

Designing for pupils with the autism spectrum disorder, case study of the Northern School for Autism, Melbourne, Australia

Klaudyna Mentel^{1*} and *Zbyszko Bujniewicz*¹

¹Silesian University of Technology, ul. Akademicka 2A, 44-100 Gliwice, Poland

Abstract. The manuscript presents the case study of The Northern School for Autism in Melbourne (2013), designed by Hede Architects. The building achieved several rewards including first place in the Council of Educational Facility Planners (CEFPI) Regional Award and the CEFPI Educational Facilities Award. It appeared on the list of finalists of the World Architecture News Awards 2013. Specialist Magda Mostafa classified it as one of the most dedicated facilities for people with autism spectrum according to Autism design index ASPECTSS™ rating. Practical autism therapists have been interviewed to carry out the expert survey about the subject building. Responses have been based on photographic material and diagrams attached to the survey. Respondents have been based on so-called sensorisms, i.e. manifestations of discomfort in the receiving and processing of sensory stimuli. This symptom can be recognized in pupils' behaviour, revealed in unfavourable conditions for people with ASD. The examined group has been also based on their own therapeutic experience during the usage of educational facilities. The survey determined the probable impact of the applied design solutions on the perception of a child on the spectrum. The special method of designing for people with autism is to follow sensory features of different spaces as the main superior design tool. As a consequence, sensor map determines building functional zones. The manuscript describes other specific architectural solutions used in the project to decrease the deleterious impact of external stimuli on the sensory integration of students. Presented survey method reveals, that designing architectural project with sensorial guidelines may have a positive effect on the concentration of attention of students on the autism spectrum. By providing appropriate educational and therapeutic conditions, students might have a chance to function better in the community and be revalidated.

1 Introduction

Increasing interest in the field of designing for people with autism is related to the rising number of diagnosed cases of students with autism spectrum disorder. According to CDC's (Centres for Disease Control and Prevention) research conducted among 8-year-old children in 2012, 1.45% had a diagnosis [1]. In 2020 this rate increased to 2.8% of children [2]. In Australia, in 2015, 2.8% of children aged 5 to 9 were diagnosed with autism spectrum

* Corresponding author: klaudyna.mentel@polsl.pl

disorder, in 2018, 3.1% of children received the same diagnosis. Two in five (40.8%) of the children attended a special class in a mainstream or special school. [3]. Due to the increasing demand for educational facilities in Australia – The Northern School for Autism was raised in Melbourne, 2012 according to the specialized project from Hede Architect Office.

The building design has been awarded many times. It achieved first place in the CEFPI Regional Award and the CEFPI Educational Facilities Award [4] and was also shortlisted for the World Architecture News Awards 2013, 16th [5]. In addition, Magda Mostafa classified it as one of the best-adapted facilities for people with autism spectrum according to ASPECTSS™ studies. The mentioned survey was based on the opinion of both designers, who rated the building at 45.25/60 points, and facility users, whose rating was higher and amounted to 52/60. In the survey, participants expressed their opinion on a scale of 1-5, the questions concerned seven design criteria: acoustics, space sequencing, quiet places, divisions in space, communication, sensory zones, and security [5].

Research carried out by Magda Mostafa proves that implemented design solutions improve the effectiveness of therapy for people with autism. [7]. Cooperating with therapists, the architect proved that the architectural features of space could extend the attention span and concentration [6]. Achieving pupils' particular sensitivity to stimuli is an enormous design challenge. The base point of the design process is the study of the impact of the sensory properties of architectural space on the perception of people with ASD.

2 Research method

The case study [8] was carried out for the expert survey [9] based on the analysis of questionnaires conducted among 10 therapists, qualified in the field of revalidation of people with autism spectrum disorders. The evaluation by the respondents was based on the photographic material and diagrams attached to the questionnaires. In the first stage of the research, the respondents identified the possible impact of the design principles used by Hede Architects on a student from the spectrum as positive or negative, and at the second stage, they justified their choice.

Therapists assessed the building in the field of sensorisms – visible in disturbances of the reception and processing of sensory stimuli by children with autism spectrum disorders [10], visible in conditions unfavourable for people with ASD [11]. Respondents were basing on their own experience in using educational facilities. The result of the survey is presented in Table 1. in following paragraph.

The executive method of the research is supported by theoretical guidelines of Carl Delacado, who studied the unusual way of seeing the world by people with autism. According to mentioned guidelines, Carl Delacado distinguished three groups of sensory disorders: hypersensitivity, hyposensitivity and white noise. Hypersensitivity occurs while pupils' nervous system is more sensitive to stimuli than neurotypical people. Low sensitivity to stimuli is also an abnormal reaction of the nervous system, a sensory insensitive person looks for high intensity stimuli. 'White Noise' phenomena appear while constant background sounds (even internal heartbeat) attract the attention of the pupil. The nervous system itself produces stimuli (sensory impressions) without the participation of external sounds [12].

3 Case study

Hede Architects was founded in 1982 by Paul Hede. The office is an industry leader in education architecture with particular expertise in designing for special needs and disabilities. In 2019, Hede became part of the Bickerton Masters (BM) Group [13]. Paul Hede has designed several schools for students with Autism Spectrum Disorder; Western Autistic

School, Port Phillip Specialist School, Southern Autistic School, and Merriang Specialist School.

The Northern School for Autism in Melbourne was designed with the intention to meet the ASD pupils' needs. The architects deal with participatory design in cooperation with the management teams of the facility. The design process was based on multiple case studies of facilities from the USA and Scandinavian countries, including Saunalahti School and Espoo International School, Espoo, Finland; Learning Spring, New York City, as well as on own experience. This resulted in listed design outlines that ought to have a positive effect on the therapy of people with autism spectrum.

Above mentioned design principles of Hede Architects for designing the schools for autism are as follows: break up into sub-schools, use natural light, separation, calming indoor/outdoor, calm colours, progression through support life skills, safety for teachers in terms of exit routes, supported therapists [14].

The Northern School for Autism is one storey high and is located on the outskirts of a South Australian town – Melbourne. The building is inscribed between the quarters of single-family housing; it occupies about 1/4 of the quarter with an area of about 2.02 ha.

School was designed for 144 students who study in classes of 6-8 people. Students acquire knowledge at four educational stages: early school, middle school, intermediate school, and senior school, and each of them is clearly reflected in the architectural structure of the building [5]. (Fig. 1)

The building has an irregular shape, resembling a triangle surrounded by a green zone with an open, also triangular atrium. In the center of the piazza lies a playground for the youngest children attending early school. The remaining courtyards are directly adjacent to each stage educational zone and have their courtyards on the north side. The entrance square and the public car park are located in the south-western part of the plot. In direct communication with the entrance area, there is a senior school, a large, multifunctional, irregularly shaped hall, a library, an art room, and restrooms. In the southern part of the building, there are staff rooms, auxiliary rooms, and terrace rooms. Each of the functions has a separate entrance from the internal road and parking zone.

All classrooms were arranged as a gallery along the bends of the corridors. The classroom windows are oriented to the northwest and northeast. Due to its location in the southern hemisphere, this is the direction of greater insolation. The main triangular passage is curved shaped and has rounded edges. The design of all learning areas had alternative means of escape for staff and students from all rooms. Access to toilets for students/staff from building independent of learning areas. Each learning space has its storage to enable the amount of furniture and equipment to be controlled by teachers. The withdrawal which could be for quieter learning for 1 to 2 students or alternatively calming room for agitated or anxious students. The learning area has direct to-outside space for self-calming.

Undercover but with north sun access to desired sub school sections.

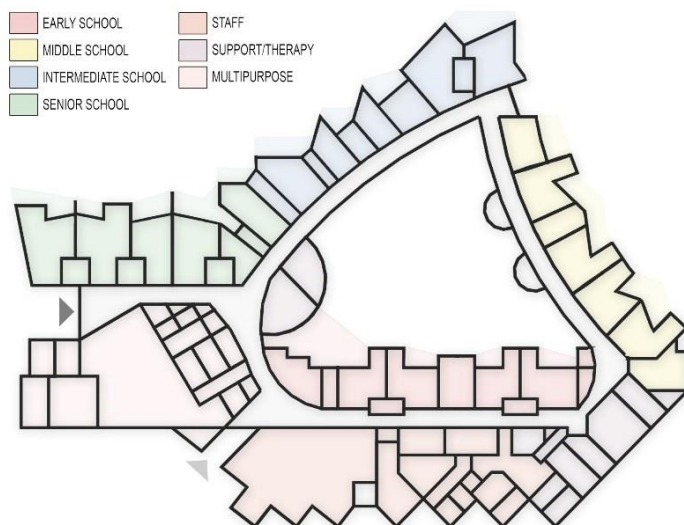


Fig. 1. Scheme of The Northern School for Autism, Melbourne, Australia. Author's diagram based on internet source [14]

4 Expert survey results

The survey among the expert respondents (Table 1) indicates that the characteristic feature of ASD-dedicated design is the sensory properties of architectural space. Those are the superior design tools that organize the building's functional zones. Such divided internal structure of the building improves the wayfinding of each student, and the shape of the corridors gives the opportunity to calm down and shelter from sensory impressions.

Visual hyperactivity in ASD children causes the pupil to react negatively, and aggressively to stimuli, e.g. sunlight, contrast, smooth/reflective surfaces, or movement (e.g. outside the window). Canopies applied over the exits from the classrooms to the courtyards prevent sunlight from falling directly into the classroom; they also protect from the phenomenon of glare and limit the large contrasts caused by the constantly changing chiaroscuro. Large glazing provides optimal lighting and reduces the frequency of using artificial light. The above solution prevents uncontrolled self-stimulation of the sense of sight, e.g. by staring at a light source or tracking the shadow of moving objects. Additional lighting above the child's line of sight provides a large amount of natural light, furthermore objects moving outside the window do not distract the child's attention.

The colour code of different functional zones improves the child's orientation in space, and provides a sense of subconscious order and stability, due to which the child feels secure. A hypersensitive person overreacts even to sounds that are too quiet to be heard by a neurotypical person. The use of irregular shapes in the structure of the entire building helps to reduce the feeling of crowding and noise also in common spaces. Sound-absorbing materials (e.g. carpets) eliminate the reverb effect and improve acoustic conditions. Such solutions also prevent sound self-stimulation.

Table 1. The likely impact of design guidelines on the therapy of people with ASD

Design principles	Assessment of the possible impact on the student* - summary of therapists' responses
<p style="text-align: center;">Break up into sub schools</p> <p>The school building was divided into 4 sections connected with each stage of education (early school, middle school, intermediate school, senior school).</p>	<p style="text-align: center;">positive 8, negative 2</p> <p>Structural division delimits the overall crowd ambient. Curved shapes of the corridors and classrooms have a positive effect on the acoustic properties of the space and reduce reverberation, therefore supports the sensory integration of students.</p>
<p style="text-align: center;">Natural light</p> <p>The structure of the building provides a large amount of natural - diffused light, large glazing inside classrooms from the north-west and north-east. Additional lighting of the space through the windows located above the child's line of sight.</p>	<p style="text-align: center;">positive 10, negative 0</p> <p>Natural lighting is the best way to illuminate a school building. However, the possibility of control and adjustment (blinds/screens) should be provided to adjust the amount of light to the activity held in the classroom and the individual preferences of the child. The location of some windows above the child's line of sight does not introduce additional distraction (objects moving outside the window). LED lighting is recommended to supplement daylight.</p>
<p style="text-align: center;">Separation</p> <p>Clear and intentional divisions into functional and sensory zones visible in the structure of the entire school (division into loud and quiet zones), acoustic separations as well.</p>	<p style="text-align: center;">positive 8, negative 2</p> <p>The sensory features of each space should be characteristic and clear. Each feature ought to define its function, support the sense of sensory security and create a sense of predictability. In conclusion, the aim of shaping the space indicates the way of using it.</p>
<p style="text-align: center;">Calming indoor / Outdoor</p> <p>The quiet sensory zone as an organized space in the therapeutic room and in the external zone of the teaching room.</p>	<p style="text-align: center;">positive 7, negative 3</p> <p>A quiet zone is support for sensory overload children to help them achieve sensory balance. The space should include devices supporting calming down children with different sensory needs, enabling the control of environmental light/sound factors.</p>
<p style="text-align: center;">Calm colour</p> <p>Vivid and saturated surface colours are reduced to a minimum.</p>	<p style="text-align: center;">positive 9, negative 1</p> <p>Expressive colours are introduced for visual identity of the space. Colour contrasts are to define the boundaries of functional and sensory zones</p>
<p style="text-align: center;">Safety</p> <p>Safety and security of usage</p>	<p style="text-align: center;">positive 8, negative 2</p> <p>People with ASD may have a different sense of surrounding space. The strongest impact should be made on wayfinding, navigation and traffic patterns, and their quality and signage.</p>

* At the first stage of the research, the respondents identified the possible impact of the design assumption used by Hede Architects on a student from the spectrum as positive or negative, and at the second stage they justified their choice.

The solutions used in the project help people with autism to cope with their sense perception. Education organized in small groups provides a better adaptation of learning conditions to the individual needs of a student. Cooperation with architects can support therapists' work with research-based design solutions.

5 Conclusion

The presented analysis shows that the design guidelines of “The Northern School for Autism” can decrease the disadvantageous impact of sensory stimuli on the therapy of people with ASD. This building, a multiple time awarded project (CEFPI Regional Award; CEFPI Educational Facilities Award; World Architecture News Awards) can be an example of well-renowned architecture that fulfils the requirements of the space dedicated to therapeutic purposes. In the 2013 entry to the World Architecture Education Awards, the winning author architect, Paul Hede himself indicated, that “student learning is achieved in small, calm and directly accessible areas of changing shape (that) assists (the students’) sense of order which assists their learning” [14]. When provided with appropriate educational and therapeutic conditions, students have a chance for better coexistence in the rapid society.

Acknowledgments

Special thanks go to the group of autism therapists for their cooperation and valuable feedback.

References

1. Christensen, D.L.; Braun, K.V.N.; Baio, J. (2018) Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years – Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2012. *MMWR Surveill. Summ*, 65, 1–23
2. Maenner MJ, Warren Z, Williams AR, et al. (2023) Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020. *MMWR Surveill Summ* 2023;72(No. SS-2):1–14. DOI: <http://dx.doi.org/10.15585/mmwr.ss7202a1>.
3. Australian Bureau of Statistics. (2018). Disability, Ageing and Carers, Australia: Summary of Findings. ABS. ABS, Disability ageing and carers Australia summary findings [Online]. Available at: <https://www.abs.gov.au/statistics/health/disability/disability-ageing-and-carers-australia-summary-findings/latest-release>.
4. Learning Environments [Online]. Available at: <https://learningenvironments.org.au/award/2013-awards/2013-regional-award-winners-and-commendations/> access date: 28.04.2023.
5. Hede Architects [Online]. Available at: <https://hedearchitects.com.au/Northern-School-for-Autism/>
6. M. Mostafa, 2008, “An Architecture for Autism: Concepts of Design Intervention for the Autistic User, *International Journal of Architecture Research*”, *International Journal of Architectural Research*, vol.2, str. 190-206
7. M. Mostafa, 2015, “Architecture for autism: Built environment performance in accordance to the autism ASPECTSSTM design index,” *Design Principles and Practicles*, vol.8, str. 67
8. L. Groat, D. Wang, 2002, “*Architectural Research Methods*,” John Willey & Sons. Inc
9. E. Niezabitowska, 2014, “*Metody i techniki badawcze w architekturze*,” Wydawnictwo Politechniki Śląskiej
10. Polski Autyzm [Online]. Available at: <https://polskiautyzm.pl/organizacja-bodzcow-zmyslowych-sensoryzmy/>, access date: 01.06.2021

11. Encyklopedia, Sensoryzm [Online]. Available at: <https://encyklopedia.biolog.pl/index.php?haslo=Sensoryzm>, access date: 01.06.2021
12. C.H. Delacato, 1995, "Dziwne, niepojęte autystyczne dziecko" Fundacja Synapsis, str. 81-85
13. Hede Architects [Online]. Available at: <https://hedearchitects.com.au/About/> [04.04.2021]
14. P. Hede, architect director Hede Architects pty ltd, "Australia disability in our society the reaction case studies"; [Online]. Available at: <https://docplayer.net/49136374-Introduction-paul-hede-architect-director-hede-architects-pty-ltd-australia-disability-in-our-society-the-reaction-case-studies.html> [04.04.2023]