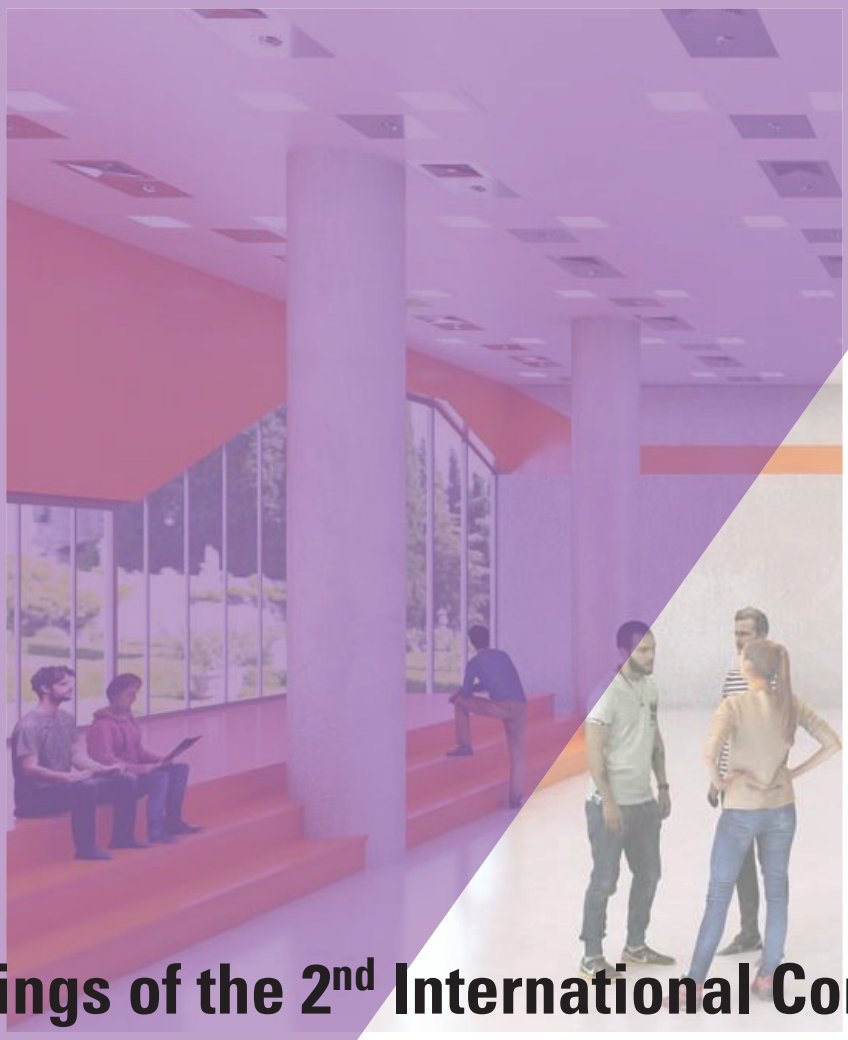

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Education Rethinking Schools and Redesigning them Together

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ABSTRACT: *This paper presents a project based on collaboration between architects, education specialists, teachers, and students. It originated in 2015 from a basic research project funded by DAStU, Department of Architecture and Urban Studies at the Politecnico di Milano, on the theme of existing school buildings, livability, and the wellbeing of students and teachers. The research aim was to build up a knowledge base on the condition of school buildings, and the relative problems and expectations, to be shared with all salient actors: architects, teachers, policymakers, etc. The first steps in the research process included a comprehensive review of the literature, encounters between architects and education specialists, and interviews with the head teachers of lower secondary schools, a segment that is often overlooked in innovation projects. Field work was then conducted involving: observation of school spaces by a group of architects and education specialists, with the help of floor plans; an on-site visit during which the research team first engaged in free exploration before being given a guided tour by school staff; further in-depth observation of the use of the spaces; focus group discussions with students and teachers to elicit their opinions and suggestions for change; administration of a questionnaire adapted from a European project in keeping with the local research aims and context. The results were analyzed, compared, integrated, and ultimately disseminated, mainly via open access outlets. The study gave rise to further developments. On the one hand, it led to the setting up of the transdisciplinary work group Ambiente Scuola [School Environment], which continues to promote cooperation across a growing network of schools, local authorities, associations, etc. On the other hand, the field work fostered enhanced awareness, on the part of the participating schools, of the topic of school spaces, leading in some cases to continued reflection on the innovation goals to be pursued and/or the independent implementation of improvements. Thus, teachers and students have become direct actors in the revisiting of spaces and their uses, and the enhancing of the physical school setting with help – proactively offered in some cases – from parents. An example is the A.B. Sabin school in Segrate, where renewed interest in school spaces inspired both an educational project that qualified for national funding and engaged the students themselves in redecorating the school, and the design and implementation of maintenance and furnishing projects by the students' families.*

KEYWORDS: *Architecture, Education and teaching methods, Schools, Co-design, Student voice, Teacher voice.*

Introduction

Education and architecture have not always been in dialogue. Space, despite its importance for educational trajectories and the well-being of students, teachers, and school staff, was not a priority when schooling was first institutionalized at the national level. There were many other urgent needs, including: overcoming illiteracy, introducing basic school subjects, addressing health issues, and forming citizens with due appreciation of the national unification process. With regard to space, schools legislation mainly only defined the standard parameters for the construction of school buildings. However, some educationalists were beginning to observe, and increasingly to emphasize, that children's learning and participation were positively impacted when the material setting was seen as playing a role in the teaching-learning process and in school life more generally. Examples are two educationalists born in 1870 and active in the 20th century, whose work continues to be influential today. Specifically, Maria Montessori and Giuseppina Pizzigoni both acknowledged the importance of indoor and outdoor spaces, albeit from different conceptual perspectives. Thus, the educational approaches they brought to bear were embedded in the places of their schools, defining the layout of classrooms, furnishings, yards, and gardens. While Maria Montessori (1969) worked on detailed specifications for indoor and outdoor spaces and school furniture, Giuseppina Pizzigoni (1971) focused on the school building as a whole, viewing the educational process as intimately related to the construction of the physical edifice.

Over time, the theory and practice of teachers and education specialists have increasingly come to focus on indoor and outdoor spaces, and especially on what children should do in these places. Crucially however, as students grow older, less attention is paid to space, and by high school, the school spaces they typically encounter might be classified as 'nondescript'. The classrooms are highly impersonal, and bear no trace of what goes on inside them in terms of learning and participation, as though when subject contents become abstract, there is no need to take care of space.

In lower secondary (also known as 'middle') schools, which are typically located in older buildings that have been in use for many years, renovation projects are often carried out at the level of individual rooms. Such 'patchwork or mosaic'-style interventions are based on the well-intentioned inputs of individual teachers, which however are rarely drawn together into a holistic view of the entire school building, based on in-depth analysis and documentation of its uses, needs, and potential transformation. The layout of the school building and its indoor and outdoor spaces are often observed separately to one another. Building maintenance is carried out by external agencies on an emergency basis only. Head teachers are not always fully briefed about interventions that have been made, contributing further to a lack of consistent planning over time. Some fine renovation work has been done, but rarely has it

concerned the entire school building, or been based on analysis of the overall layout of the school, or been executed as part of a coordinated strategy. The project we present here represented an attempt to reverse this pattern by conducting a preliminary analysis of school spaces and listening to the voices of their users, with a view to generating a new, and more comprehensive perspective. After the project, some of the participating schools independently continued exploring the potential for transforming their buildings with the involvement of students and parents.

1. Basic research for advancing and sharing knowledge about middle school facilities

1.1. Hypotheses and goals

Recent decades have seen a renewed focus – internationally – on school infrastructures and their role in learning processes and educational outcomes (Fianchini, 2019). However, it is more difficult to introduce innovative models of using space into existing schools than to incorporate them into new ones. This poses a great challenge, if all future students (and their communities) are to be offered equal educational opportunities, at least in terms of the contribution of the 'third educator', as defined by Malaguzzi.

In-depth knowledge of the problems, needs, and wishes of school users – concerning the conditions and use of school buildings – is required to raise awareness of physical environment issues and inform decision-making, but such knowledge is not commonly pursued in Italy.

To fill this gap and bring to light a range of issues that are rarely visible outside of school walls, a basic research project entitled *Back to School* was designed to gather knowledge in the field and share it with all actors who are interested or wish to initiate improvement processes (Fianchini *et al.,* 2019). It was specifically focused on middle schools, given that at this level of schooling, attention to the relationship of spatial and environmental factors with learning and wellness tends to decrease (Zuccoli, 2019).

This research was funded by the Department of Architecture and Urban Studies (DAStU) of the Politecnico di Milano in 2015 and carried out by a transdisciplinary group of scholars from both DAStU and the 'Riccardo Massa' Department of Human Sciences for Education at the University of Milano-Bicocca, in collaboration with a representative of the regional education department and the participating school communities.

1.2. Research methodology and programme

In order to home in on the quality issues with middle school buildings – within national and local, legal, operational, and management conditions and constraints – at the outset of the research project, a workshop was

held with a group of school principals. Next, a field survey focused on the physical school environment was devised, targeting the communities of five middle schools, all different in terms of context, size, crowding, age and technical characteristics of school building (Fig. 1).

FIG. 1. *The five case studies in the field research*

In evaluating the performance of school physical environments in relation to user needs, we mainly followed the literature on Post-Occupancy Evaluation methods or POE (Preiser *et al.,* 1988; Baird *et al.,* 1995). POEs are a methodological approach to assessing existing building systems, with a view to informing decision-making about renovation and/or adaptive reuse (Fianchini, 2017). Many government agencies and institutions have used such methods to evaluate and monitor their real estate assets, with a view to planning renovation projects, or designing new development projects and processes based on the 'lessons learned' (Blyth *et al.,* 2001).

From the educational research perspective, we adopted a mixed-method approach, which supplemented quantitative with qualitative methods to make the data more intelligible and hence provide a stronger basis for action.

The involvement of teachers, students, and parents in the research was implemented according to the method and praxis of Student Voice (Cook-Sather, 2002, 2009; Flutter *et al.,* 2005), a field of research that was pioneered in English-speaking cultures, but has now become mainstream in Italy too (Grion *et al.,* 2013).

Our research was also informed by the European project, Voices, in which the Milano-Bicocca Department of Human Sciences for Education played an active part in exchanges between European universities and teachers on the transformation of schooling, including in relation to educational environments and the challenges of the Twenty-First Century (Teruggi *et al.,* 2015).

The procedural model and instruments for the evaluation process were drawn from the *International Pilot Study on the Evaluation of Quality in Educational Spaces (EQES)* (OECD/CELE 2009) but adapted to our own specific research objectives, and informed by the research team's own prior experience (Fianchini, 2001, 2007, 2015; Dessì *et al.,* 2015).

The on-site implementation stage involved two days' work at each school. During the first day, the physical and functional conditions were observed and information on the use of the different spaces was collected. During the second day, focus group discussions were held with both students and teachers.

The tours of the schools were conducted from two different perspectives: a more strictly architectural one, with a focus on the physical structure of the school building, the exact layout of the spaces, the furnishings and other architectural details; and a more pedagogical view, understood as a key to accessing the voices of the schools' 'inhabitants', concerning the way that the various actors in the school community inhabited the building, moved around it, and statically or dynamically occupied it.

The students' and teachers' own voices on the topic under study were recorded during separate focus group discussion sessions. At the beginning of each discussion, the research project was presented, emphasizing the fact that the discussion would not lead to immediate concrete change, but was designed to build up an understanding of how the school environment was experienced, and to tap into any associated difficulties, ideas, thoughts, and proposals. The sample of students that participated in the focus groups comprised one student per class, while in most cases the discussion groups with the teachers were less well attended.

A wider survey of the usership was conducted via a questionnaire, with a view to involving the entire school community in reflecting on the school environment and to broadening the pool of participants from which to collect information and qualitative evaluations. Rates of participation across the five case studies varied significantly; overall, 673 students (from 36 classes) and 69 teachers (covering all ten groups of compulsory school subjects) took part. Separate data analysis was conducted for each school. Then the outcomes were compared with a view to distinguishing between commonly recurring patterns and issues specific to individual cases.

Finally, a workshop was held with the principals of the five schools to present, discuss, and validate the research findings.

1.3. Outcomes

The technical inspections revealed that most of the buildings had only undergone a limited number of interventions related to compliance with safety and disabled access legislation; the interiors rated poorly in terms of finishes and decoration; systems and equipment were dated, although many classrooms had interactive whiteboards (IWB). There are also multiple discomfort-related issues, especially: noise; temperature control (during hot/cold weather); glare.

From our observations of typical school mornings, some basic conclusions were drawn:

- the space most used was the classroom; laboratories were often empty;
- usage of school spaces and times followed a pattern linked to the class group and the school timetable;
- there was little mixing between different class groups, even during recreation;
- typically: empty corridors=working in the classroom, corridors full= not working, breaktime or school over;
- the need for constant authorization from the teachers for students to move around school spaces;
- students had necessarily to be supervised by teachers and/or caretakers at all times, including breaktime.

During the focus group discussions, students proved to be acute observers of all aspects of the classroom, from its more general to its more specific characteristics, and offered many details, including concerning its layout and shape, which they immediately associated with liveability and visibility.

The students' feedback fell under the following categories:

- the request for greater attention to the body, its dimensions, and need for physical movement;
- the consequent need for furniture to be appropriated designed to contain/host the body, from smaller items such as desks and chairs to the larger scale;
- a focus on environments as a whole: colours, brightness, temperature, and noise;
- the desire to have opportunities to use the school more autonomously, and participate in decision-making processes.

Notably, group work, project work, individual or pair work, readings held in a corner of the library, were never mentioned by the students. Only a few examples were recalled of working outside the classroom setting; one student pointed out that in his class, learning was more active and participatory and reported a flexible use of space, as if this were the exception to the rule.

In the teacher groups, discussing environments, their uses, their characteristics, and indoor and outdoor spaces ultimately led to broader reflection on the teachers' own professional competence, and their role

in contemporary society. In many cases, they conveyed a sort of weariness, and in some cases, demotivation concerning their work. This seemed to be exacerbated by contact with a complex society in a continuous state of flux, and the incessant social, economic, and cultural change, which in turn requires schools to adapt quickly and rise to the new challenges.

Concerning the use of spaces, although the classroom was undoubtedly the most intensely experienced space, many teachers stressed the importance of having dedicated classrooms for individual subjects or at least laboratories for subjects such as art, music, etc. When specifically discussing alternative teaching-learning methods to conventional lecture-style classes, such as group work, the obstacle explicitly raised was large class size.

In many school buildings, laboratories, especially modern ones, were not included in the original building design and so have been installed in spaces originally designed for other purposes. Compelling needs such as a greater number of students with disabilities also create space pressures. Due to this lack of space, many teachers of laboratory subjects (technology, etc.) are forced to teach in ordinary classrooms, which necessarily means, in their opinion, cutting down on both the learning contents and the practical activities offered. A further obstacle to making flexible use of halls and corridors is the issue of teaching students to respect safety regulations, and a lack of emergency exits and easy access. The inherent constraints of the buildings, originally designed for a radically different teaching-learning style, were thus viewed as insurmountable. Similarly, green spaces, and outdoor spaces, were only seen as suitable for exceptional teaching-learning activities.

A frequently-mentioned theme was dissatisfaction with current staffroom arrangements. Another recurring theme was the use of innovative methodologies, including frequent use of laboratories, where present, but both the inspections conducted in the schools and the students' comments suggest that such approaches are rarely implemented in practice.

A final key theme was the school's ties with the local community. Some of the participating schools had been practising forms of exchange with the surrounding area for years, for example by making the school building available to host community activities, although some of the teachers did not agree with this policy, stating that they would prefer the school to be kept closed to outsiders for security reasons. In other cases, the school has concentrated primarily on cultivating relationships with the students' parents rather than the local community per se, involving parents in projects designed to enrich the educational offering (manning the library and actively contributing to the maintenance of the school building).

The most important points that emerged from the focus group discussions with the teachers may be summarized as follows:

- lesser participation, in numerical terms, of teachers compared to students;
- reflection on spaces acting as a cue to discuss teaching-learning methods and educational strategies;
- preoccupation with safety issues, interpreted as institutional constraints preventing change;
- the need for a shared educational approach, which seems to be lacking in the lower secondary school cycle given its compartmentalization into subject areas.
- almost no mention of involving students in the potential rethinking of school spaces, their layout and uses.

The questionnaire data provided a large amount of information about the accessibility, features, and conditions of the school, the functionality and comfort of the classrooms, the mode and frequency of use of the different spaces, the users' perceptions of safety and sustainability practices, the changes needed, and related proposals.

The main outcomes from the student questionnaire data were:

- concerning internal and external access, in all case studies, no critical issues were flagged;
- apart from the classroom, the most used learning environments in the schools assessed were the gym and IT room; the least used were the art and science labs;
- furniture and especially the comfort of chairs received the most negative evaluations in the domain of functionality;
- in relation to the school's appearance and maintenance, the most negatively rated features were the conditions of the toilets and the colouring of the walls;
- the security of their belongings was problematic for 55% of students;
- over 75% of students wished for changes to be made to their school and many made proposals in answer to the open-ended questionnaire item. Most of their suggestions focused on aspects elsewhere flagged as critical. There were also many suggestions for enhancing the liveability of the school building. Organisational aspects were also assessed, with a focus on increased and more targeted use of school spaces. Roughly 50% of students expressed the desire to return to school outside of class hours, thus identifying the school building as a space with a role in bringing people together, including outside of regular educational activity, and with more autonomy.

The main outcomes from the teacher questionnaire data were:

- with regard to learning environments and equipment, the greatest dissatisfaction concerned 'variability in classroom configuration', a lack of space and facilities for storing work materials belonging to the teachers and students, classroom size, insufficient student access to ICT, insufficient equipment for

students with special needs, a lack of alternative spaces and equipment for teachers (individual workspace and computer access, places for meeting parents, staffroom facilities);
- evaluation of the school's appearance and maintenance differed significantly across the five case studies;
- in relation to comfort: most teachers deemed summer conditions to be worse (too hot) than winter conditions; scope to regulate natural light and/or artificial light in the classroom was poor; most teachers reported uncomfortable levels of noise from outside the classroom
- high level of dissatisfaction with the lack of availability and related lack of security of personal spaces for keeping their materials;
- a variety of realistic proposals were made, especially concerning possible changes to the staff room, and tailoring spaces and equipment to foster learning and meet students' needs.

1.4. Findings

The initial concept of involving a group of school communities in a research project, aimed at bringing out the most common issues that significantly affect the physical educational environment turned out to be undoubtedly positive and effective, with regard to both the reflections that matured over time, from the standpoint of teachers and researchers alike, and the long-term results which brought about the first tangible signs of change. Indeed, the time spent on-site by the team of researchers (theoretical experts) and the on-site tours and focus groups conducted with school users (actual local experts) facilitated a collective increase in knowledge and skills concerning the relationships between physical environments and learning environments in school buildings. The project was an intense self-learning opportunity, based on an in-depth exchange of ideas and impressions which derived as much from different disciplinary and cultural backgrounds as from different levels and conditions of experience.

However, feedback obtained subsequently from the teachers suggested that the project left its mark on the schools that participated. Teaching staff at some of the school continued the discussion about how to change and improve the physical school environment conditions, even questioning their own way of occupying and using their allotted space.

Where the schools involved were more committed to enhancing their buildings and were operating under more favourable conditions, the reflective process initiated during the research project led to the subsequent launching of improvement schemes and actions. These were autonomously managed by the schools themselves, with the different sectors of the school communities participating in a variety of ways.

A particularly significant example is described in the next section.

2. Interventions for enhancing school spaces via the involvement of the school community: the experience of a lower secondary ('middle') school at the A.B. Sabin Comprehensive Institute (Segrate)

The A.B. Sabin Comprehensive Institute, in the town of Segrate in the province of Milan, consists of seven schools of three different levels. In the context of the above-described 'Back to school' research project on lower secondary school spaces conducted by DAStU at the Politecnico and the University of Milano-Bicocca, the comprehensive institute's two middle schools were assessed with a view to identifying the weak points and potential strengths of their existing spaces by listening to the voices of their users: the students and teachers. The principal of the Comprehensive Institute, Elisabetta Trisolini, also participated in one phase of the research. Feedback from the ongoing research activity and recent international projects stimulated the launch of a series of interventions by the comprehensive institute itself, implemented with the collaboration of a very active and enterprising parents' association.

The actions undertaken by Istituto Comprensivo Sabin to enhance the school are still ongoing and involve the entire school community formed by students, teachers, and parents. Reflection on the role of the indoor and outdoor school environment in learning and well-being –via both the functional layout of educational spaces and the multisensorial perceptions of those who use them daily – encouraged the school principal to channel human and economic resources available within the school community into educational activities designed to enhance selected school spaces and make them more distinctive. Thus, the lower secondary school students who were the beneficiaries of these activities have played a leading part in launching a process of personalization and characterization of their own school spaces.

The areas chosen to undergo partial and gradual transformation were the connecting spaces of the Milan Due lower secondary school: the entrance hall/atrium, which provides direct access to a series of key educational/functional spaces (library, staffroom, coordination office, music room) and leads to the school's two separate classroom wings; the corridors internal to each of the wings.

The intervention was implemented over two distinct, but coordinated, phases. Taking advantage of the parents' association's offer to do painting work, priority was given to the entrance hall, the heart of the school's relational activities. The choice of colours took into account the two existing and original colours of the building, which was designed and built in the 1970s. Following a series of trials, the surfaces to be painted were chosen with a view to emphasizing the architectural volumes and planes defining the space of the atrium. The painting intervention, after being designed with the input of the students, was entirely financed and carried out by the parents outside of school hours (Fig. 2).

FIG. 2. *Transformation of the atrium following the parents' intervention and educational activities with students.*

Subsequently, educational expressive art workshops inspired by street-art were implemented under the *Programma Operativo Nazionale per la scuola, competenze and ambienti per l'apprendimento* [*National Operational Program for Schools, Competences and Learning Environments*]. The aim of these activities was to aesthetically enhance the school's connecting spaces (main atrium and corridors to the classrooms). The workshops ran for 30 hours outside of the normal school timetable and involved the decoration of grey metal cabinets already present along the corridors of the school, as well as the design and application of wall graphics with a view to marking out and lending character to key spaces. The students played an active role at each stage in the process of creating a product to be enjoyed by the entire school community. They were allowed a significant degree of autonomy, both in relation to organizing the work of their teams and in seeking new and original technical solutions, albeit under the supervision of their teachers (Fig. 3).

The activities were mainly practical, but nevertheless required the integrated deployment of operational and cognitive skills. The methodology adopted throughout was 'learning by doing', or learning to do something as opposed to learning contents, as is usually the case in laboratory/workshop activities. The laboratory work gave the students the opportunity to learn different techniques to those used during their regular curricular activities, but also to play a lead role in enhancing their everyday spaces, with their work remaining as a legacy to the entire

school community, present and future. Finally, the laboratory proved to be a valid setting for learning social and civic skills related to developing a sense of care for and belonging to places.

FIG. 3. *Storage cabinet and wall decoration during the extracurricular educational activities.*

Conclusions

In this paper, we have presented the case study of the A.B. Sabin Comprehensive Institute, which drew on a study of school buildings conducted in five lower secondary schools in Milan to design and implement a series of modifications to one of its schools. The key points emerging from this research project overall include: the need, before initiating renovation work, to analyse the current use of spaces by referring to floor plans, collecting the voices of all the actors involved, focusing on identifying the needs that any changes should serve, and involving the entire school community in the transformation process. It is also crucial to define an overarching strategy, rather than focusing on small, uncoordinated interventions. Even if renovations are implemented gradually, a holistic vision of the school should never be lost: the school should always be viewed as a single organic entity, within which the various actors can jointly implement innovative ways of experiencing it and enhancing participation, with positive implications for educational processes and learning outcomes.

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