Implementing Inclusive Design in Architectural Education and Design Practice

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Abstract. The objective of the article is to present working methods in didactics and in design practice in terms of the implementation of the inclusive design concept. It obliges the students and participants to be involved in the design process in order to recognize the needs and preferences of different user groups. Additionally, since the development of ICT technology allows us to increase the availability of space, the expansion of the range of tools in the design process requires the expansion of the knowledge of future designers. Therefore, the authors pose questions: how to educate future architects in this context? what tools and technologies to offer to local communities so that they can actively participate in such design processes? The subject of the analyses involves the implemented didactic projects regarding the solutions for the elderly and the disabled, both in facilities having the caring function and in public spaces. The effects of the completed didactic projects and project activities had a diverse character: from conceptual designs to the prototypes of small architecture elements. The basic assumption in the implemented projects is to adopt the formula of education through experience and the use of pre-project research. According to the state of the knowledge in this respect, the effectiveness of a design process for people with disabilities requires direct contact with users, research on the functioning of space and how it is experienced. The article presents the tools and techniques of work applied in the method ‘education through experience’: focus meetings, individual interviews, observational studies, role playing, experimenting, testing the solutions.

1. Introduction

Inclusive Design, like Universal Design and Design for All, can be defined primarily as a design process aimed at the development of optimal solutions for social groups being at risk of marginalization, or users whose needs and preferences differ from standard requirements [1]. Each of the above design attitudes is focused on creating accessibility [2]. They enrich the principles and guidelines applied in the design process, especially if they are used when we define the profile of products or space for users with disabilities.

What distinguishes inclusive design is the fact that by including specific groups of users in the design process, the designers’ perspective changes, whereby they have greater opportunity to realize an optimal design, in contrast to situations when they attempt to find solutions for everyone, which in practice is impossible. It also addresses the term "reasonable" referred to in the definition: "Principally, it should be acknowledged that "inclusive design" is not a fixed set of design criteria, but a constantly evolving philosophy. The goal of creating beautiful and functional environments that can be used equally by everyone, irrespective of age, gender or disability requires that the design process must be constantly..."
expanding to accommodate a diverse range of users, as we develop a greater understanding of their requirements, desires and expectations." [3]. The British Standards Institute (2005) defines inclusive design as: "The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible on a global basis, in a wide variety of situations and to the greatest extent possible without the need for special adaptation or specialized design." [4]. It means that inclusive design comprises a factor of pragmatism in the selection of solutions, and it is a way of choosing means and solutions at the optimal level while providing at the same time alternative solutions that can complement each other.

As mentioned above, inclusive design is a process that focuses on user diversity and the benefits that can result from design diversity for particular design decisions [5]. The inclusive design methodology distinguishes four main design phases: management (defining objectives and stages of the design), defining users' needs, generation of ideas and testing of the design concepts. The authors' experience to date shows that in the case of a built environment it is often difficult to carry out the testing stage due to the scale of solutions. For this reason, the efficiency of the process in the case of inclusive design requires the experience of the design team and efficient pre-design research methods that effectively determine the needs of users. Additionally, we can use the potential offered by ICT technology, whereby we can increase access to the data on space features and obtain tools to design and test the design solutions. Nowadays, with the favored user-oriented design approach, this aspect requires additional development of competences in educating future architects. At the same time, it should be emphasized that the main driving force of changes in space environment should be inspired by people, and not technology, in line with the perspective adopted in the concept of Human Smart City [6]. In this perspective, it is crucial now to build an ecosystem of innovation, which primarily springs out from the partnership of citizens and local communities, local authorities and external stakeholders (e.g. entrepreneurs). Thus, we are facing a question: how to educate future architects in this context, and what tools and technologies to offer to local communities so that they can actively participate in such design processes?

2. Methodology

In order to analyze the designing process of spatial changes, in which groups of users with functional limitations have been included, the authors scrutinized their completed works, primarily those involving inclusive design with the participation of the elderly and the disabled. Selected examples of the completed projects involve both educational activities and activities with the participation of local communities, carried out in 2017-2020. The adopted criteria of analysis were dictated by the main objective of the article, i.e. to determine effective didactic methods to comprise the inclusive design process in architectural education and in participatory activities. For the needs of further analysis of the problem, the following criteria were defined: the scale of the social impact of the project, ways of confronting the assumptions and effects of the project with a group of users, and limitations of the project.

In the case of didactic projects, the initial stage, i.e. project management, was always prepared by a group of experienced educators; the particular stages of the project were integrally combined with the academic year cycle. And at the first stage of the work, entities from the socio-economic environment participated as one of the project's stakeholder groups. However, at the stage where the users' needs were being defined, target user groups were included. Their needs and preferences were defined using the tools and techniques appropriate for qualitative research methods, such as focus meetings, individual interviews, on-site verification, object inspection (so-called walk through), behavioral mapping, non-participant observation, and the analysis of construction documentation. The said method allows both to assess the quality of the built environment and to gather information on how the selected space is used. The generation of ideas, in turn, is viewed as a creative stage, realized by students with the participation of lecturers and stakeholder groups. As mentioned earlier, the testing stage terminating the
process, in the case of spatial projects is the most difficult, because it requires the use of simulation tools or/and modeling methods, and ultimately the presentations of spatial solutions which are very clear for the recipients. It also requires - which is very important - an active dialogue with the participation of all stakeholders and designers. All projects were being realized with external partners, and the verification of student projects in two cases was carried out in the formula of an architectural competition for students.

In the didactic project "House in Bytomska Street" at the stage where users' needs were being defined, the students examined the willingness of seniors to apply online tools to strengthen social ties. For the study, they used projection methods, and they interviewed the seniors with the help of tutorials describing internet tools, including webinars or online discussions. Apart from pure research and didactic aspect, the meeting of students with the seniors also had the dimension of intergenerational exchange of knowledge and concerns about new technological potential. For the seniors, it was new and opening knowledge, and for the students, it was an opportunity to reflect on the usefulness of digital tools when working with the elderly.

In the case of projects realized with groups of high school students, the initial stage was prepared by the coordinators of the projects: Model Dworcowa Street and Access City (Dworcowa Wzorcowa and Miasto Dostępne), i.e. people with extensive research and design experience, mostly practicing architects and urban planners. The decision to work with high school students resulted from the need to involve diverse groups of stakeholders, including adolescents, whose needs are often overlooked in the design of public spaces. For further stages of the project, people who volunteered to participate in the project were selected. Most of them were people who were interested in design issues, or even planned to apply for studies in architecture. For further stages of the project, people who volunteered to participate in the project were selected. Most of them were people who were interested in design issues, or even planned to apply for studies in architecture. In the Access City project, the participant observation tool was used to directly analyze architectural barriers and quickly define the needs of people with disabilities. The main element of the project comprised the research stage, but the experience of high school students translated into specific proposals for changes in the space of the town of Bytom, which were written down and forwarded to the appropriate departments of the Town Hall and to designers involved in the design of the pedestrian zone of Dworcowa Street in Bytom. Consequently, the stage of generating ideas was handed over to professional designers. The Model Dworcowa Street project had a wider scope. At the research stage, the tools and techniques were selected and applied in accordance with the qualitative research method, such as e.g. individual interviews, on-site verification, non-participant observations, participant observation, public discussion, analysis of construction documentation, analysis of historical documents. The stage of ideas generation was an opportunity to summarize the collected materials and to encourage creativity in young people. High school students developed visions on how to change Dworcowa Street under the guidance of lecturers. The effects of the workshop work were presented at the meeting with the inhabitants of Bytom, and they provided an opportunity to share opinions about the town and about the need for changes in public space, especially in terms of eliminating architectural barriers and improving the town’s image. As part of the testing of the adopted solutions, an experiment was carried out in the street space, which was attended by the students of the Junior High School from Creative Activity Classes. The task of the young students was to voice their main needs in terms of organizing a place for meetings and fun in public space. The stage did not have the character of prototyping, but it had the form of creative expression, place-making activities that were to manifest the awareness of the participation of young people in the life of the town and their presence in urban space.

Apart from teaching at the university and bottom-up activities in cooperation with high schools, also educational projects were carried out, e.g. projects as part of the Architektour workshop for students in Bytom. The objective of the group, headed by Sylwia Widzisz-Pronobis and Grzegorz Pronobis, was to propose spatial solutions for the residents of the area around Barbara Square in Bytom, Rozbark District. Importantly, the Rozbark district has been included in the revitalization program, and a number of social problems have been diagnosed in its area, including the social exclusion of the elderly [7]. The socio-
spatial diagnosis demonstrated that older people lock themselves in their homes and do not establish neighborly relations. The analyses of that situation showed that public space is full of architectural and mental barriers. During the workshops, the students were to conduct the research stage and the stage of generating ideas in response to the research problem developed by the teachers: "Lack of places to meet ". For the research stage, the students designed their own research tools based on the method of qualitative research: a sensory mock-up and children's animation combined with a focused interview (Figure 1, Figure 2).

Figure 1. Sensory mock-up (the tool used during the workshop Architektour Bytom). Phot. S. Widzisz-Pronobis

At the stage of generating ideas, the students received the support of experts in the field of social revitalization, which helped them to precisely define their vision corresponding to the research problem. Unfortunately, the testing process turned out to be too expensive and time consuming, and for that reason, the students focused on animation activities to raise awareness of the potential of the Barbara Square space within the local community. The proposal of public space development was presented at the meeting summarizing the entire workshop cycle in which the local community took part. After the workshops, local NGOs lobbied for student proposals and some of them were entered into the execution documentation and were implemented in public space.
3. Effects of the completed didactic and participatory projects

3.1 Didactic projects
The subject matter of all realized didactic projects involved the quality of life of the elderly, both in the realm of public spaces and in the realm of objects dedicated to this age group. The above subject was undertaken due to the fact that such research studies and educational activities are conducted in the Department of Design and Qualitative Research in Architecture [8-12]. They are dictated by the necessity to verify the current attitude to the quality of the built environment and to its shaping in view of the observed aging process of the society. This means among other things that we should start to accumulate knowledge and to enrich design practice to be able to create optimal architectural solutions that respond to the above challenges. In the assumptions of didactic projects, spatial solutions were to support the functioning of the elderly in space, and at the same time solutions were being sought to allow the integration of older residents with the local community and their participation in social life. Thus, in terms of didactic objectives, the implemented projects were aimed at raising the knowledge and competence of architecture students in the field of design specifics for older people in various contexts.

3.2 Participatory projects
All the realized participatory projects covered a wide range of analyses on public space. Yet, the involved young people focused primarily on the issues of space accessibility for socially excluded people, including the elderly and the disabled. The inclusion of young people in participatory processes requires a special plan and involvement of schools due to the specificity of this age group. Working with young people is primarily aimed at architectural and civic education. It is important that they feel their agency, and, therefore, the implemented projects assume the development of such spatial solutions and the selection of such research methods so that the effects of the work could be obtained almost immediately. The stimulation of activity translates into their further life choices often associated with
design professions, and the involvement in participatory projects sensitizes them to other users of public spaces. Table 1 presents the general characteristics of the realized projects.

**Table 1.** General characteristics of the selected projects realized by the authors

| DIDACTIC PROJECTS                                                                 | The applied working methods, tools and techniques                                                                 | Effects of the project / Results                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **Didactic project and student competition "Śląskie Przysiadki", Gliwice, October 2017 - January 2018** "Silesian Perch Benches" – that is how it was translated in one of the articles | **Project objective:** to design a bench for "perching" in public space while maintaining the principles of universal design, to create an attractive element of small architecture that can become an element of visual identification in public spaces of Silesian towns. | **In terms of design work:**  
• 140 variants of solutions (expert selection of the best solution)  
• realization of the prototype perch and its installation in public space  
• presentation of the effects of the competition as part of a nationwide event on design in public space  
**In terms of didactic work:**  
• introducing new teaching content into the study program, participation of external partners in didactics |
| **Student workshop 'Garden of Sensations', Warsaw, May 2018**                     | **Project objective:** creation of a garden concept at the Public Nursing Home for the elderly as a place of recreation and integration of older residents of the facility with the local community, a concept involving the development of a social garden by the students of architecture and landscape architecture | **In terms of design work:**  
conceptual development - architectural and compositional solutions, allowing for the choice of plantings with the elements of a therapeutic environment  
**In terms of didactic work:**  
formula of education through experience, acquiring competences to work in a team with specialists from other fields |
### Table 1. (continued)

| Didactic project and student competition "House in Bytomska Street", Gliwice / Tarnowskie Góry, November 2019 - January 2020 | Project objective: the concept of developing additional space in a building and in its surroundings to increase the scope of activities and social services for the elderly offered by the daycare center for the elderly, defining the potential significance of the daycare center for the local community. |
|---|---|

| The applied working methods, tools and techniques | Effects of the project / Results |
|---|---|
| **initial stage - pre-project studies:** | **In terms of design work:** |
| • qualitative research method, | variant conceptual studies on the adaptation of the attic of the daycare center building and its surroundings |
| • case study method, | **In terms of didactic work:** |
| • action research method | expanding competences in terms of the application of techniques in pre-project research and the collection of information from the users |
| • techniques: focus meeting, individual interviews, walk through, behavioral mapping, non-participant observations | |

| **conceptual phase:** | |
| consultations to assess the functionality of the solutions of the concept | |

| Architektour - workshops with Architecture students of Polish universities, Bytom, III 2017 | Project objective: to design interventions engaging the local community in Bytom in the Rozbark District and to design solutions that respond to the needs of the community, in particular the senior environment, which, according to preliminary estimates involving the development of the Municipal Revitalization Program, is most exposed to the risk of being excluded due to the lack of offer responding to their needs. |
|---|---|

| The applied working methods, tools and techniques | Effects of the project / Results |
|---|---|
| **action research method** | **In terms of design work:** |
| **talks with the users by way of the sensory mock-up of the Barbara Square (the mock-up of space using materials corresponding to different tactile sensations, engaging in conversations about emotions experienced by the users when using space)** | • drawing up concepts for the development of the Barbara Square; the concepts were used by the Municipal Administration of Roads and Bridges to develop the functional-utility program to raise funds for investments in public space. |
| **research walk with a survey done with the users Animation of children on the Barbara Square combined with the observation and interview with the children about their needs in public space** | **In terms of didactic work:** |
| | • broadening competences in the use of techniques in pre-project research and obtaining information from the users |
| | • experience gained in the creative design of research tools |

The completed didactic projects involved small-scale tasks (elements of small architecture, urban facilities with the function of care for the elderly), but the work on the selected topics always include broader perspectives, indicating in this way the social significance of the elements and solutions supporting the elderly. In the case of Silesian perch benches, the students were asked to design an element of small architecture that meets the principles of universal design and at the same time is an attractive element in the public spaces of Silesian towns. The intention of the task was to emphasize the social impact of such elements, which is a factor of comfort for the elderly in everyday life, which facilitates both moving around in the urban space and the participation in social life, which was noticed and reported by the seniors of Gliwice [13]. The project yielded 140 student works and resulted in the implementation of a prototype of one of the perch benches (the work presented in the finals of the competition) and its installation in the public space (academic campus). In the case of the other two topics - the scope of the project tasks was broader and involved the role of the facilities with care function for the elderly as integration places of the local community. The point was to emphasize that inclusive design allows the development of solutions with social values that enhance the accessibility of space and its usability. The most significant project covering that subject area was the Architektour workshop, which aimed to organize interventions engaging the local community of Bytom in the Rozbark District.
and to design solutions that meet the needs of the community, in particular those of the senior environment. In effect of the workshop, concepts for the development of the Barbara Square were realized, and the concepts were used by the Municipal Administration of Roads and Bridges to develop the functional-utility program to raise funds for investments in public space.

Table 1. (continued)

| PARTICIPATORY PROJECTS | Effects of the project / Results |
|------------------------|---------------------------------|
| Model Dworcowa Street / Access City – the diagnosis of public space done with high school students of Bytom, Bytom, September-December 2019 | In terms of design work: |
| Project objective: an exploration of public space with high school students and sensitizing high school students to the needs of people with disabilities. | • drawing up a map of places the least friendly to people with disabilities |
| Audit of public space: | • preparation of data for the architectural design project carried out by the Pronobis Studio design office. |
| • action research method | • spatial visions defining the needs to organize meeting spaces and to create a positive image of the town by adapting design solutions to contemporary trends. |
| • observations of public space users, | |
| • role playing, adopting the role of a person with limited mobility or a visual impairment, | In terms of didactic work: |
| • photographic walk, | • by adopting the roles of people who have problems with moving in public space, high school students noticed the need to eliminate architectural barriers, |
| Research on the potential of space and the needs of users: | • students pointed to the social reception of people with disabilities, |
| • surveys carried out in public space, | • they learned to name their needs, which can be met by an appropriate development of public space management |
| • design workshops with users, | |

The project "Garden of sensations" was dedicated to the Nursing Home building with its surroundings as a place of cultural and historic value, permanently woven into the history of the Powiśle District of Warsaw. The design project was aimed to develop a concept of surroundings of the said building as a social garden - a space that would facilitate the integration of the local community with the elderly and which would allow conducting programs and activities for a wider group of users. In the case of the project "House in Bytomska Street", the project’s objective was to develop additional space in the building and in its surroundings to enhance the range of activities and social services for the elderly offered by the daycare center for the elderly. In addition, an attempt was made to determine the potential significance of the Daycare Center for the local community. The City of Access project was of research character, and its main purpose was to draw the attention of young people to the real limitations faced by people with disabilities in public space. The involvement of high school students consisted in the audit of several urban spaces selected by the coordinators, in wheelchairs or with blindfolds allowing moving around the town as a blind person with a white cane and with a lower limb immobilized so as to empathize with the role of a person with a leg injury.

A group of seniors participated in each of the projects, and in the case of the social garden project in Warsaw and the project "House in Bytomska Street" also staff members were involved. The participation of those stakeholder groups was crucial at the stage of needs defining, and then confronting the assumptions and effects of the project with a group of users. In the case of the "Silesian perch
benches project (Figure 3), the workshops were held with a group of active seniors from the University of the Third Age who used urban spaces. The workshops supervised by the teaching staff (J. Tymkiewicz, D. Winnicka-Jasłowska, M. Bielak-Zasadzka, A. Bugno-Janik) were prepared and conducted with great passion by the students of Architecture. During the course, the students had the opportunity to use various research methods, techniques and tools, very useful in research studies involving the users, e.g. prototype modeling to determine the shape and to define the preferred features of the perch bench. The work on the subject of 'Garden of Sensations' was entirely carried out in the form of workshops, conducted at the headquarters of the Nursing Home in Warsaw.

![Figure 3. Workshop with a group of active seniors, "Silesian perch benches project". Photo: A. Szewczenko](image)

4. Inclusive design in didactic and participatory processes
The scale of social impact with respect to individual projects varied. The only project that triggered a universal interest was the "Silesian perch bench" project. The project can be used in any location. And the other projects were important for local communities and for the group of direct users of space. The Architektour workshops were organized in Bytom in the Rozbark District, which had been a forgotten district for years, overlooked in investment plans, including cultural and social projects. Student activities stimulated the residents (including children) and gave them a sense of importance. The attention paid by students translated into further activities for the benefit of the district, including the monitoring of investments as part of the revitalization process. We should also emphasize the effects of the 'Garden of Sensations' project as well as the projects of Model Dworcowa Street and Access City, the effects of which triggered further design activities. Although both Bytom projects were implemented independently, the conclusions worked out with young people are currently the basis for developing an architectural design for Dworcowa Street in Bytom. It seems, therefore, that the inclusion of local spatial issues into architectural education, using the inclusive design process is most useful and allows for the development of tailor-made solutions, and it can trigger further design activities. It should also be emphasized that the essence of inclusive design is to know in depth the future users for whom the project is implemented.

The testing stage of initial concepts and the verification of solutions require special care in the selection of appropriate communication techniques with users, with the elderly. For some projects, at the stage of
verification of solutions in view of their possible implementation, the participation of senior groups was limited, and the focus meetings and consultations took place with a selected group of active seniors, who had no cognitive limitations whereby they could actively participate in the discussion. Nevertheless, every effort should be made to create conditions for the participation of seniors in individual stages of the project, as well as to use the available forms of visualization of the designed solutions. Indisputably, direct contacts of students with the elderly, the use of photos, visualizations, mock-ups or spatial models help to understand the intentions of designers. What is also important is that the testing stage should be closely related to the objective of the entire project, which is often not easy to specify. Frequently, the main objective of participatory projects undergoes changes during the research phase and project development. It happens that the objective is achieved at the initial stages, e.g. establishing neighborly relations, and the architectural solution itself is only a consequence of the ongoing process.

When we talk about limitations in the realization of projects, they most often relate to the lack of time to expand research with the users, and the lack of summary and evaluation of the final effects of the project in the form of an open meeting with the users with a discussion on the real connection of their needs with students’ visions. In didactic projects, this involved organizational limitations. The participation of all project stakeholders (e.g. associated, supporting services as well those provided by persons responsible for financing the investment) is also limited, which would increase the chance of making the proposed solutions more realistic. An important limitation can be also attributed to the costs associated primarily with the testing stage. Prototypes that offer interaction and direct confrontation of the users with design proposals require an individual cost estimate tailored to the objective we want to achieve.

5. Conclusions

Based on the analysis of the carried out activities, we can conclude that the use of inclusive design has several key dimensions in architectural education:

- **Inclusive design as an action that facilitates functioning in the built environment**: care for the comfort of users: it requires knowledge of how to use space by different groups of users with varying degrees of fitness, and that is why education through experience is important,

- **Inclusive design as an action focused on the accessibility of space**: through variable accessibility, we obtain a new value of the built environment as an unbiased space, allowing the realization of goals for various user groups, as well as the introduction of new values; therefore, it is a creative process that requires seeking for innovative solutions, which implicates the stimulation of creativity and innovative thinking,

- **Inclusive design as a process involving users**: thanks to specific research tools and techniques we can obtain the most optimal solutions and an individual approach to the topic,

- **Inclusive design with the support of modern ICT technologies**, which offer the users many opportunities to compensate for psychophysical dysfunctions and related to the limitations in social life; they provide an opportunity to simulate certain solutions and create a new dimension of accessibility and quality of space; yet, they are only a tool to achieve the intended goals.

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