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PROCEEDINGS

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DOING RESEARCH WITH SCHOOLS, BRIDGING SPACE AND EDUCATION

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This paper examines the evaluation methods for participatory research projects in educational settings, with a focus on the EDENLAB research group's initiatives. The research integrates nature into school environments, enhancing pedagogical practices through the inclusion of plants in learning spaces. Utilizing a participatory approach, teachers and school communities actively engage in the research, ensuring the relevance and applicability of the findings. The study presents a comprehensive model for evaluating the impact of these interventions, categorizing outcomes into inclusive physical environments, personal resources, and social environments conducive to change. By employing a combination of qualitative and quantitative methods, including questionnaires and reflective logs, the evaluation captures the nuanced effects of these projects on educational practices and school communities. The findings demonstrate significant improvements in spatial use, professional development, and community engagement, highlighting the transformative potential of participatory research in fostering innovative educational environments.

participatory research, evaluation research, learning environments, pedagogical innovation

RETHINKING THE SCHOOL AND ITS SPACES TOGETHER

A building always tells a story: the story of those who designed it and the story of those who live or will live in it. Especially when thinking about buildings used for education, the relationship between design and life is enriched by two disciplinary fields of reference: Architecture and Pedagogy. When the sciences of design and the sciences of the development of human potential enter into a dialogue with each other, the resulting buildings are more coherent, more generous and capable of absorbing the changes of the times. They are buildings

in which architecture can create spaces for educational life (Weyland & Attia 2015).

When designing a building, especially an educational building, two dimensions are always taken into account: the technical-functional aspect and the value and cultural dimension.

By ‘pedagogical living’ we mean projects in which the synthesis of the technical and cultural aspects enables the creation of spaces that welcome and empower the individual, places that open the eye to the appreciation of the surrounding landscapes and contexts. Pedagogical living is the pedagogical-architectural dialogue that gives rise to spaces that are both strong and discreet, capable of disciplining action and stimulating it at the same time. Combining the concept of living with pedagogy means, above all, combining the spontaneity of human action with intentionality, the spiritual dimension with the rational. According to Cesare Scurati’s thinking (1997), each discipline carries out the critical exercise of reason on reality under its own profile and the school adopts its perspectives aimed at the realisation of the integral human being.

Pedagogy and architecture are disciplines that not only observe the reality of the educational universe from different perspectives (abstract vs. material) but also share a common peculiarity: they have a heuristic and propositional soul. Both interpret and model reality and both formulate proposals for the development of human potential: being, doing, living and staying. Pedagogy to guarantee the conditions for an effective and authentic education, architecture to go beyond function. Both disciplines strive in different ways to offer scenarios of possible living, possible relating, possible learning.

In the landscape of this field of study (Weyland, 2024; Woolner et al., 2018; Zuccoli et al., 2021) a consensus is emerging on the idea that the design or rethinking of spaces can be an opportunity to promote the “development of the school” as a particular type of “learning organisation” (Schratz & Steiner Löffler, 1999/2001). On the other hand, it cannot be assumed that changes in the built environment can in themselves bring about a positive change in teaching and learning (Woolner & Stadler-Altman, 2021). This potential can be realised under certain conditions; above all, this includes choosing a participatory approach (Woolner et al., 2012; Weyland & Stadler-Altman, 2019).

Since 2019, several schools have joined action-research projects with the interdisciplinary research group converging on the EDENLAB laboratory (EDucational ENviroments with Nature – edenlab.unibz.it) with the aim of creating more comfortable environments that support an open, exploratory and

collaborative didactics focused on the development of human potential. In this projects, pedagogical living has been enriched by a form of closer micro-relationship with nature, in which plants become facilitators in the exploration of spaces and didactics (Weyland, 2022).

RESEARCH, ACTION AND TRAINING

The EDEN LAB's "joint research" approach falls within the spectrum of participatory research, and integrates the components of research, action and training.

After initial exploratory experiences, the design of these projects becomes more structured with recurring phases. Before starting, external experts and agreements are presented to the school community, outlining objectives and activity plans. The process begins with forming research groups and defining the initial problem through contextualization and training activities, such as seminars and specific materials. Semi-structured tools like an online noticeboard and a questionnaire survey are used to gather participant characteristics and motivations. Researchers then support project development through regular meetings, facilitating group reflection and documenting processes with tools like participant logbooks. The final phase involves presenting and analyzing results, incorporating a second questionnaire, and considering the project's ongoing development.

There is a clear distinction between the active and reflective role of "practitioners" within their own context and the role of external researchers, which in participatory approaches is twofold: on one hand, acting as facilitators of the teachers' reflection and training process, and on the other, as researchers committed to producing knowledge both on the topics of shared research with the teachers and on their own training strategies (Losito, 2018, p. 67). This duality of roles and research agendas becomes particularly important when defining what constitutes a result of the research itself.

MEASURING AND APPRECIATING RESULTS

The researchers who have joined forces in the EDEN lab aim to develop models and tools to recognise and examine the outcomes of different projects (Weyland & Zini, 2023). Methodological issues related to evaluating outcomes in participatory research have been explored (Agrusti & Dodman, 2021), focusing on the potential and limitations of evaluation approaches using indicators. Results are defined in terms of learning that "is not limited to the innovation

achieved but involves a transformation of the context and a change in the ways of doing and thinking of the actors” (Cardarello, 2018, p. 61).

A model was developed for classifying results (Zini & Weyland, in press, Zini, in press), which aims to evaluate effects by tracking changes in three critical factors: the physical environment, personal resources, and social environment. The model includes sixteen outcome categories and allows for relationships and feedback effects between different categories. It provides a framework for selecting appropriate indicators to measure outcomes without prescribing specific methods or tools.

Tab. 1. Factors and outcome categories.

F1. Inclusive physical environment that promotes active learning and well-being	
R1.1	Negotiation quality of spatial interventions
R1.2	Aesthetic quality and accessibility
R1.3	Perceptible and symbolic quality of spaces
R1.4	Pedagogical quality of spaces for learning purposes
R1.5	Pedagogical quality of spaces for teaching purposes
R1.6	Access and utilisation
F2. Personal resources, attitudes and behaviours conducive to educational innovation	
R2.1	Professional development
R2.2	Practices
F3 Social environment conducive to change in the school	
R3.1	Multiplication, implementation of further coherent measures
R3.2	Interpersonal transfer and broadening of the stakeholder base
R3.3	Training and design
R3.4	Organisation and Curriculum
R4.1	Building networks to support change
R4.2	Interaction with the local community
R4.3	Involvement of parents
R4.4	Involvement of technical staff

CONSTRUCTION OF INSTRUMENTS AND FIRST APPLICATIONS

An initial data collection instrument was constructed in the form of questionnaire that was administered to a group of teachers in the final stages of one of the most recent EDEN LAB projects. Beate Weyland and Giusi Boaretto collaborated with the Monini kindergarten in Umbertide (Perugia) to appropriate the spaces of a new kindergarten in which two exploratory classrooms dedicated to the encounter with plants were to be created. Before the final meeting, a questionnaire was distributed in order to carry out a joint analysis of the data collected and derive indications on the sustainability of the process. Examples of open questions and structured questions can be found in Table 2.

Tab. 2. Examples of questions from the final questionnaire.

Examples of dichotomous and open questions.
Did the presence of the plants in the classrooms lead to teaching/educational activities or unexpected actions? (Yes/No) If yes, can you briefly list which ones or give an example? Have changes been made to the organisation and/or the pedagogical/didactic project? (Yes/No) If yes, can you specify which changes or give an example? Can you say how parents or other stakeholders in the area have frequented the spaces and/or supported the initiative?
Examples of questions on a four-point agreement scale with defined extremes (1. strongly disagree – 4. strongly agree).
The environments are easily accessible for all types of users. Teachers find the spaces and the design with plants helpful in planning and carrying out classroom activities. Children have a positive attitude towards the place (nurturing, bonding). I have enriched my repertoire of teaching strategies. I have observed changes in the attitude or practise of teachers who were initially less engaged (...). More interventions have been carried out in the school environment that are consistent with those carried out during the collaboration with EDENLAB. There was an exchange of experiences and thematic projects between the teachers of the school. Parents were involved in activities held in the spaces concerned in the EDEN project. Organisations or associations in the area actively supported the activities.

To obtain not only information on the individual indicators but also a summarised overview of the project's impact on the determinants, an internal consistency test (thresholds: $\alpha > 0.70$; item-scale correlation > 0.40) was performed on the item sets associated with the three factors according to the theoretical model, making it possible to construct reliable efficacy indices.

In a later study conducted with the kindergartens and primary schools of the Direzione Didattica "Aldo Moro" in Terni (Weyland, Ruzzante, & Zini, 2024), a series of questions were proposed in both the initial and final questionnaires to test the changes in teachers' beliefs regarding the presence of indoor plants in the school space and their potential in relation to different pedagogical intentions. Furthermore, to test the hypothesis that this element of innovation can trigger processes that lead to a general questioning of the quality of the educational space, a small number of indicators were selected from the literature on the assessment and improvement of the pedagogical quality of learning environments in early childhood educational institutions (Bondioli & Savio, 2018) and used with adaptations. In particular, a significant difference (measured with the non-parametric Mann-Whitney U test) was found between the distributions of scores for two items in the data collected at the beginning and at the end of the project:

- (1) Organisation of the school's spaces is the result of teachers' recent joint planning ($p = 0.001$);
- (2) The teachers observe how the children use the rooms in order to reorganise them ($p = 0.012$).

CONCLUSIONS

During the meetings and exchanges, the teachers show that they appreciate the path they have taken and recognise that they are developing skills both in the process of appropriating and transforming the spaces and teaching methods and in their relationship with the plants. The survey instrument was developed to make these changes visible with statistical data, which is also useful for objectively "measuring" the changes that are actually taking place. The presence of open-ended questions qualifies the instrument and provides important insights, both to validate the interpretation of certain structured questions and to gather further information on unexpected outcomes (positive or negative), obstacles or factors that facilitated the path.

In summary, the proposed model seems to provide an appropriate framework to reflect on the outcomes of each intervention at different levels (micro –

individual change, meso – change in organisations, macro – change in communities) and to bring together the data collected from the different experiences in a common research plan that the EDEN LAB will implement with the schools. The direct involvement of participants is in line with the participatory research model and the prominent formative function of evaluation, which aims to further develop the activated processes, even more than reporting.

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