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Laura MAZUR[1]

FUNCTIONING OF PEOPLE WITH VISUAL DISABILITIES IN PUBLIC SPACES. THE EXHIBITION "TOWARDS DARKNESS" AS AN ELEMENT OF THE EDUCATION SYSTEM OF FUTURE ARCHITECTS AND ARCHITECTURE STUDENTS

The aim of the article is to describe how people with visual disabilities function in public space and to examine the potential of the educational exhibition "Towards Darkness" in the process of educating future architects.

The study was based on the previously gathered knowledge and analysis of the researchers. During the analysis, special attention was paid to diseases of the sense of sight that affect the perception of architecture. Moreover, author analyzed problems related to architectural barriers. The article also contains an analysis of the forms of expanding knowledge about blind people.

The rest of the considerations in the article is focused on the exhibition "Towards Darkness" located in the Center for Science and Senses "WOMAI". It is a place whose main goal is to present the problems of people with visual disabilities. The exhibition is located in a completely dark room where, with the help of a blind guide, visitors can learn about the world of blind people and understand their everyday problems.

In order to obtain answers to the selected topic, author of the study chose a focus study as a research method. The aim of the study was to obtain experts' opinions on the "Towards Darkness" exhibition. During the study, experts answered the questions and then took part in a discussion that allowed to draw necessary conclusions.

The research results indicate that the "Towards Darkness" exhibition has a very high educational value and would successfully enrich the education program of architecture students.

Keywords: blind people, educational exhibition, education of architects, architecture

[1] Koło Naukowe "URBAN GREEN" pod opieką prof. dr hab. inż. arch. Ewy STACHURY. Politechnika Krakowska im. Tadeusza Kościuszki, Wydział Architektury, Katedra Kształtowania Środowiska Mieszkaniowego. ORCID: 0009-0003-0943-2045.

1. INTRODUCTION

"Imagine the lights go out. There is absolute pitch-black darkness, and you must manage without the use of your sight, interacting with your surroundings in a way that allows you to function normally and perform everyday tasks" [Niewidzialna Ulica w Poznaniu 2024].

This is the reality for nearly 5% of people living in Poland. This group includes blind individuals as well as those with visual impairments such as reduced visual acuity, central scotomas, or tunnel vision. As we can observe, each of these impairments, to varying degrees, affects the perception of space and architecture [Kłopotowska 2016].

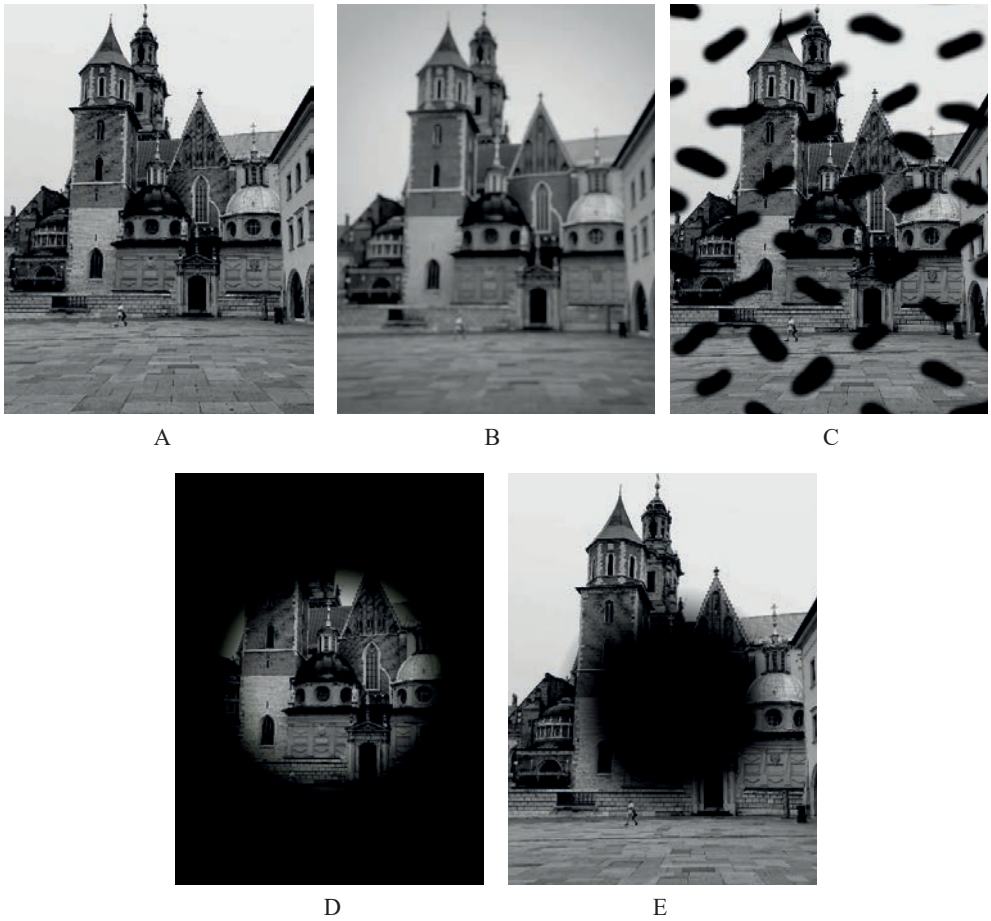

Fig. 1. Visual perception in the context of visual impairments: correct vision (A); vision with reduced visual acuity (B); vision with scattered scotomas (C); vision with tunnel vision (D); vision with a central scotoma (E) [own elaboration based on Kłopotowska 2016]

Blind individuals and those with visual impairments encounter daily challenges that sighted people are often unaware of. This stems from an insufficient understanding of the needs and ways in which blind individuals navigate public spaces. Common issues include architectural barriers such as protruding or hanging elements in walkways or unmarked changes in ground elevation. These elements appear unexpectedly, and their unclear placement causes difficulties for visually impaired individuals. They also pose significant risks to health and safety and greatly hinder mobility. These obstacles impact the quality of life for these individuals, often leading to fear and uncertainty about navigating public spaces [Kłopotowska 2016].

Another significant issue is errors in the navigation systems for blind people, particularly the lack of or improperly constructed tactile paths. The absence of rules and navigational elements excludes visually impaired individuals from the group of users and makes moving through such spaces extremely difficult. This significantly affects their comfort and the way they use public spaces [Kłopotowska 2016].

To improve the functioning of individuals with visual impairments in public spaces, it is essential to better adapt these areas to their needs. One notable example of an institution that has extensively modified its San Francisco headquarters to accommodate blind individuals is the "LightHouse for the Blind and Visually Impaired Training Centre", designed by blind architect Chris Downey.

Through a profound understanding of the challenges faced by blind people daily, Downey introduced several key modifications in his design to significantly enhance accessibility. One of the first changes implemented was the intentional use of varied floor textures. This simple adjustment enables blind individuals to easily identify their location within the building. Another improvement was the introduction of a straightforward navigation system based on tactile paths installed on the building's walls. This system facilitated movement for blind users and provided a simple and intuitive way to navigate the space.

The final but equally critical element of the design was the use of soundproofing insulation to block noise between rooms and from the street. This measure improved communication for blind individuals and made it easier for them to function within the building [60 Minutes 2023].

Downey's example demonstrates that understanding of the challenges faced by blind individuals provides architects with a foundation for creating spaces and developing solutions that facilitate their functioning in public areas. Another important benefit is breaking stereotypes and thereby improving the public perception of blind individuals.

For any of the above solutions to be effectively implemented, it is crucial to first expand the knowledge of future architects about the experiences and challenges faced by blind individuals in navigating public spaces. Three key and most valuable sources of knowledge about visually impaired individuals can be identified.

The most common and easily accessible source is information obtained from media outlets. These may include scientific research results, popular science articles, or other types of information published on the Internet.

Another example is the analysis of 3D models. While primarily designed for use by blind individuals, studying how these models are utilized can provide valuable insights into how blind individuals perceive the world. This also allows for a deeper understanding of their cognitive and thought processes [Kłopotowska, Kłopotowski 2018].

Fig. 2. Model of the Church of Saints Peter and Paul and the Church of Saint Andrew, model author: Karol Badna [author's photo]

Fig. 3. Model of the Castle in Kremnica, model author: unknown [photo author: E. Stachura]

The last and most unconventional method of expanding future architects' knowledge about the functioning of blind individuals is through various educational exhibitions. A very good example of this type of exhibition is "Towards Darkness", located at the Center for Science and Senses "WOMAI" at Pawia Street 34 in Kraków.

This exhibition takes place in a completely dark room, and our guide is a blind person. The guide leads visitors through different stages of the exhibition, during which they must confront the daily tasks faced by individuals with visual impairments. Throughout the entire exhibition, the blind guide explains and demonstrates solutions that facilitate everyday functioning. This is a very unconventional and rarely encountered educational method. The exhibition teaches through experience, allowing participants to directly experience a glimpse of the world of blind individuals and understand their challenges. Therefore, I believe that the educational potential of such exhibitions is not sufficiently utilized, and investigating their impact on the audience could reveal how they can be integrated into systems of support for individuals with visual impairments [Center for Science and Senses "WOMAI" 2024].

2. AIMS AND METHODS

The main objective of the research conducted was to examine the potential of the "Towards Darkness" exhibition as one of the educational tools for future architects. Another aim of the study was to assess the extent to which the exhibition influences the improvement of the public image of blind individuals and how this affects their functioning in public spaces.

To obtain the necessary information about the "Towards Darkness" exhibition and its impact on the education of future architects, a focus group study was conducted. This research method involves gathering as much feedback and information as possible from a specially selected group of experts. The group consists of a small number of individuals with extensive knowledge or significant experience in the studied field. Initially, these individuals are asked to complete a survey, based on which a scenario for the subsequent discussion is created. The same group of experts also participates in the discussion, whose goal is to gather opinions and information on the topics addressed in the survey. The discussion also allows for a deeper understanding of the subject and for collecting additional insights. A moderator oversees the entire study, ensuring the discussion stays on track and aligns with the previously prepared scenario consisting of questions and topics that facilitate the smooth progression of the research.

The study was conducted with a group of 10 employees from the "WOMAI" Science and Senses Centre in Kraków, who are directly involved in the "Towards Darkness" exhibition. Among the experts, there are both blind guides, who daily show others a glimpse of their lives through the exhibition, and sighted individuals who assist in organizing the event. These individuals possess significant knowledge in the studied field, which is why they were included in the group of experts. They were asked to complete a specially prepared survey, based on which the planned discussion took place. The survey consisted of 7 multiple-choice questions related to the functioning of the centre, the main goals of the exhibition, the emotions it evokes in visitors, and how it is perceived. The questions aimed to obtain essential information and better understand the operation of the centre. The information gathered from the survey helped steer the discussion in the right direction and gather the necessary insights. The discussion allowed for the confrontation of extreme responses and provided in-depth justification for the problems identified by the survey participants. It also helped eliminate extreme opinions and exclude them from further stages of the study. After the discussion, the results were analyzed, and conclusions were drawn.

This method was chosen due to its ability to collect large amount of data in relatively short time. Another important aspect is its flexibility, as the moderator can adapt the questions based on the current state of the discussion and guide it in the desired direction. During the study, it is also possible to observe the interactions and behavior of the experts, which may influence the collected information.

3. RESULTS

As a result of the research conducted, a wealth of information was gathered regarding the functioning of the WOMAI Science and Senses Centre and the impact of its activities on visitors.

The responses from the experts indicate that the primary goals of the centre are to raise awareness about the daily lives of blind individuals and to show how the world is perceived by them. The centre also aims to provide an interesting and unique form of leisure. These goals were chosen due to the insufficient knowledge that sighted people have and their unrealistic perceptions of the lives of blind individuals.

Participating in the exhibition is meant to tangibly demonstrate the realities of blind people's lives and the scale of the problems they face daily. Through its engaging format and knowledgeable guides, the exhibition presents the challenges blind people experience in public spaces in a friendly and understandable way.

The research findings also indicate a direct connection between the exhibition and a wide range of emotions experienced by visitors. These emotions manifest in various ways, such as tears, handshakes, or even speechlessness. These reactions are triggered by the new experience, which is often shocking for participants. The study revealed that during the exhibition, visitors can experience a broad spectrum of extreme emotions, such as sadness, fear, joy, empathy, understanding, excitement, humility, and curiosity. The emotions are strongly influenced by the personal nature of the individual and the way the exhibition is presented by the guide.

The research clearly shows that the most common emotional state is curiosity. This is a natural human reaction to unfamiliar experiences. The visitor never knows what to expect or what obstacles they will face. This state is further amplified by their limited knowledge of blind individuals and their world. Visitors are curious about how the knowledge will be conveyed, what challenges they will encounter, and to what extent they will be able to handle them.

In addition to curiosity, empathy and understanding are frequently encountered. This is due to the reduction of distance and a closer understanding of the blind person's life, and thus a deeper and better understanding of the difficulties they experience. During the exhibition, visitors learn through practice, experiencing the scale of the problem firsthand. By gaining insight into the issues faced by blind individuals, visitors are able to comprehend the difficulties these people encounter. Being surrounded by darkness, it becomes easier for visitors to empathize and understand the scale of the problem and the real impact it has on the lives and functioning of blind people. The emotional state experienced the least is sadness.

The results of the study suggest that the way the exhibition is conducted, combined with the fascinating and genuine individuals working at the centre, contributes to the overwhelmingly positive reactions to the exhibition. The guides share their personal stories and are eager to show how their lives unfold.

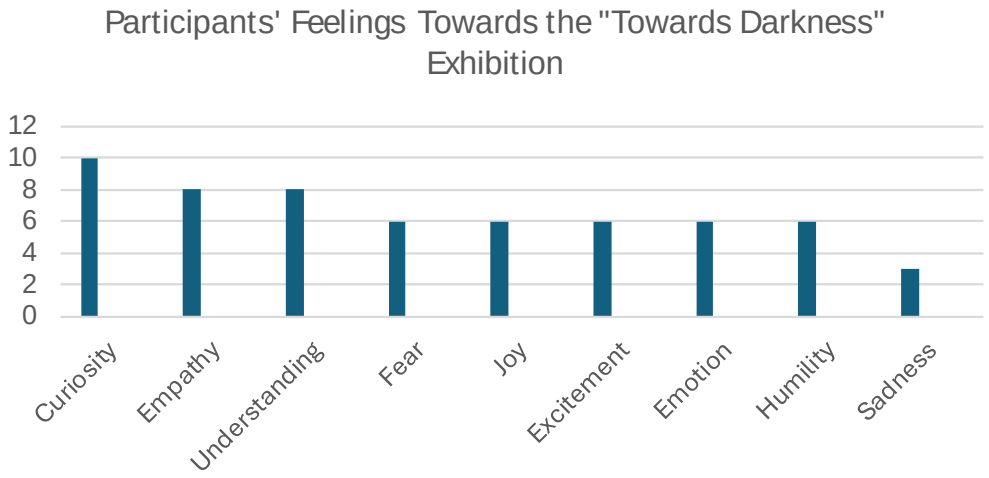

Fig. 4. Participants' Feelings Towards the "Towards Darkness" Exhibition [own analysis based on survey results]

The results of the study also indicate that the exhibition attracts significant media interest, and consequently, a large number of visitors. The widest group of attendees consists of students and educational staff, with private individuals also frequently attending.

The exhibition attracts many visitors because it addresses an interesting and rarely discussed topic. It often becomes a part of educational trips and enables young people to understand problems they were previously unaware of. Educational staff also frequently return with new groups of students because they consider the exhibition to be highly educational and worth attention. It covers a niche that is not taught at schools, and the centre allows people to touch and experience a different way of perceiving the world. It is also worth noting that the way the exhibition is presented depends entirely on the guide and their personality. Each guide focuses on slightly different aspects that they consider most important. Therefore, the exhibition can be visited multiple times, with each visit offering a new perspective and additional knowledge.

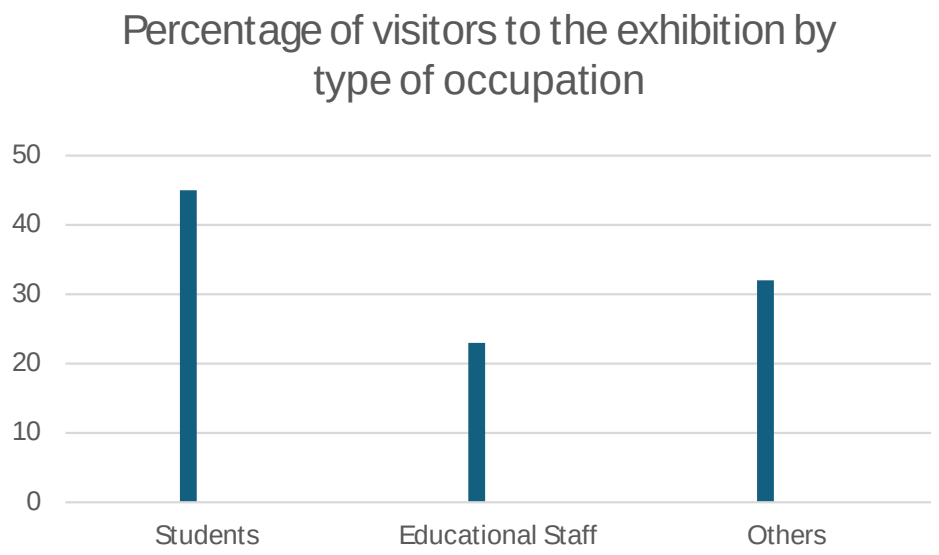

Fig. 5. Percentage of visitors to the exhibition by type of occupation [own study based on survey results]

The exhibition is received very positively by visitors. People are interested in the message and the form of the exhibition. Visitors are very eager to return and consider the experience to be very educational. The centre is frequently recommended and visited by tourists. The exhibition owes its greatest interest to its unique form and the staff. It is the people who set the rhythm and dynamics of the exhibition. Through their natural character and personal stories, they help others understand their world.

4. DISCUSSION

The main goals of the "WOMAI" Science and Senses Centre highlight the significant educational value of the "Towards Darkness" exhibition. They show that the primary aim of the exhibition is to educate visitors and expand their knowledge on the daily functioning of blind individuals. Through an accessible and understandable format, sighted people can gain a vivid understanding of the scale of problems faced by blind people and the daily challenges they must overcome. The unique form of the exhibition also helps to dispel unrealistic ideas and stereotypes about blind individuals. During the visit, visitors are confronted with the world of blind people in the most direct way possible, allowing them to notice errors and issues in the world around them. Additionally, by understanding these obstacles,

future architects will be better equipped to create solutions that are more adapted to the needs of individuals with visual impairments.

It can also be observed that the Centre places a significant emphasis on presenting the guides as "ordinary" people. This approach shortens the distance between the guide and the visitors, facilitates easy communication, and fosters a better understanding of the topic. These efforts enable visitors to identify more closely with the issues faced by blind individuals. The individual approach and the unique character of the guides also influence the way information is conveyed, making it simpler and more accessible in a friendly environment. Each guide adapts their method of communication to the specific group they are leading, ensuring that the information is delivered in the most effective way.

The emotional states experienced by the participants of the exhibition further emphasize the educational value of the exhibition. Among the wide range of emotions, one of the most frequent is understanding. It occurs almost always during the visit and proves that the exhibition has a strong educational impact. Understanding comes with a deeper exploration of the subject and the expansion of knowledge. When the world and problems of others are fully understood, one can offer real help and devise appropriate solutions.

The number of students and education professionals who visit the centre confirms that it is an excellent educational method. It is an unconventional yet effective way of transmitting information, one that stays in mind long after the experience. As it is widely known, people learn best through experience, and in the case of this exhibition, when visitors encounter and experience the world of blind individuals firsthand, they gain a better understanding of their situation and problems. Education professionals often return to the centre with new groups, noting that the exhibition opens their eyes and presents the world in a completely new way. They also mention that it is a life-changing experience and undoubtedly highly educational for young people.

In conclusion, the exhibition as an educational method helps to better understand the needs of blind individuals, which in turn gives visitors the opportunity to solve various problems that blind people encounter. Through the experiences gained at the Centre, visitors begin to notice aspects of daily life that were previously taken for granted. They are also able to identify mistakes and search for appropriate solutions quicker and easier.

The exhibition also leads to a change in attitude. It fosters emotional connections with blind individuals, which shortens distance and improves understanding of the issue, making it closer to the visitor. One of the effects is also the breakdown of the fear of interacting with blind individuals, a fear that exists among some people, often stemming from a lack of basic knowledge about people with visual impairments. Thanks to the exhibition's method of communication, stereotypes are broken, which in turn improves the image of blind people.

All of the above impacts of the exhibition demonstrate that it could be effectively used as an educational tool and would greatly enrich the curriculum for architecture students. By including the exhibition in the education of students, we raise future architects' awareness about inclusive design and create spaces that are accessible to all people. It is also worth noting that the emotional impact of the exhibition on individuals is an asset. Through the experiences gained during the exhibition and by experiencing the challenges firsthand, young architects will be able to design public spaces in a more thoughtful way, taking into account the needs of all individuals. This will allow the creation of spaces that are open to everyone and free from barriers that hinder daily functioning.

5. SUMMARY

As the research presented above shows, the exhibition "Towards Darkness" can be successfully used as an educational method for both architects and architecture students. In the rapidly developing world, new educational methods should be integrated into curricula to improve older approaches and address systemic gaps. Introducing educational exhibitions will help better understand the needs of blind individuals and adjust solutions in designs to meet those needs. Furthermore, it will eliminate recurring mistakes in designs and allow for the development of new methods that facilitate the functioning of blind people in public spaces.

Moreover, educational exhibitions can be easily adapted to the current needs of universities, which allows for flexibility in the topic and the quality of the knowledge conveyed. By employing different guides, various opinions and perspectives can be obtained in a given situation. The wide range of available configurations of guides and exhibition topics ensures that students will be able to extract the most important information and apply it in their future projects.

With the introduction of educational exhibitions into academic curricula, the image of blind individuals will be improved, and new job opportunities will be created. By spreading knowledge and fostering close contact with blind people, future architects will fully understand the needs of such individuals, and in turn, break various stereotypes related to visual impairments. Additionally, through new solutions embedded in their designs, greater emphasis will be placed on promoting inclusive design. This will allow for the creation of new objects and spaces that are open and welcoming to all users.

Furthermore, by complementing the curriculum with educational exhibitions, a closer emotional bond will be established, which will influence the design process. When the needs of blind individuals are better understood, our approach to the issue changes. This happens because a topic that was once considered taboo is fully explained and understood. As a result, it is no longer something completely unknown, but rather something close and easy to understand.

LITERATURE

60 Minutes, 2022, *Architect goes blind, says he's gotten better at his job*, https://youtu.be/fi38ooKPvaE?si=2DOjj3TBRV3rUSgf (access: 15.06.2024).

Asanowicz A., 1988, *Percepcja jako czynnik kształtujący formę architektoniczną*, Wydawnictwa Politechniki Białostockiej, Białystok.

Budny J., 2009, *Dostosowanie budynków użyteczności publicznej – teoria i narzędzia*, Stowarzyszenie Przyjaciół Integracji, Warszawa.

Center for Science and Senses "WOMAI", 2024, https://womai.pl/ (access: 8.05.2024).

Czarnecki B., 2004, Siemiński W., *Kształtowanie bezpiecznej przestrzeni publicznej*, Difin, Warszawa.

Dziedzic J., 1962, *Z zagadnień orientacji przestrzennej niewidomych*, Zakład Badawczy Związku Spółdzielni Inwalidów, Warszawa.

Goldsmith B.C.,1996, *Designing for the Disabled. The New Paradigm*, Architectural Press, Oxford.

Goldsmith S., 2000, *Universal Design*, Architectural Press, Oxford, Auckland, Boston, Johannesburg, Melbourne, New Delhi.

Jaranowska K., 1996, *Osoby niepełnosprawne w środowisku miejskim*, COBO-Profil sp.z o.o., Warszawa.

Kantarek A.A., 2013, *O orientacji w przestrzeni miasta*, Politechnika Krakowska, Kraków.

Kłopotowska A., 2009, *Architektura w przekazie pozawzrokowym. Kształtowanie świadomej percepcji*, "Czasopismo Techniczne. Architektura", vol. 106.

Kłopotowska A., 2010, *Przestrzeń do nauki przestrzeni. Sztuka projektowania przyjaznego osobom niewidomym i ociemniałym*, "Czasopismo Techniczne. Architektura", vol. 107.

Kłopotowska A., 2015, *The alphabet of non-visual architecture – towards a methodology of enabling people with visual impairment to participate in architectural play*, "Czasopismo Techniczne".

Kłopotowska A., 2016, *Doświadczenie przestrzeni w rehabilitacji osób z dysfunkcją wzroku. Sztuka a tyflorehabilitacja*, Oficyna Wydawnicza Politechniki Białostockiej, Białystok.

Kłopotowska A., 2017, *Tactile Architectural Models as Universal 'Urban Furniture'*, IOP Conference Series: *Materials Science and Engineering*, vol. 245, IOP Publishing.

Kłopotowska A., Kłopotowski M., 2018, *Dotykowe modele architektoniczne w przestrzeniach polskich miast*, part I: *Standardy*, Oficyna Wydawnicza Politechniki Białostockiej, Białystok.

Kłopotowska A., Magdziak M., 2021, *Tactile Architectural Drawings – Practical Application and Potential of Architectural Typhlographics*, "Sustainability", vol. 13, MDPI.

Niewidzialna Ulica w Poznaniu, 2024, https://niewidzialnaulica.pl/ (access: 20.04.2024).

Schwartz L., Bola T., 1991, *Vademecum projektanta – problemy osób niepełnosprawnych*, part 2: *Budynki mieszkalne i użyteczności publicznej*, Instytut Wzornictwa Przemysłowego, Warszawa.

ATTACHMENT 1

Survey on Methods of Educating Sighted People About Spatial Perception Based on the Example of the "WOMAI" Science and Sense Center

Please complete the survey by selecting one answer (or multiple answers if indicated).

1) What is the main goal of the "Towards Darkness" exhibition? (Please select a maximum of 3 answers)

☐ To show how blind people perceive the world.
☐ To bring closer the problems faced by blind people.
☐ To teach orientation and movement in darkness.
☐ To emphasize the importance of the senses of smell, touch, and hearing in daily life.
☐ To raise public awareness of issues related to the daily functioning of blind people.
☐ To break stereotypes about blind people.
☐ To raise public awareness about helping blind people.
☐ To provide an interesting and rare form of spending free time.

2) What emotions or feelings does the "Towards Darkness" exhibition most often evoke in visitors? (Please select only one option in each line)

	Never	Hardly ever	Often	Very often	Alwyas
Curiosity					
Sadness					
Joy					
Fear					
Excitement					
Empathy					
Understanding					
Humility					
Emotion					

3) How is the "Towards Darkness" exhibition perceived by visitors?

☐ Positively, visitors are interested in the message and form of the exhibition, considering the experience extremely educational. They are eager to recommend and share their experiences with others.
☐ Positively, visitors are interested in the message and form of the exhibition. They consider the exhibition educational.
☐ Positively, visitors are satisfied with the form and message of the exhibition, but the topic is not particularly interesting to them.
☐ Negatively, visitors do not like the theme of the exhibition.
☐ Negatively, visitors do not like the theme of the exhibition or its presentation. They consider the exhibition boring and worthless.
☐ Visitors' attitude is indifferent.

4) Does the "Towards Darkness" exhibition evolve?

☐ Yes, once a year.
☐ Yes, once every six months.
☐ Yes, less frequently than once a year.
☐ No.

5) Does the "Towards Darkness" exhibition attract media attention?

☐ Yes, a lot.
☐ Yes, a little.
☐ Yes, if the media are informed.
☐ It does not attract attention.

6) Who belongs to the largest group of visitors to the exhibition "Towards Darkness"? (Please select a maximum of 2 answers)

☐ Healthcare workers
☐ Students
☐ Uniformed service personnel
☐ Education staff
☐ Civil servants
☐ Architects
☐ Customer service staff
☐ Artists
☐ Others

7) How many people visit the “Towards Darkness” exhibition in a week?

☐ 0-10
☐ 11-20
☐ 21-30
☐ 31-40
☐ 41-50
☐ 50+

FUNKCJONOWANIE OSÓB Z NIEPEŁNOSPRAWNOŚCIĄ WZROKU W PRZESTRZENI PUBLICZNEJ. WYSTAWA „W STRONĘ CIEMNOŚCI” JAKO ELEMENT KSZTAŁCENIA PRZYSZŁYCH ARCHITEKTÓW I STUDENTÓW ARCHITEKTURY

Streszczenie

Celem artykułu jest ujawnienie i opis sposobu funkcjonowania osób z niepełnosprawnością wzroku w przestrzeni publicznej oraz zbadanie potencjału wystawy edukacyjnej „W stronę ciemności” w procesie kształcenia przyszłych architektów. Podstawę do przeprowadzenia badania stanowiły wcześniej zdobyta wiedza oraz analiza dotychczasowego dorobku badaczy. Podczas analizy szczególna uwaga została poświęcona chorobom zmysłu wzroku wpływającym na odbiór architektury i przestrzeni. Przeanalizowane zostały również problemy związane z barierami architektonicznymi. Artykuł zawiera też analizę form poszerzania wiedzy na temat osób niewidomych, ze szczególnym uwzględnieniem wystaw edukacyjnych. Dalsza część rozważań prowadzonych w artykule w całości dotyczy wystawy „W stronę ciemności” zlokalizowanej w Centrum Nauki i Zmysłów „WOMAI”. Jest to nietypowe miejsce, którego głównym celem jest przybliżenie problemów osób z niepełnosprawnością wzroku oraz podniesienie świadomości społecznej na tematy związane z codziennym funkcjonowaniem osób niewidomych. Wystawa znajduje się w całkowicie ciemnym pomieszczeniu, gdzie dzięki pomocy niewidomego przewodnika zwiedzający mogą poznać świat osób niewiadomych oraz zrozumieć ich codzienne problemy. W celu uzyskania odpowiedzi na wybrany temat zostało przeprowadzone badanie fokusowe, którego celem było uzyskanie opinii ekspertów na temat wystawy „W stronę ciemności”. W gronie ekspertów znaleźli się pracownicy Centrum Nauki i Zmysłów „WOMAI”, którzy podczas trwania badania udzielili odpowiedzi na pytania zawarte w specjalnie przygotowanej ankiecie, a następnie wzięli udział w dyskusji, która pozwoliła wyciągnąć niezbędne wnioski. Wyniki badań wskazują, że wystawa „W stronę ciemności” ma bardzo dużą wartość edukacyjną i z powodzeniem wzbogaciłaby program kształcenia studentów architektury. Badania wskazały również zależność wystawy od odczuwanych emocji, które w bardzo rozległej skali występują wśród zwiedzających.

Słowa kluczowe: osoby niewidome, wystawa edukacyjna, architektura, kształcenie architektów