The Urban Book Series

Eugenio Arbizzani · Eliana Cangelli · Carola Clemente · Fabrizio Cumo · Francesca Giofrè · Anna Maria Giovenale · Massimo Palme · Spartaco Paris *Editors*

Technological Imagination in the Green and Digital Transition

OPEN ACCESS

Springer

The Urban Book Series

Igor Vojnovic, Department of Geography, Michigan State University, East Lansing, MI, USA

Claudia Yamu, Department of Built Environment, Oslo Metropolitan University, Oslo, Norway

Qunshan Zhao, School of Social and Political Sciences, University of Glasgow, Glasgow, UK

The Urban Book Series is a resource for urban studies and geography research worldwide. It provides a unique and innovative resource for the latest developments in the field, nurturing a comprehensive and encompassing publication venue for urban studies, urban geography, planning and regional development.

The series publishes peer-reviewed volumes related to urbanization, sustainability, urban environments, sustainable urbanism, governance, globalization, urban and sustainable development, spatial and area studies, urban management, transport systems, urban infrastructure, urban dynamics, green cities and urban landscapes. It also invites research which documents urbanization processes and urban dynamics on a national, regional and local level, welcoming case studies, as well as comparative and applied research.

The series will appeal to urbanists, geographers, planners, engineers, architects, policy makers, and to all of those interested in a wide-ranging overview of contemporary urban studies and innovations in the field. It accepts monographs, edited volumes and textbooks.

Indexed by Scopus.

Eugenio Arbizzani · Eliana Cangelli ·
Carola Clemente · Fabrizio Cumo ·
Francesca Giofrè · Anna Maria Giovenale ·
Massimo Palme · Spartaco Paris
Editors

Technological Imagination in the Green and Digital Transition

Springer

Editors
Eugenio Arbizzani
Dipartimento di Architettura e Progetto
Sapienza University of Rome
Rome, Italy

Carola Clemente
Dipartimento di Architettura e Progetto
Sapienza University of Rome
Rome, Italy

Francesca Giofrè
Dipartimento di Architettura e Progetto
Sapienza University of Rome
Rome, Italy

Massimo Palme
Departamento de Arquitectura
Universidad Técnica Federico Santa Maria
Antofagasta, Chile

Eliana Cangelli
Dipartimento di Architettura e Progetto
Sapienza University of Rome
Rome, Italy

Fabrizio Cumo
Dipartimento Pianificazione, Design,
Tecnologia dell'Architettura
Sapienza University of Rome
Rome, Italy

Anna Maria Giovenale
Dipartimento di Architettura e Progetto
Sapienza University of Rome
Rome, Italy

Spartaco Paris
Dipartimento di Ingegneria Strutturale e
Geotecnica
Sapienza University of Rome
Rome, Italy

ISSN 2365-757X ISSN 2365-7588 (electronic)
The Urban Book Series
ISBN 978-3-031-29514-0 ISBN 978-3-031-29515-7 (eBook)
https://doi.org/10.1007/978-3-031-29515-7

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Committee

Sapienza University of Rome
DIAP—Department of Architecture and Design
LAB.ITECH—Laboratory of Architecture, Building Innovation and Technology, Environment and Climate Changes, Health
Fondazione Roma Sapienza

International Scientific Committee

David Allison, Clemson University, South Carolina, USA
Ruzica Bozovic-Stamenovic, National University of Singapore, China
Federico Butera, Polytechnic University of Milan, Italy
Orazio Carpenzano, Sapienza University of Rome, Italy
Ljiljana Dukanović, University of Belgrade, Serbia
Peter Droege, University of Liechtenstein, Liechtenstein
Boyan Georgiev, UAGEC-Department of Tecnology, Bulgaria
Anna Maria Giovenale, Sapienza University of Rome, Italy
Mario Losasso, University of Naples Federico II, Italy
Robinson Manguro, Kirinyaga University, Kenya
Saverio Mecca, University of Florence, Italy
Mario Morcellini, Sapienza University of Rome, Italy
Iva Muraj, Faculty of Architecture, University of Zagreb, Croatia
Silvia Naldini, Delft University of Technology, Netherland
Roberto Pagani, Polytechnic University of Turin, Italy
Massimo Palme, Federico Santa Maria Technical University, Valparaiso, Chile
Mario Raul Ramirez de Leon, University of San Carlos Guatemala, USAC, Guatemala
Fabrizio Schiaffonati, Polytechnic University of Milan, Italy
Markus Schwai, Norwegian University of Science and Technology, Norway
Begoña Serrano Lanzarote, Polytechnic University of Valencia, Spain

Wei Xing Shi, Tongji University, China
Belinda Tato, Harvard Graduate School of Design, USA

Scientific Coordination Committee

Eugenio Arbizzani, Sapienza University of Rome
Rosalba Belibani, Sapienza University of Rome
Eliana Cangelli, Sapienza University of Rome
Carola Clemente, Sapienza University of Rome
Fabrizio Cumo, Sapienza University of Rome
Alfonso Giancotti, Sapienza University of Rome
Francesca Giofré, Sapienza University of Rome
Spartaco Paris, Sapienza University of Rome

Organizing Committee

Anna Mangiatordi, Sapienza University of Rome
Elisa Pennacchia, Sapienza University of Rome
Virginia Adele Tiburcio, Sapienza University of Rome

Editorial coordination

Eugenio Arbizzani, Sapienza University of Rome
Anna Mangiatordi, Sapienza University of Rome
Mariangela Zagaria, Sapienza University of Rome

Contents

Chapter 89
Wood Snoezelen. Multisensory Wooden Environments for the Care and Rehabilitation of People with Severe and Very Severe Cognitive Disabilities

Agata Tonetti and Massimo Rossetti

Abstract The paper wants to present the progress of a research project focused on the study and design of a Snoezelen room made with wooden components. "Snoezelen" refers to closed environments capable of stimulating the senses in people with severe intellectual disabilities and non-self-sufficient people. Within these environments, multisensory stimulation takes place through various equipment and instruments such as optical fibers, water-powered light columns, systems for the reproduction of sounds or vibrations, and materials with different surface treatments. Many studies and researches have demonstrated the effectiveness of multisensory stimulation generated within a Snoezelen environment on children with autism spectrum disorder, and how this has led to beneficial effects such as the reduction in aggressive and/or self-injurious behaviors. The increase and diffusion of these environments, especially in schools, could lead to both an increase in the number of students who can undertake a rehabilitation process, and an increase in the sensory-perceptive aids available to the school. The rehabilitation and multisensory aspect of the Snoezelen methodology is, in this context, emphasized by the use of wood, thanks to its beneficial properties in terms of healthiness, comfort, and influences on psychological aspects. The goal of the research is the design of a wooden Snoezelen environment, the drafting of guidelines for its implementation, and an evaluation schedule for its use. In particular, the environment will be made by applying construction techniques in wood as a material for cladding, finishing, and components of the interior environment.

Keywords Wooden constructions · Intellectual disabilities · Snoezelen · Healthy indoor environments · Advanced prefabrication

A. Tonetti (✉) · M. Rossetti
IUAV University of Venice, Venice, Italy
e-mail: atonetti@iuav.it

M. Rossetti
e-mail: rossetti@iuav.it

E. Arbizzani et al. (eds.), *Technological Imagination in the Green and Digital Transition*,
The Urban Book Series, https://doi.org/10.1007/978-3-031-29515-7_89

89.1 Introduction

The Italian demographic scenario shows a constant decrease of new births against progressive aging of the population (Fig. 89.1), with important consequences on the social, health, economic, and productive structure of the country. Moreover, thanks to an increased diagnostic capacity, statistics show that these two age groups represent the segment of the population most exposed to disability. In 2019, there were about 3,150,000 disabled people, 5.2% of the population, of whom almost 1.5 million are over 75 (Blangiardo 2021). The number of disabled children is not insignificant, with a constant percentage increase over the years of 6% (Fig. 89.2). In the 2019/2020 school year, there were 283,856 disabled scholars, 3.5% of those enrolled (Istat 2020). In this scenario, a response is needed in the architectural sphere through the design of facilities that can meet the needs of the future population by designing residential, care, assistance, and rehabilitation facilities for disabled people. These environments include Snoezelen rooms or multisensory rooms that provide non-pharmacological therapy for people with severe and/or very severe multi-disabilities. Recent research has observed how multisensory stimulation generated within a Snoezelen environment on people with severe and/or very severe mental retardant has led to beneficial effects such as, for example, a reduction in aggressive and/or self-harming behavior (Lancioni et al. 2004).

An increase in the number of such environments would therefore lead to an increase in the number of people who could undertake rehabilitation. The design of care and rehabilitation environments requires an appropriate and careful choice of technologies and building products; in this context, recent studies (Demattè et al. 2018) have shown that wood environments can benefit people, thanks to the specific characteristics of the raw material; similarly, other studies have highlighted the potential of wood as an ideal material for the design of environments for the accommodation of dependent people (Camerin et al. 2020); furthermore, the effectiveness of wood in environments designed for people with autism spectrum disorder has been demonstrated (Venturini 2010).

The use of wood as a building material is therefore shown to be optimal for the creation of Snoezelen environments.

89.2 Organization and Research Methodology

The main objective of the research project “wood Snoezelen. Multisensory wooden environments for the care and rehabilitation of people with severe and very severe cognitive disabilities”, which was developed by Iuav University of Venice, is to contribute to research aimed at assisting people with severe and/or very severe intellectual disabilities by designing a Snoezelen environment. The project involves other Veneto territorial realities, namely (1) “La Nostra Famiglia”, based in Conegliano Veneto and Treviso, (2) I.S.R.A.A., based in Treviso, (3) “Progetto Legno Veneto”

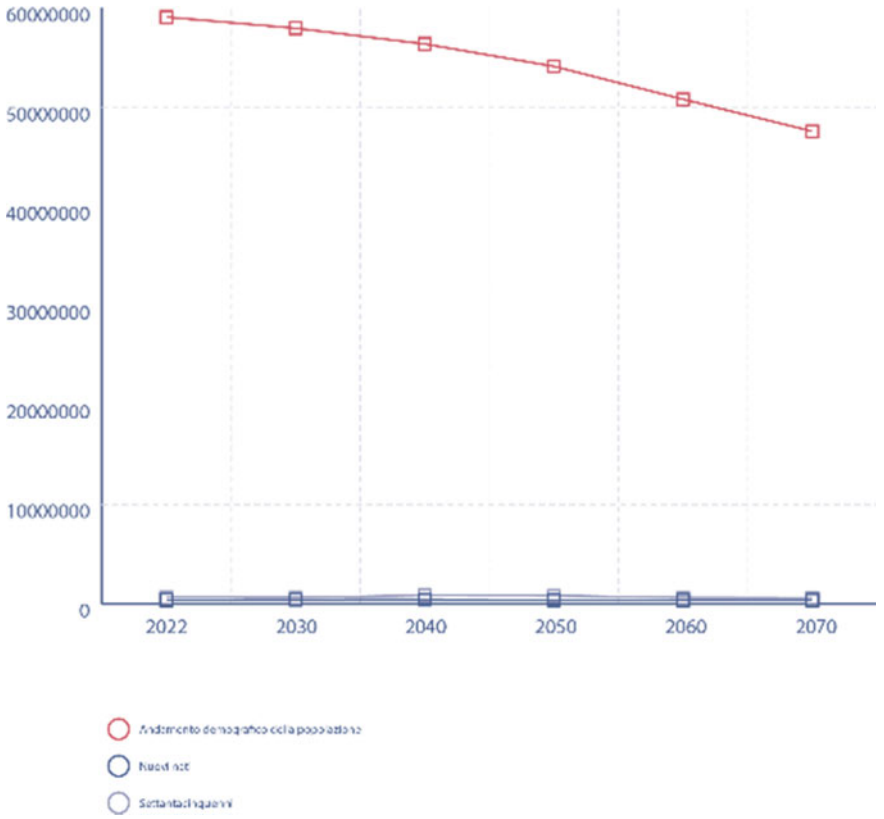

Fig. 89.1 Population projection: years 2022–2070. *Source* Istat (2022)—Graphic elaboration by the authors

Consortium, the Regional Innovative Network Foresta Oro Veneto and the company Bozza S.r.l. The research project, which is under development, is developed through 6 phases (1) reconstruction of the state of the art related to intellectual disabilities, wooden environments, and Snoezelen rooms; (2) identification of the characteristics of a Snoezelen room, with particular reference to the use of wood as the prevalent material for its construction in an existing space; (3) identification of an unused room of a Veneto School Institute for the construction of the Snoezelen environment; (4) design of a prefabricated Snoezelen room with wooden structure; (5) creation of guidelines for the design and use of the Snoezelen room and an evaluation system of the Snoezelen approach; (6) construction of the Snoezelen room inside the previously identified school.

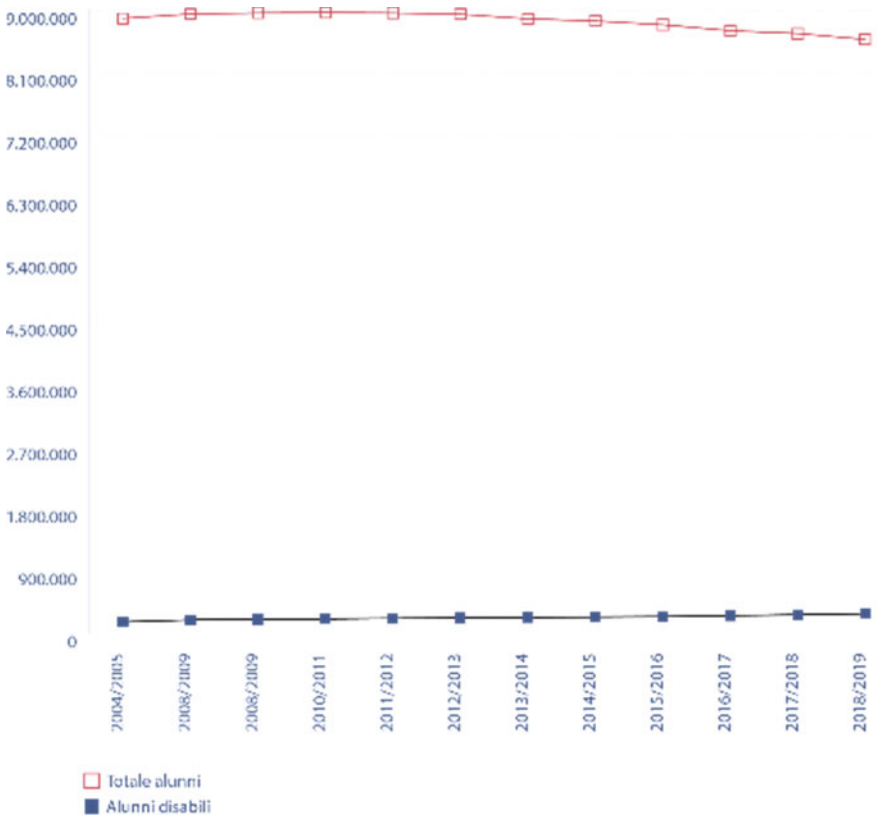

Fig. 89.2 Scholars with disabilities, the school year 2018/2019. *Source* Istat (2020)—Graphic elaboration by the authors

89.3 Snoezelen

The Snoezelen approach is a non-pharmacological therapy aimed mainly at severely and/or very severely disabled people, during which selective sensory stimulation is carried out, under the guidance of an expert operator, in one or more sensory domains, according to the needs of the individual. This approach is carried out in special adaptive spaces, called Snoezelen rooms, equipped with sensory instruments in which the amount, arrangement, and intensity of stimulation are controlled and modulated by the operator. The Snoezelen approach aims to find a balance between relaxation and activity within the multisensory environment. The combination of these two contrasting activities constitutes the term Snoezelen, which derives from the contraction of the Dutch verbs *snufelen* (to sniff) and *doezelen* (to doze), meaning,

respectively, to explore and to rest. Numerous studies have demonstrated the effectiveness of the Snoezelen approach, particularly concerning dementia (Strøm et. al. 2016), severe and complex disabilities (Glenn et. al. 1996), autism spectrum disorder (Germeau 1998), and special educational needs (Carter et. al. 2012). The Snoezelen approach originated in the Netherlands in the 1970s as a result of experimentation carried out by Ad Verheul and other Dutch occupational therapists at the De Hartenberg Center, the Haarendael Board, and the Piusoord Board. The first permanent Snoezelen Room was built in 1982 at the De Hartenberg Center; it was a significant event as it was the beginning of the dissemination and testing of the Snoezelen approach. Snoezelen rooms usually consist of two separate rooms: (1) the *white room*, the relaxation room equipped with bubble tubes, waterbed, soft seating, fiber optics, and projectors and (2) the *dark room*, within which the senses of touch, hearing, and proprioception are developed through different equipment such as tactile surfaces, sound and light projectors, and balance tools (Fig. 89.3).

The Snoezelen method has spread mainly in Holland, Denmark, Canada, the United States, and Australia, where there are large Snoezelen room facilities made up of several rooms, such as, for example, the Lacey A. Collier Snoezelen Complex on the campus of the Escambia Westgate School in Pensacola, Florida. In Italy, this approach is still little known; in Italy, currently, there are only approximately 102 Snoezelen rooms in different types of structures such as RSAs, Day Care Centers, and Schools. Snoezelen rooms are unevenly distributed throughout Italy: mainly in Tuscany (18), Lombardy (17), and Veneto (15) followed by Piedmont (9) and Sicily (8), while the other Italian regions have less than 5, except for Basilicata which does not have any (Fig. 89.4.). The majority of Italian Snoezelen consists of a single room in which there is the coexistence of relaxation and exploration equipment.

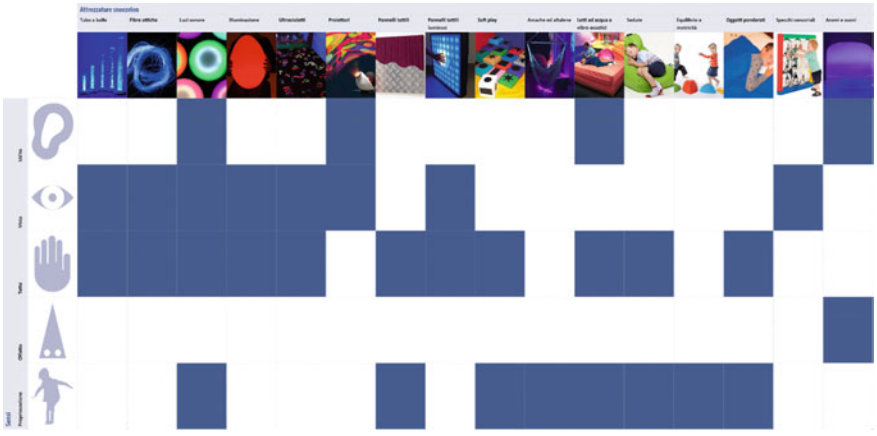

Fig. 89.3 Relationship between Snoezelen equipment and use of the senses—Graphic elaboration by the authors

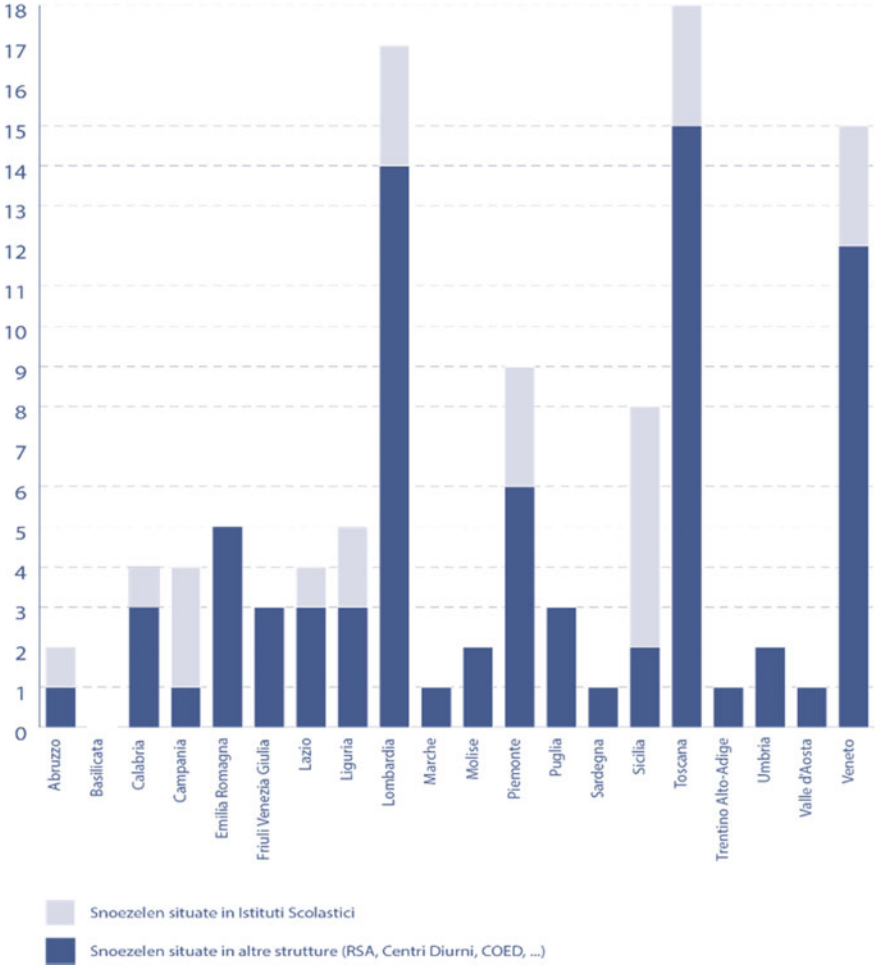

Fig. 89.4 Snoezelen in Italy, last update 02/02/22—Graphic elaboration by the authors

89.3.1 Snoezelen in the Schools

In Italy, the number of Snoezelen in schools is small; there are only 26: two in nursery schools, 23 in primary schools, and one in secondary schools. If compare the number of Italian schools—22,863 nursery schools, 16,840 primary schools, and 8048 secondary schools—with the number of Snoezelen, it is clear that the difference is quite remarkable (Fig. 89.5). The first Snoezelen located in an Italian school is at the Istituto Comprensivo "De Amicis" Primary School in Eraclea, Veneto, which opened in 2012 (Fig. 89.6). Specifically, there are only three Snoezelen rooms in schools in Veneto: in addition to Eraclea, the other two are the Collodi Primary School in Ceggia, which opened in 2014, and the XI Aprile 1848 Preschool in Castelnuovo del Garda,

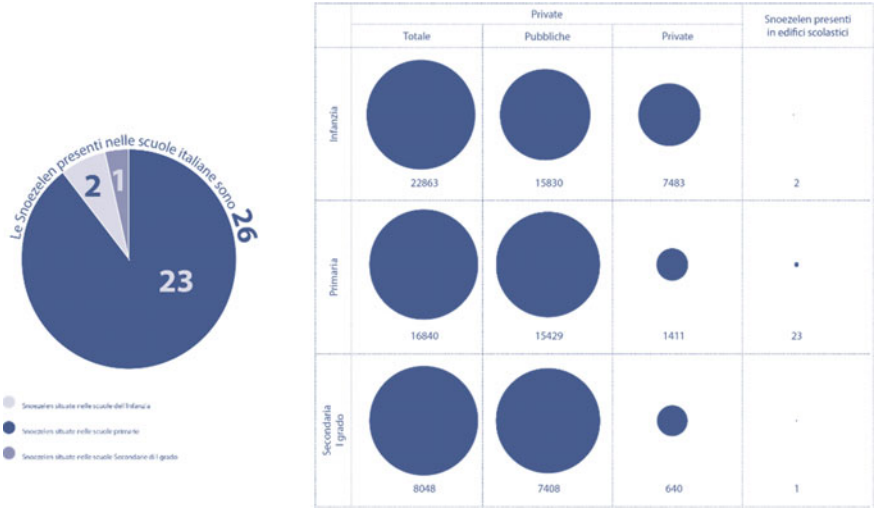

Fig. 89.5 Snoezelen about schools by grade and level, last update 02/02/22—Graphic elaboration by the authors

which opened in 2021 (Fig. 89.7). It is thought that the low number of Snoezelen in Italian educational institutions is caused by almost no knowledge of this approach, as evidenced by various newspaper headings and municipal administration websites that bear the words "the first Snoezelen room in a school" (GenoaMunicipality 2018) probably ignoring the existence of other rooms. Almost all Snoezelen rooms in Italian schools have been located in classrooms not used by the school, placing the usual catalog equipment inside them without thinking about possible solutions of architectural integration between the internal envelope and the equipment. Most of these are in a single, small room, where there is a coexistence of the relaxation area and the activity area.

The Snoezelen rooms analyzed have in common what can be considered the basic equipment: bubble tubes, fiber optics, projectors, soft seating, ball pool, and soft play. One example is the case of the Istituto Comprensivo Alessio Narbone in Caltagirone, which has become a spokesman for the Snoezelen approach in schools throughout Italy by organizing the National Network of Snoezelen Schools.

The institute has a Snoezelen space of 150 square meters consisting of a sensory corridor, a white room, and a workshop for motor and manipulative activities. The Snoezelen space, inaugurated in 2016, is open to the territory and used by 10 other schools for a total of almost 80 students divided into 17 preschool students, 30 primary students, 18 secondary students, and 12 secondary students (Sestina 2020).

Fig. 89.6 Overview of Snoezelen in Italian schools and the year of the opening, last update 02/02/22—Graphic elaboration by the authors

Fig. 89.7 Snoezelen in Veneto, last update 02/02/22—Graphic elaboration by the authors

89.4 Project

The therapeutic quality of Snoezelen environments is significant and, if installed in schools, can become part of the long process of school inclusion as well as compensating for the scarce presence of systems for sensory disabilities in schools.

This research aims to design Snoezelen environments in educational institutions through the architectural integration between the internal envelope and Snoezelen equipment. The integration will be accomplished through the design of prefabricated wooden modules. Recent projects have shown how wood lends to the making

Fig. 89.8 Creative Crews, Classroom Makeover for The Blind, Pattaya, Thailand, 2018, credits: Mana and Friends, Ekkachan Eiamananwattana, Jirakit Panomphongphaisarn

of therapeutic-sensorial environments. There are two exemplary cases of wooden multisensory spaces in school buildings: (1) Noverca house by the architecture studio Atelier JQTS, which built a prefabricated wooden pavilion housing a multisensory space for disabled pupils at the Maria Veleda school; (2) classroom makeover for the blind by the architecture studio creative crews (Fig. 89.8), which designed a wooden multisensory room in line with the Pre-Braille Curricula for kindergarten children.

Wood can also be used to design sensory systems, of which "Dear Disaster" and "Sensorium" exhibition are two emblematic cases. "Dear Disaster" is a cabinet designed by Jenny Ekdhal to help victims of natural disasters recover from their traumatic experiences, while "Sensorium" is a temporary installation designed by Les M where the parametric wooden floor is able to move according to the pressures caused by the human body.

89.4.1 Advance Modular Wooden Components

The considered examples were fundamental for the design—which is still in progress—of the advanced modular wooden components, such as false wall, false ceilings, containing elements, and raised floor systems. The modules are designed to create a neutral room that can be customized as needed by the operator to adapt the

room to the patient's therapeutic needs. Specifically, the false walls feature a micro-perforated, acoustic, and backlit acoustic panel in wood (Fig. 89.9). The backlighting and acoustics enable the operator to choose the combination of sounds and colors useful for individual therapy. In addition, the holes allow the installation of additional modules consisting of different surface finishes—smooth, rough, movable shingle, and wood skin—which the operator can choose according to tactile stimulation. The raised floor (Fig. 89.10), in addition to offering optimal acoustic performance and the passage of equipment, allows for the integration of Snoezelen equipment such as bubble tubes.

The finishing layer also consists of different modules with multiple textures—bright and rough surfaces—and various sections that offer tactile, visual, and proprioceptive stimulation. Containing elements (Fig. 89.11) can also be placed on the floor to act as containers for the vibroacoustic waterbed and ball pool. The acoustic false ceiling (Fig. 89.12) allows for the integration of the lighting system, spotlights, hammocks, and ultraviolet. The components, dry-assembled, can generate different spatial configurations resulting in three predefined Snoezelen rooms having three different sizes: S (25 sqm), M (50 sqm), and L (100 sqm). The setup of these

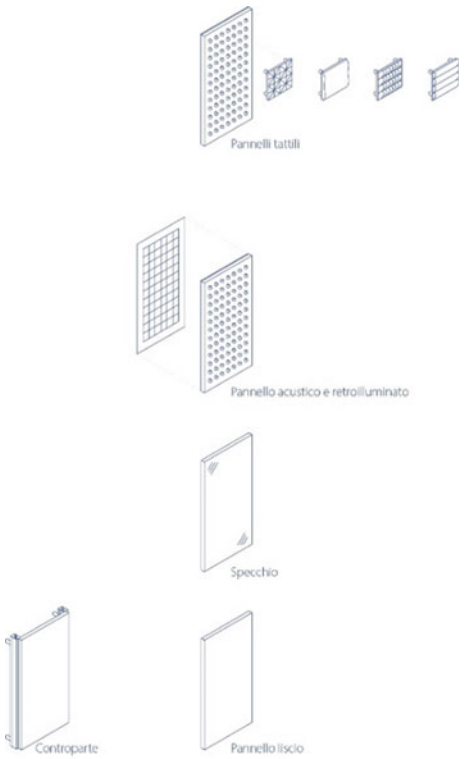

Fig. 89.9 False wall modules—Graphic elaboration by the authors

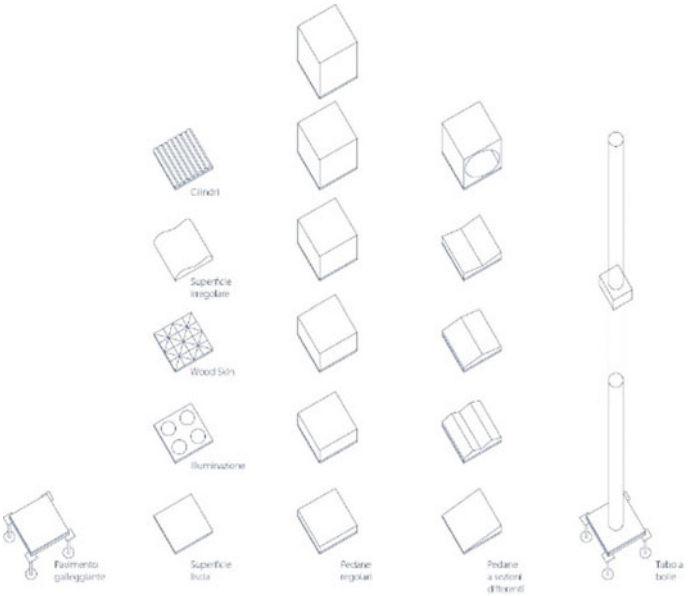

Fig. 89.10 Raised floor systems modules—Graphic elaboration by the authors

Fig. 89.11 Containing elements modules—Graphic elaboration by the authors

rooms and the modular components, illustrated in the guidelines, will be used by future stakeholders and designers as a basic tool for the making of the desired Snoezelen room.

89.5 Conclusions

The research project aims to contribute to studies on environments for the rehabilitation of people with cognitive disabilities, in particular concerning the potential provided by the advanced prefabrication of wooden construction elements, components, and furniture. This objective will be achieved through the design and implementation of a Snoezelen room with wooden components in a school in Veneto,

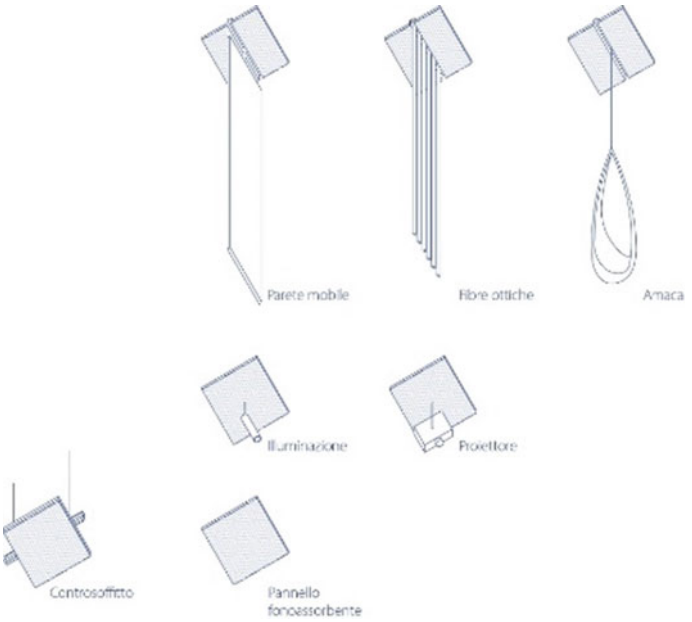

Fig. 89.12 False ceiling modules—Graphic elaboration by the authors

which will be able to open to the surrounding area. Moreover, guidelines for the design of Snoezelen rooms will be drawn up, so that other institutes can also make use of this type of inclusive structure and an assessment system to check the patient's therapeutic progress.

References

Blangiardo GC (2021) Audizione dell'Istat presso il Comitato Tecnico Scientifico dell'Osservatorio Nazionale sulla condizione delle persone con disabilità. https://www.osservatoriodisabilita.gov.it/it/notizie/audizione-dell-istat-presso-il-comitato-tecnico-scientifico-dell-osservatorio/

Camerin F, Incelli F, Rossetti M (2020) Confrontarsi con il tempo. Unità abitative temporanee in legno per anziani non autosufficienti. Techne 20:282–291. ISSN online: 2239-0243

Carter M, Stephenson J (2012) The use of multi-sensory environments in schools servicing children with severe disabilities. J Dev Phys Disabil 24(1):95–109. https://doi.org/10.1007/s10882-011-9257-x

Demattè ML, Zucco G, Roncato S, Gatto P, Paulon E, Cavalli R, Zanetti M (2018) New insights into the psychological dimension of wood–human interaction. Eur J Wood Wood Prod. 76:1093–1100.https://doi.org/10.1007/s00107-018-1315-y,CorpusID:21662687

GenoaMunicipality (2018) A Genova la prima snoezelen room in una scuola, perché nessuno resti indietro, Comune di Genova. http://www.comune.genova.it/content/genova-la-prima-snoezelen-room-una-scuola-39perchegrave-nessuno-resti-indietro39. Accessed 10 Dec 2022

Germeau I (1998) *Une approche particulie're dans la relation personne autiste/e´ducateur en milieu institutionnel: Le Snoezelen.* Faculte´ de Psychologie et des Sciences de L'E´ ducation, Universite de Lie'ge

Glenn S, Cunningham C, Shorrock S (1996) Social interaction in multi-sensory environments. Routledge

Istat (2022) Previsioni della popolazione—Anni 2020–2070: Indicatori demografici. http://dati.istat.it/Index.aspx?QueryId=19668. Accessed 15 Mar 2022

Istat (2020) L'inclusione scolastica degli alunni con disabilità. https://www.istat.it/it/files/2020/12/Report-alunni-con-disabilit%C3%A0.pdf

Lancioni et al (2004) Effects of Snoezelen room, activities of daily living skills training, and vocational skills training on aggression and self-injury by adults with mental retardation and mental illness. Res Dev Disabil 25(3):285–293. https://doi.org/10.1016/j.ridd.2003.08.003

Sestina, G., (2020) Progetto Stimolazione multisensoriale in ambiente Snoezelen, ISTITUTO COMPRENSIVO STATALE "ALESSIO NARBONE" A.S. 2019/2020 AMBITO. https://www.alessionarbone.edu.it/index.php/area-snoezelen/24-monitoraggio-di-esiti-e-processi.

Strøm SB, Ytrehus S, Grov EK (2016) Sensory stimulation for persons with dementia: a review of the literature. J Clin Nurs 25(13–14):1805–1834. https://doi.org/10.1111/jocn.13169

Venturini V (2010) Residenze temporanee presso il Castello di Granarola (PU). Spazi interni ed esterni a misura di bambino speciale. In: Francesca Giofré (a cura di), *Autismo protezione sociale e architettura* (133–150). Aliena Editrice