

The Urban Book Series

Eugenio Arbizzani · Eliana Cangelli ·
Carola Clemente · Fabrizio Cumo ·
Francesca Giofrè · Anna Maria Giovenale ·
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Technological Imagination in the Green and Digital Transition

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Chapter 80

Healthy and Empowering Life in Schoolyards. The Case of Dante Alighieri School in Milan



**Valentina Dessì, Maria Fianchini, Franca Zuccoli, Raffaella Colombo,
and Noemi Morrone**

Abstract This paper presents a participatory process aimed at improving outdoor education in a primary school in Milan. The rationale of this work was that the psychophysical benefits for children from outdoor living could be enhanced through outdoor education. Indeed, open-air environments are fit for supporting learning experiences, bringing out different abilities and improving well-being. Moreover, during the COVID-19 pandemic, schoolyards turned out to be a resource for overcoming physical distancing. Nevertheless, the availability of flexible physical environments and proper equipment for the educational goals is a basic condition for overcoming difficulties in the extensive use of outdoor spaces in schools. The purpose of this work was to support the school in designing new outdoor educational environments with a focused vision on the pedagogical context. Thus, the process was developed by a multidisciplinary team with the involvement of the students and the teaching staff. By the initial analytical stage, site and use conditions as well as emerging needs were enlightened. These outcomes were assumed to develop a design solution both suitable for the innovation goals and attentive to environmental aspects. The proposal was selected for funding by the Municipality and implemented. Finally, a three-year post-occupancy evaluation program started in the earliest stages of use. In conclusion, by the first monitoring activities, it emerged that outdoor educational

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experiences increased and diversified from the past, together with students' perception of opportunities and benefits achieved from more frequent and longer work in external environments, and their expectation of involvement in proposing further implementations.

Keywords Outdoor learning · Children well-being · Healthy life · Environmental education · Monitoring process

80.1 Introduction

Life in the open air is essential for the psycho-physical development of children and teenagers, for the benefits and stimuli deriving from contact with nature and the opportunity to overcome sedentary lifestyles that favor obesity and limitation of social relations (Muñoz 2009; Knight 2013). However, most of their day is spent inside the school building, with limited time in the schoolyards, mostly for recess. Outdoor education favors the development of children's multiple skills; in particular, direct experience, practical exercises and interaction with the surrounding environment promote learning and school performance, as well as well-being and social inclusion. At the same time, they reduce the risk of discomfort and disease (Dessì and Fianchini 2021; Faskunger et al. 2018).

Various national and international experiences focused on the problem and promoted initiatives to encourage outdoor activities in the school's outdoor spaces and enhance them (Broda 2011; Gamson 2010). The new configuration of outdoor school spaces should help teachers overcome operational difficulties and imagine new ways of working (Bellomo 2019; Dessì and Piazza 2020; Gilbertson et al. 2006; Boston Schoolyard Initiative 2013).

In the years of the COVID-19 pandemic, the classrooms arrangements returned to fixed and outdated solutions; thus, schoolyards were rediscovered as resources for overcoming physical distancing. Providing flexible environments and equipment suitable for teaching objectives is a fundamental condition for overcoming cultural resistance and operational difficulties in the extensive use of outdoor spaces in schools. However, it is not always enough to set up the places; it is also necessary to promote awareness-raising paths on the potential that different school contexts can offer and involve the school communities in designing the most suitable solutions.

The case study of the new outdoor learning environments in the Dante primary school in Milan is an example of place adaptation and practice innovation. It has been done through the synergy between different disciplines, the development of design visions anchored to the context but open to the future, the renewal of decision-making and operational processes.

The Dante Primary School is part of the Rinnovata Pizzigoni Comprehensive School, where the Pizzigoni Educational Method is followed. This is an early XX century experimental program aimed at reforming learning methods, for whose application a new school was purposely built, with all classrooms opening onto a large

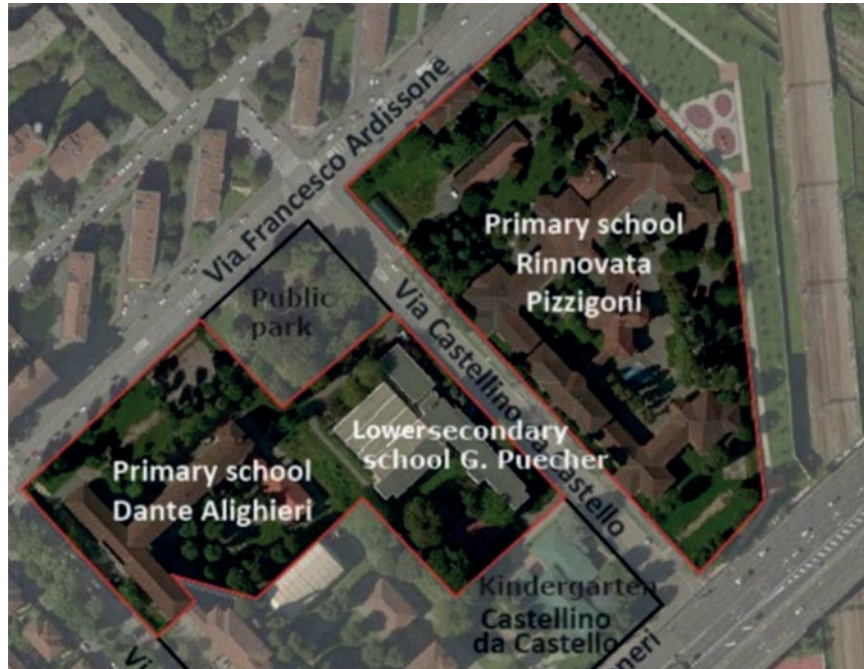


Fig. 80.1 Aerial view of the three schools of the Rinnovata Pizzigoni Comprehensive School (Dessi and Piazza 2020)

well-equipped garden, to offer children various opportunities for direct experiences through observations and practical activities (Pizzigoni 1914).

The Dante School is located on the third floor of a traditional school building, located on the opposite side of the road (Fig. 80.1). Since the method was adopted, the spaces and special equipment available in the Rinnovata Pizzigoni school have been shared with them, causing an increase in use and greater access difficulties. Hence, the need to adapt the external spaces of the Dante school to Pizzigoni's educational approach and thus rebalance the school's resources.

80.2 Process Development: Methodology and Results

The enhancement of the outdoors of the Dante school through new equipment for educational use is the result of a process started without a precise plan, but developed step by step with a multidisciplinary scientific approach and experimental participation practices.

In 2017, as part of the activities of the Ambiente Scuola team of the DASTU dept. of the Politecnico di Milano in collaboration with the Department of Human Sciences for Education “Riccardo Massa” of the University of Milano-Bicocca, a research agreement was stated with the Rinnovata Pizzigoni school. Then, the process started to analyze the site, identify users’ needs and expectations (students and teachers) and define project proposals by university students of the School of Architecture (2017–2018).

In July 2020, a competitive call by the Municipality of Milan for the “support of projects aimed at the innovation of learning environments for the first cycle of education schools in Milano area” gave the chance to resume the project and deepen it, also to meet a pedagogical plan. The project proposal got funding, so the new learning environments were built in the early 2021 and occupied in April 2021, while the monitoring process started a month later.

80.2.1 Phase 1. Analytical Activities

During the collaboration with the Rinnovata Pizzigoni Comprehensive School, some activities were carried out on the external spaces of all its schools.

Some of these didactic experiences were aimed at defining guidelines and design proposals for outdoor learning in the Dante and Puecher schools. However, the close connection between all schools often prompted to include the Rinnovata Pizzigoni school in the analysis as well. The works have been developed through a method based on the enhancement of spaces, starting from a careful process of knowledge from different points of view. According to this approach, strategic lines of intervention have been proposed, that must take this into consideration:

Functional aspect. Flows between the school building and the open space, flows among the three schools, the entrances.

The maps in Fig. 80.2 show the external space of the Rinnovata school compared to the other ones. The balance between close and open spaces in this school encourages the use during break time and outdoor learning activities and the pavilion type offers more chances of moving from indoors to outdoors than in the Dante school, that is located on the third floor and consequently with few connections. Space functions are less in this latter and, apart from the vegetable garden, the outdoor space is more suitable for play than for learning. For this reason, flows are mainly from the Dante school to the Rinnovata one, which shares special spaces (a farm, a science pavilion, a greenhouse).

In Dante, once the outdoor experience related to the observation or contact with natural elements is over, the lack of a gathering space for the class is evident.

Physical aspect. The resources, in terms of vegetation, equipment, and the relationship between permeable/waterproofed surface (analysis of materials).

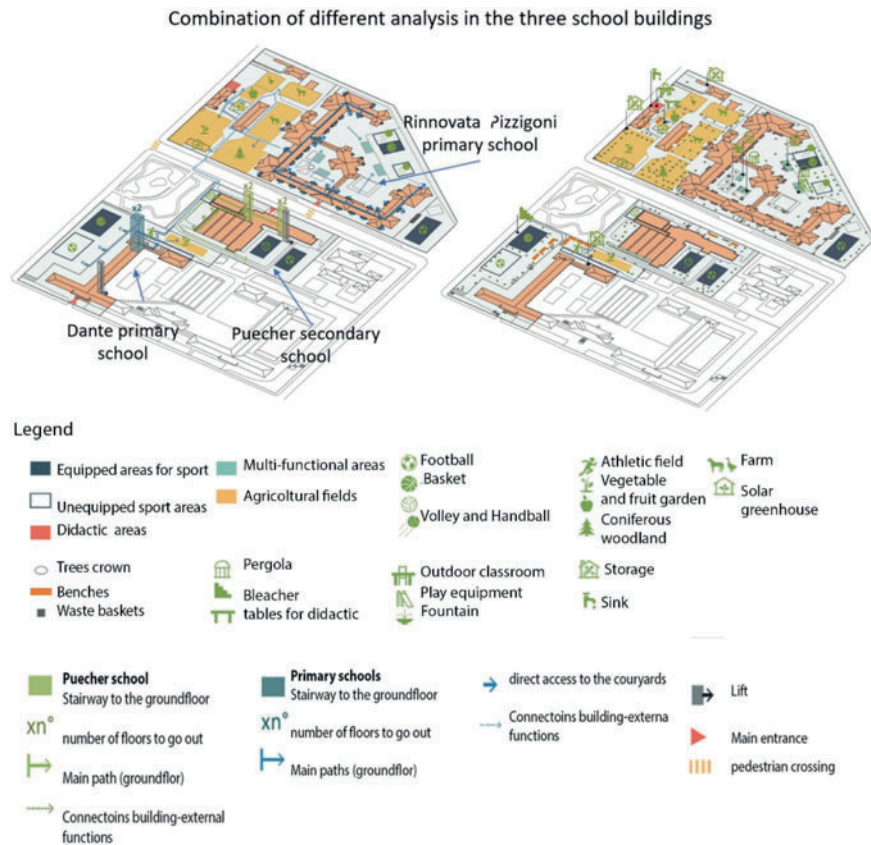


Fig. 80.2 Maps of the School Institute combining different aspects: learning/sport areas with pedestrian flows/accessibility (left) and with equipment (right) (Dessi and Piazza 2020)

In the three schools, there is a high percentage of draining lawn flooring, but also a part of waterproof, in asphalt; the existing concrete or earth sports fields present critical issues both for the type of activity (no suitable paving materials) and in the moments after rainfall or, on the contrary, when it is too dry because of the dust. At the main entrances of the schools, there are concrete tile floors, while the concrete sidewalks run all around the school buildings (Fig. 80.3).

Energy aspect and environmental comfort. Identifying areas with more potential to host/equip specific functions.

It can be done with a series of assessments of the microclimatic conditions that change according to the urban morphology, the orientation, the materials, and the vegetation. The abacus of the vegetation reports, among others, the characteristics of the size and shape, necessary to build the models for the simulation.

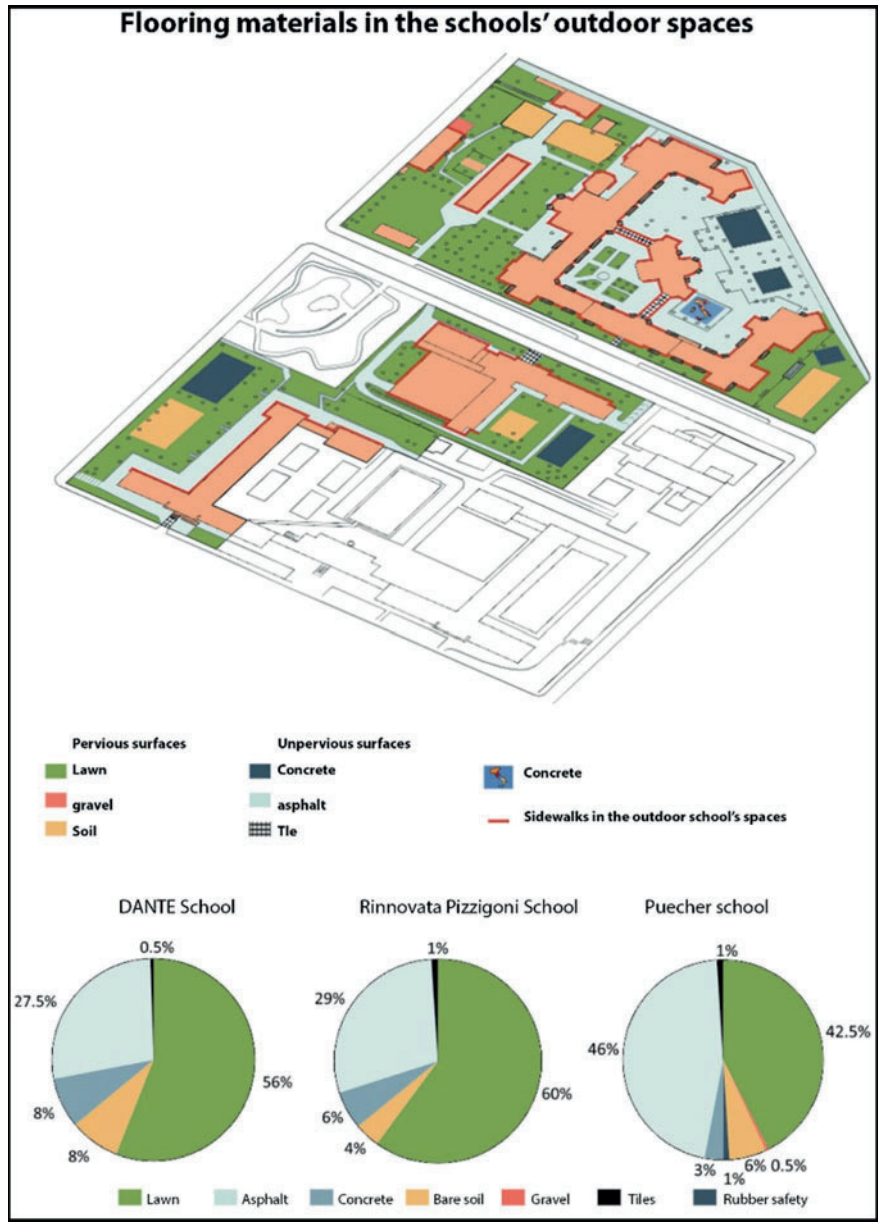


Fig. 80.3 Distribution of pervious and waterproof materials in the three schools. *Source* (Dessì and Piazza 2020)

The first campaign of microclimatic measurements was carried out in spring (March 2017) and made it possible to calibrate the OTC model simulation tool. Through simulations, the thermal comfort conditions were assessed with the UTCI comfort indicator (comfort conditions is in the range 9–26 °C and up to 32 °C with a slight discomfort) in three seasons and three hours/day (Fig. 80.4).

Thermal comfort conditions are strongly conditioned by the component of solar radiation incident on the ground, and by the coating material of the irradiated surfaces. The solar radiation control, the shading, and the materials choice (including vegetation and water) are the main strategies to improve comfort conditions and give a distinctive sign to the project. The maps (Fig. 80.4) show a spring day (1 pm), the summer solstice (2 pm), and the winter solstice (12 noon), i.e., times when the children are at school.

Considering the maps of the UTCI comfort indicator, in the part concerning the area of the Dante Alighieri school, it emerges that in the spring (1 pm), the two most used areas have different behaviors depending on the position with respect to the solar radiation. In spring, at 1 pm, the two sport fields and the area next to the vegetable garden—suitable for placing an outdoor classroom—are mostly sunny and in the

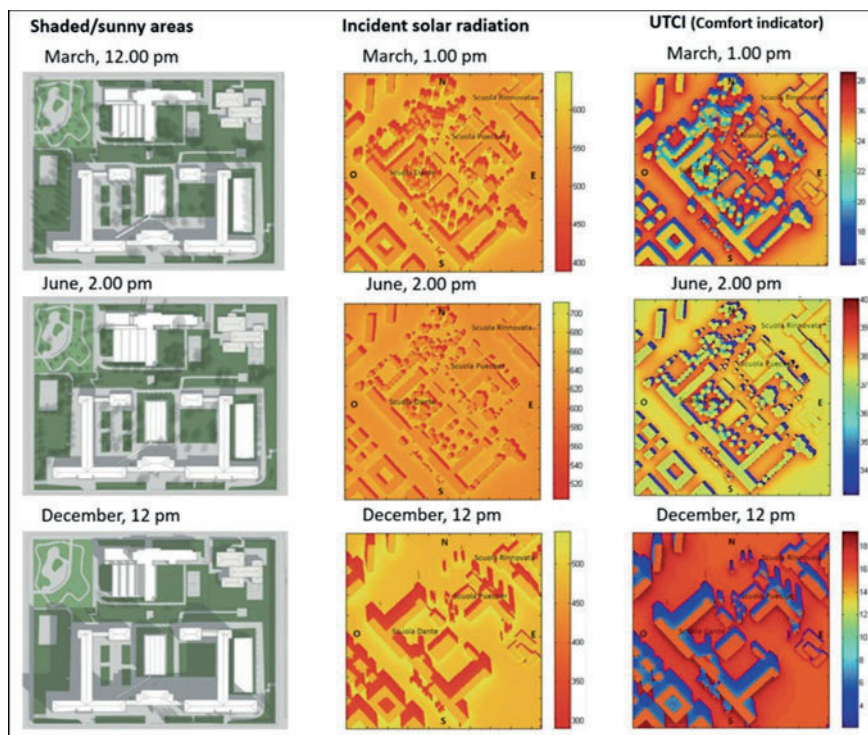


Fig. 80.4 Simulations of the shadows, of the incident radiation, and the comfort conditions in the Dante and Puecher schools (Dessi and Piazza 2020)

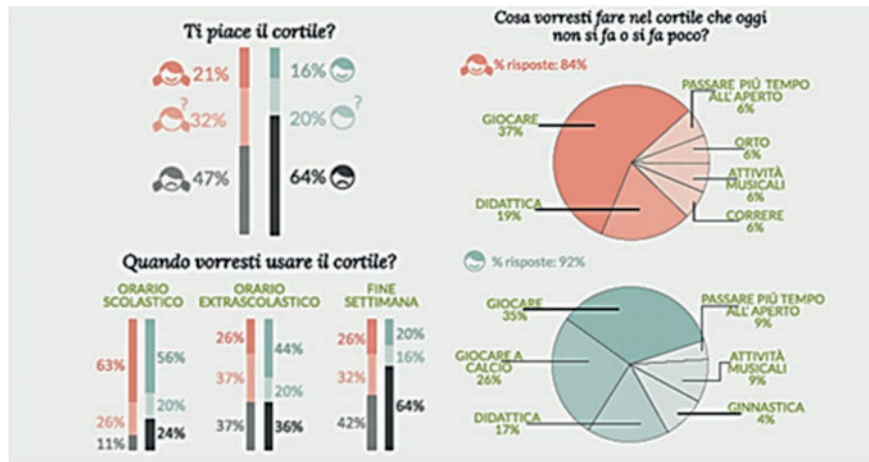


Fig. 80.5 Students' questionnaire, answers on the appreciation of the schoolyard, the time to spend outdoor, and suggestions on possible uses (play, vegetable garden, music, run, learning activities gym) (Dessi and Piazza 2020)

shade only near the trees and result in comfort conditions. In summer, the lack of shaded areas, high air temperature values, and high solar radiation intensities cause unsatisfactory thermal comfort conditions, with UTCI values above 32 °C. In winter, this area is shaded in the morning by the building and trees; the air temperatures and UTCI values are low and out of comfort conditions even when in the sun.

The users' point of view. The needs expressed by users (teachers and students of primary and secondary schools) through the questionnaires on the use of the outdoor space and suggestions for improving it (Fig. 80.5).

The proposed questionnaires differed according to the student age. Answers from pupils of the Dante school have brought out interesting aspects regarding the space and functions. In general, those of the first grades express the need to play and run and have areas equipped to do so. The children of the last classes require more vegetation, more spaces for outdoor learning, and more benches. They appreciate the basketball court, but find critical the concrete floor that makes it little usable.

The curbs between different types of pavements are dangerous especially when children run. Children have diverse ideas about the timing of use. Although the majority favor the use of space during school hours, they are less favorable to using it after school hours and on weekends.

80.2.2 Phase 2. Project and Realization

The analysis results were essential for responding quickly, effectively, and successfully to a municipal tender aimed at funding new learning spaces and plans able to

strengthen educational effectiveness and at the same time approach the pandemic limitations.

According to the pedagogical vision of this school, the open-air classroom was intended as a bridge between the primary and the lower secondary schools, to experiment the Pizzigoni's method in an innovative way and to guarantee physical distancing by outdoor activities, while involving the whole school community in its development. Thus, the place was expected to be full of significant and significative elements, to enhance the relationship between learning and experience (Pizzigoni 1921). In fact, outdoor lessons and observation of nature have been hallmarks of this school long before the pandemic emergency made these practices necessary for school life. Specifically, the new space should have had a hybrid and innovative function in which all the pupils could experience new ways of learning through peer education and cooperative learning.

Consistently with the school pedagogical objectives and with the technological-environmental approach, the new project was oriented not only to the search for flexible and adequate solutions for the foreseen use scenarios, but also to the promotion of users' well-being, the implementation and enhancement of the natural resources, the integration of new spaces in the physical and functional system, and the search for solutions with low environmental impact.

The new learning environment was built in a marginal area, on the limit of the courtyard of the Dante school near the connection path to the lower secondary school (Fig. 80.6). It consists of two spaces with different features and functions, available both for parallel activities of different classes, and the joint use of larger and heterogeneous groups, in line with the peer education program. The first space (Fig. 80.7) is about m^2 75, and it is fitted with fixed equipment (a gazebo with a steel frame that supports a packable waterproof roof, wooden flooring and fence) and furnished with tables and stools. The second one (called the "bucolic classroom") (Fig. 80.8) is smaller and more informal; it is bordered by benches made with tree trunks placed under some olive trees, to which are added a dozen seats in wooden blocks. Both are fully integrated into the larger green area of the schoolyard and in connection with the vegetable garden (Fig. 80.9).



Fig. 80.6 Site before the intervention (left) and in the project rendering (right) (elaborated by E. Cusato and A. Esposito)



Fig. 80.7 Use of the open-air classroom with (left) and without (right) tables



Fig. 80.8 Use of the Bucolic classroom during a learning activity (left) and during recess (right)

80.2.3 Phase 3. The Monitoring Process

The Municipality tender required a three-year monitoring program with annual reports.

The proposal assumed a multidisciplinary methodological approach, and a mix of references, both from the post-occupancy evaluation (Way and Bordass 2005) and from the operational and methodological activation of the Student Voice (Cook-Sather 2002, 2009; Flutter et al. 2004). Three objectives were focused: to highlight the educational changes achieved through the of the physical environment modification (Imms et al. 2016); to bring out experiences and encourage comparison between different groups of users, for an expansion of the outdoor learning plan and project; to point out initial critical issues and outline possible interventions.



Fig. 80.9 Partial view of the vegetable garden

In May 2021, the monitoring process was launched through field observations and focus groups with students. It emerged that both spaces had already been used in different ways, especially the main one, whose fittings are very flexible, both for the furniture that can be easily moved by the students (Fig. 80.10) and for the opening roof of the gazebo. The lower secondary students occupy this space in a deeper and more natural way than the primary ones, while standing, moving, sitting on the floor, etc. Conversely, the bucolic classroom is used both for more concentrative activities and during recess. The different but connected use of this pair of spaces typically occurs in peer tutoring activities between secondary and primary classes. The students' most appreciated conditions are: to stay outdoors/in nature; the possibility of looking around, breathing, and seeing schoolmates from other classes; materials other than the internal classrooms and the use of timber.

A second phase was opened in February 2022, when teachers were engaged through two surveys: by electronic questionnaires delivered to all staff and internal interviews to the staff of just the Dante school. Forty teachers from the primary schools and sixteen from the secondary one answered the questionnaires. It resulted that over 70% of them have used the new outdoor learning environments, but only 10% regularly.

As about the activities, the same done inside prevail, followed by those that need larger spaces or in relation with natural elements. It seems significant that better well-being and health conditions than in indoor environments are the main reasons



Fig. 80.10 Pupils put away the stools at the end of their activity

to work outdoors, followed by the greater interest and participation on the part of students, and by the available space and equipment. Conversely, the most highlighted criticality is the disturbance from other classes in the courtyard, followed by feeling cold in autumn.

About half of the teacher sample changed the setting according to the different activities, while a minimal percentage used the coverage opening system to regulate the shading. Finally, almost all the teachers consider these environments as an opportunity to be further enhanced. From the focus with the Dante school teachers more intensive and diversified use of both outdoor environments has emerged, due to the opportunity to experience the school environment differently, in contact with nature, with ample freedom of movement. Again, the most underlined criticalities are the noise from the other classes, the cleaning and furniture keeping, and thermal comfort in the later spring.

80.3 Conclusions

The opportunity of realizing the new outdoor learning environments was offered by the pandemic emergency, which prompted the municipality to invest in innovative fit-out projects to improve school environments and limit risks of contagion. However, a school community already oriented toward an experimental education and open to academic research, together with a base of knowledge previously developed, were the actual conditions to meet this objective in such a short time as the result of careful evaluations from the different points of view.

From the monitoring activities, it emerged that outdoor educational experiences increased and diversified from the past, together with students' perception of opportunities and benefits achieved from more frequent and longer work in external environments, and their expectation of involvement in proposing further implementations.

The process of enhancing the outdoor environments of the Dante school is still in progress, both in terms of the space layout and the operational conditions. Future goals will include favoring a more extended use, to be pursued by both dealing with emerged criticalities and enhancing the evidence of appreciation brought by students and teachers that experienced them with great awareness of the benefits got in terms of greater freedom and psycho-physical well-being.

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