focus by supporting attention management, reducing sensory overstimulation, and providing a calm setting that promotes self-regulation and mental well-being. The *Agora* represents the school space that opens up to the wider community. It should be accessible and equipped with an effective wayfinding system. This space fosters social inclusion and a sense of belonging, functioning as a hub for interaction among students, teachers, institutional and community stakeholders.
- The *informal area* should be easily accessible, clearly recognizable, and self-explanatory. It should include signage that encourages autonomous use, social interaction, and open communication. Inclusivity is enhanced through the presence of graphic and tactile supports, as well as digital and analog tools that facilitate expression and peer-to-peer exchange without mediation.
- The *exploration lab* is dedicated to the practical experimentation of knowledge acquired during lessons. It should be equipped with materials, tools, facilitators, and solutions that support differentiated and individualized approaches, as well as the use of digital and immersive technologies to enable multichannel representations and experiences, in line with CAST guidelines (2018). Additionally, it should allow for autonomous movement within the space, supporting orientation and enabling each learner to explore and develop their own talents.

The idea underpinning Indire's research on learning environments is therefore the need to move beyond a conception of the school as a mere aggregation of spaces dedicated to single activities (for example, the classroom for instruction, the laboratory for experiential activities, the gymnasium for physical activity, and corridors for circulation), towards the creation of an integrated environment characterized by permeability and continuity among different spaces (Tosi, 2019).

3. Methodology, research instruments, and phases of the study

In recent years, especially after the pandemic, Italian schools have received targeted funding to improve learning environments. The National Recovery and Resilience Plan (PNRR) has been central to this effort, supported by national design Guidelines later consolidated in Futura. Designing, Building, and Inhabiting the School, which now guide many PNRR-funded projects. These policies encourage moving beyond traditional classroom-and-corridor layouts toward integrated systems of complementary spaces (MIUR, 2013). Research also links learning environments to achievement, well-being, inclusion, and teachers' practices-insights reflected in the Futura framework. Building on this theoretical background, the Regional School Office for Tuscany (USR Toscana) and INDIRE have launched a research project to explore the impact of interventions funded through the National Recovery and Resilience Plan (PNRR) as well as other funding streams introduced following the COVID-19 pandemic. The study aims to provide a

shared opportunity for reflection to better understand the goals pursued, the results achieved, and their contribution to creating more inclusive, welcoming, and innovative schools. The study adopts a mixed-methods research design (Creswell & Plano Clark, 2018), which includes an initial phase of theoretical systematization, followed by standardized data collection through an online questionnaire. The collected data are mapped and analyzed to identify a set of cases of particular interest for in-depth case studies conducted in selected pilot contexts. The integration of quantitative and qualitative evidence supports the development of an interpretative framework that helps to describe how Tuscan schools are currently reconfiguring their learning environments. Accordingly, the research is structured into three main phases:

1. the first phase is the administration of a questionnaire - SET (Spazi Educativi Toscani) to school principals (or their delegates) to map the aims and types of interventions carried out;
2. the second phase consists in the analysis of the responses to identify a subgroup of particularly significant schools, followed by semi-structured online interviews with a representative sample (one school per educational level);
3. the third phase is the development of in-depth case studies based on selected schools, focusing on the relationship between spatial design, pedagogical innovation, and inclusiveness.

This ongoing research represents an important step toward understanding how investment policies can drive the evolution of learning environments as inclusive, flexible, and future-oriented educational ecosystems.

4. The SET questionnaire

The SET (Spazi Educativi Toscani) questionnaire was developed as a comprehensive research instrument to systematically explore how schools in Tuscany have designed, implemented, or planned transformations of their learning environments in recent years. Conceived within the collaboration between the Regional School Office of Tuscany and INDIRE's research unit on learning environments, the questionnaire aims to capture not only the physical characteristics of spatial interventions, but also the educational intentions, organizational processes, and contextual constraints that shape them. The structure of the questionnaire reflects a multidimensional understanding of learning spaces, aligned with the INDIRE framework on Innovative Learning Environments and with a conception of space as an active pedagogical and inclusive factor. The questionnaire is articulated into a sequence of thematic sections that combine structured response formats with opportunities for qualitative elaboration. An initial section gathers general and contextual information, including school level (early childhood, primary, lower and upper secondary education), institutional affiliation, and the role of the respondent, while also ensuring informed consent in compliance with data protection regulations. This section situates each response within its institutional and organizational context, allowing for comparative analyses across school types and educational stages. A first core section, dedicated to the recent past, investigates the types of spatial interventions carried out over the last three years. Respondents are presented with a detailed list of intervention typologies—ranging from new school buildings and regulatory upgrades (safety, seismic compliance, accessibility) to light refurbishment, aesthetic requalification, redefinition of the use of existing spaces, introduction of flexible furniture, conversion of underused areas, and interventions in outdoor spaces. For each intervention, schools are asked to indicate the level of implementation using a four-category response scale: implemented, in progress, planned but not implemented, or not planned. This structure enables the mapping of both completed actions and emerging design trajectories, highlighting different stages of spatial innovation across the region. Subsequent sections focus on the sources of funding that supported or enabled these transformations. Multiple-response options allow schools to indicate the use of national, European, and PNRR-related programmes (such as FESR, REACT-EU, Scuola 4.0, and other targeted initiatives), complemented by open fields for further specification. This section provides insight into the relationship between financial frameworks and design choices, supporting analyses of how funding opportunities influence the scope and nature of spatial interventions. The questionnaire then addresses the educational purposes that guided the design of learning environments. Respondents are asked to select up to three priority goals from a predefined list, including improving physical comfort and environmental quality, supporting active and laboratory-based teaching, fostering social interaction and informal learning, promoting student autonomy and participation, enhancing technological integration, supporting inclusion and cultural mediation, and opening the school to the wider community. By limiting the number of selectable options, the questionnaire encourages respondents to identify their most significant priorities, thus revealing the underlying pedagogical values associated with spatial design decisions. Another section explores the types of spaces involved in the interventions, using multiple-choice responses aligned with recognized categories of learning environments: differentiated classrooms, disciplinary or transversal laboratories, makerspaces, informal and shared areas, libraries, plenary spaces (such as *agorà* or *auditoria*),

outdoor learning environments, and spaces dedicated to staff and school governance. This section allows for an analysis of how different spatial configurations are distributed within schools and how they relate to intended educational functions. Further sections investigate the conceptual and cultural references that informed design choices, such as the *Manifesto 1+4* and INDIRE's research on learning spaces, internal school working groups, external providers, or requirements linked to funding calls. The questionnaire also examines the actors involved in the design process, inviting respondents to indicate the participation of school leaders, teachers, students, families, technical staff, external experts, and local authorities. This emphasis on participation and co-design reflects the recognition of spatial transformation as a collective and organizational process. Finally, the questionnaire addresses the main challenges and critical issues encountered during the planning and implementation of spatial interventions. Schools are asked to select up to three significant difficulties from a list that includes organizational resistance, lack of professional expertise, procurement and administrative constraints, market limitations, rising costs, and challenges in stakeholder involvement. Each section of the questionnaire is complemented by open-ended comment fields, allowing respondents to clarify responses, provide contextual explanations, and offer feedback on the clarity and effectiveness of the instrument itself.

Overall, the SET questionnaire integrates quantitative mapping with qualitative reflection, offering a robust tool to explore how spatial design, educational intentions, inclusion, innovation, and organizational dynamics intersect in contemporary school practices. By combining standardized response options with reflective commentary, the instrument supports both descriptive analysis and interpretative insight into the evolving role of learning environments in the Tuscan school system.

5. Results and discussion

The analysis of the SET dataset reveals a heterogeneous yet coherent picture of how schools in Tuscany are engaging in the transformation of learning environments. Overall, the data show that most interventions carried out in the last three years are not limited to large-scale construction projects, but rather focus on incremental and adaptive strategies, such as the redefinition of existing spaces, the introduction of flexible furniture, the conversion of underused areas, and interventions in informal or transitional spaces. This trend suggests a pragmatic approach to spatial innovation, in which schools operate within existing architectural constraints while seeking to enhance the pedagogical potential of their environments. Regulatory upgrades related to safety, accessibility, and compliance remain significant, but they are increasingly accompanied by design choices explicitly oriented toward educational and inclusive goals. The purposes guiding these interventions highlight a strong alignment with student-centred and inclusive pedagogies. Improving physical comfort and environmental quality, supporting active and laboratory-based teaching, fostering student participation, and enabling differentiated uses of space emerge as recurrent priorities. Notably, inclusion is rarely framed as a separate or compensatory objective; rather, it is embedded within broader aims related to flexibility, autonomy, social interaction, and well-being. This finding is consistent with the INDIRE perspective on Innovative Learning Environments, in which inclusive design is understood as the creation of “sufficiently good” conditions for all learners, rather than the adaptation of spaces for specific categories of students. The types of spaces most frequently involved in the reported interventions further reinforce this interpretation. Alongside traditional classrooms, schools report significant investments in informal shared areas, laboratories, makerspaces, libraries, plenary spaces, and outdoor environments. These choices indicate a gradual shift away from a classroom-centred model toward a more distributed learning ecosystem, where different spatial configurations support multiple forms of engagement, collaboration, and individual work. At the same time, the data show that these transformations are often inspired by internal school reflection and by INDIRE's research framework (particularly the *Manifesto 1+4*) rather than being driven solely by market solutions or funding requirements. From an organizational perspective, data highlight the central role of school leaders and teachers in the design process, with more limited but emerging involvement of students, families, and external stakeholders. While this points to a growing awareness of co-design principles, it also reveals a potential area for further development, especially in strengthening participatory approaches. The challenges reported by schools, such as resistance to pedagogical change, limited availability of suitable furnishings or professional expertise, administrative complexity, and rising costs, underscore that spatial innovation is not merely a technical issue, but a deeply cultural and organizational process. Taken together, the SET data suggest that schools in Tuscany are engaging in a meaningful transition toward more flexible, inclusive, and pedagogically intentional learning environments. This transition appears to be evolutionary rather than disruptive, grounded in local contexts and professional practices, and supported by a growing alignment between spatial design, educational values, and institutional vision. In this sense, the data provide empirical evidence of how learning spaces are increasingly conceived as strategic resources for innovation, inclusion, and participation within the everyday life of schools.

6. Conclusions and future work

This study examined the transformation of learning environments in Tuscan schools through the lens of INDIRE's research framework and within the policy context of post-pandemic investment programmes, particularly the National Recovery and Resilience Plan (PNRR). The findings show that schools are increasingly moving beyond a classroom-centred model toward more flexible, integrated, and pedagogically intentional learning environments, often through incremental and context-sensitive interventions rather than large-scale architectural transformations. The results highlight how inclusion is embedded within broader educational goals related to participation, well-being, flexibility, and autonomy, in line with bio-psycho-social and Universal Design for Learning perspectives. Learning spaces emerge as key mediators between pedagogical intentions and everyday practices, capable of supporting diverse learners through adaptable and multifunctional configurations. From an organizational standpoint, the study underscores the central role of school leadership and professional culture in guiding spatial innovation, while also pointing to the potential value of strengthening participatory and co-design approaches. Methodologically, the mixed-methods research design proved effective in capturing both systemic trends and contextual specificities, offering a robust analytical framework. From a methodological standpoint, the mixed-methods research design adopted in this study is highly replicable in other regional and territorial contexts. The combination of standardized data collection through the SET questionnaire, qualitative interviews, and in-depth case studies provides a flexible and scalable framework that can be adapted to different educational systems and policy environments. This approach enables regional authorities and research institutions to systematically monitor how investment policies are translated into spatial and pedagogical innovation, while also accounting for local specificities. As such, the methodology offers a transferable model for supporting evidence-informed decision-making and comparative analyses across regions.

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