Universal design in the education of architecture students

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ABSTRACT: The implementation of universal design in teaching architecture is a necessary commodity for university graduates. Ensuring accessibility for people with special needs in Poland is by Act of Parliament [1]. The content of the Act refers to the definition of *universal design* adopted at the UN Convention on the Rights of Persons with Disabilities in New York on 13 December 2006. Simulation of the functioning of people with various disabilities allows designers to become aware and empathise with the user, enabling the designer to conduct an interpretative phenomenological analysis. From the perspective of shaping architectural objects, it is necessary to introduce functional and spatial solutions dedicated to seniors, based on the principles of universal design. The authors have applied analysis and logical construction to the work produced. In addition, student designs were presented and discussed, based on the principles of universal design. These were part of the course, Design Study: Housing Architecture for the Elderly.

INTRODUCTION

Universal design is a continuation of the holistic approach to shaping architectural objects. According to holism, each element of an architectural space is important and should be adapted to the needs of all users. The holistic design process is based on multifaceted co-operation and analysis. The object should be a bioclimatic design in a spatial and cultural context, reflected in its construction and installation. As well, the implementation should be a universal design. *Designing for the Disabled* by Goldsmith from 1963 is considered a precursor to the concept of universal design [2]. This issue was then developed by Ronald Mace. The universal design concept was based on inclusion of the full range of user diversity, based on physical, perceptual and cognitive capabilities.

The present definition of universal design was included in the text of the 2006 United Nations Convention on the Rights of Persons with Disabilities. According to the official definition:

> *Universal design means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design* [3].

Universal design is also associated with barrier-free design, referring to the concept of Design for All (DfA). According to the Design for All Europe (EIDD) declaration from 2004, DfA is a concept for diversity, social integration and equality, aiming to enable all people to have equal opportunities to participate in all aspects of social life [4]. A number of organisations have been created in Europe to promote and develop DfA, including the European Accessibility Network (EuCAN), Design for All Europe (EIDD) and the European Design for all e-Accessibility Network (EDeAN).

Presented in this article is a methodical and methodological way of implementing the principles of universal design in education in architectural faculties, along with examples of student projects based on this model. In addition, an educational method will be presented that involves the multifaceted implementation of universal design. Universal design is now part of student education, but it is worthwhile to emphasise its importance and necessity. The authors employed a comparative method based on conceptual designs of student semester projects as part of the course, Design Study: Housing Architecture for the Elderly. These were based on the principles of universal design as the research method. The work was conducted in the Faculty of Architecture at Wrocław University of Science and Technology (FA-WUST), Wrocław, Poland.

UNIVERSAL DESIGN AND AVAILABILITY

Universal design ensures the creation of space allowing for people with various dysfunctions. Users can be people with a wide spectrum of physical and intellectual disabilities, cognitive impairment, hearing and visual impairment, as well as autistic disorders of the development and functioning of the central nervous system. In universal design, dysfunction

should be comprehensively allowed for. This requires a theoretical approach to understanding the problems of dysfunction and perception in urban space, from the micro to the macro scale, i.e. it is important to understand the scale of operation of people with functional (physical and cognitive) limitations in public space, in multi-family housing and specialist facilities.

According to data for 2018 from the Polish Central Statistics Office (CSO), 2.5 million people in Poland were either receiving retirement and disability benefits, holding a disability certificate or a certificate of incapacity for work. In addition, in 2018/19 there were 286 special needs kindergartens in Poland dedicated to children with a disability and attended by 4,800 children. About 28,500 disabled children attended other pre-school education facilities. The number of children with special educational needs in primary education was 116,000. In 2018, there were 371 schools and educational centres in which 62% of the juveniles were intellectually disabled. Eight thousand nine hundred students attended special needs gymnasiums, and 9,300 disabled students were at public gymnasiums. Education of students with disabilities at upper secondary level was mainly in special schools, with 22,100 students. Twenty-one thousand five hundred people with disabilities studied at Polish universities in the 2018/2019 academic year, and 6,300 graduated [5].

The scale of disabled children and adults is significant and requires a special approach to shaping architectural objects, already at the conceptual stage, so as to implement the principles of accessibility. Design without barriers should apply to all facilities of education, culture, public utility, healthcare and housing. Design based on accessibility should include public spaces to take into account the needs of people with functional limitations. When implementing universal design in architectural education, attention should be paid to the needs of senior citizens aged 60+. According to the study of the Supreme Chamber of Control of the Republic of Poland based on data from the CSO, the population has been aging in the past 25 years and by 2030, 30% of the population will be 60+. Elderly and disabled people must function in everyday life. Socio-spatial barriers to this can be divided into [6]:

- Urban planning (macro-scale).
- Architectural (meso-scale).
- Items (micro-scale).

These three scales require a different design approach tailored to the needs of people taking into account each disability. Accessibility is a key element in enabling the smooth functioning of people in space regardless of restrictions. Universal design refers to spatial planning, shaping of architectural objects, public spaces and everyday objects. A holistic design approach requires theoretical and empirical knowledge of the needs of disabled people in architectural and social space.

In Poland, the awareness of shaping space, with emphasis on the needs of people with disabilities, is increasing. In 2019, an Act ensuring access to people with special needs was implemented (Journal of Laws of 2019, item 1696), in which the definition of universal design refers to the Convention on the Rights of Persons with Disabilities of 2006. According to the content of the Act, each public entity, as part of ensuring access for disabled people, is obliged to take measures to:

- Take account of the needs of people with special needs.
- Remove barriers and prevent their formation.

Entities may apply for certification of accessibility for persons with special needs [1]. Design without barriers requires understanding, sensitivity and knowledge about the functioning of people with disabilities. Nowadays, activities are being undertaken to create functional and spatial solutions ensuring the safe functioning of people with disabilities, regardless of age, gender and disability.

UNIVERSAL DESIGN IN ARCHITECTURAL EDUCATION

The education of architecture students should be based on universal design, at all educational levels. Shaping the function and form of an object and the space connecting and joining architectural objects leads to the design maturity that is an aspiration of graduates of architectural faculties. Heidegger in a lecture, *Building, dwelling, thinking,* given in 1951 in Darmstadt, spoke of the multidimensionality of contemporary architectural design. The dialectic of permanent duration and transformation between culture and time becomes important [7]. Heidegger draws attention to the multifaceted process of designing and building an architectural object.

In the context of universal design, this requires consideration of design from the conceptual through the construction to the execution phase, with particular regard to the needs of people with functional limitations and at all stages of life. Nowadays, there are seven main principles of universal design, which should be the starting point for shaping architectural objects, viz:

- equitable use;
- flexible use;
- simple and intuitive;
- clear information;

- tolerance for error in use;
- minimal physical effort required;
- good access.

The principles of universal design apply to all facilities for disabled people. Product design and implementation, from the IT interface solution to the architectural object, requires knowledge, understanding, sensitivity and the ability to *empathise* with the functioning of people with special needs. In addition to theoretical and empirical knowledge, the phenomenological context is also important, enabling empathy in functioning, life needs, fears and the expectations of people with physical and cognitive functional limitations.

As a result of many years of experience and implementing the principles of universal design for the education of students of architectural faculties, an original teaching method has been created. Universal design in education requires teaching in three areas (see Figure 1):

- Theoretical - based on precursors and the origin of universal design, principles and an international bibliography.
- Empirical - based on direct experience related to the functioning of people with physical or cognitive limitations in urban space.
- Phenomenological - based on *empathising*, which has its source in the considerations of 19th Century philosophers and theorists of culture, including Friedrich T. Vischer, Theodor Lipps and Wilhelm Dilthey, who refer to the direct experience as the essence of phenomena.
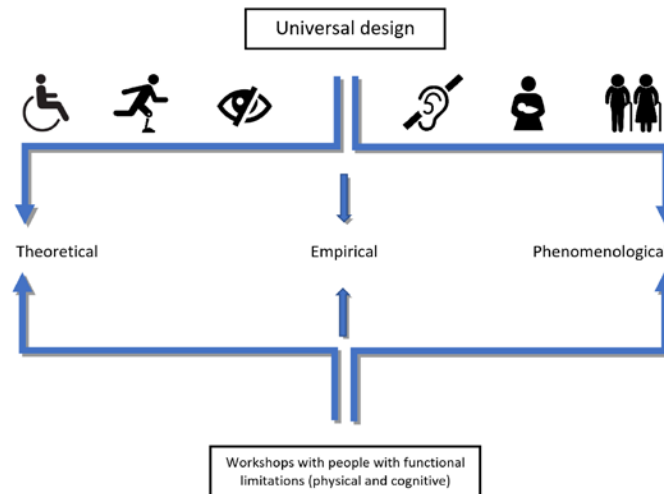

Figure 1: Universal design in education in the three basic areas (Author: A. Berbesz).

These three basic areas of universal design teaching require theoretical foundations based on design theory, sociology, psychology and medical science. All should be supported by workshop classes, with the participation of people having various disabilities using equipment to simulate the actions of people with functional limitations in architectural space.

Empirical knowledge is an indispensable element of space experience that broadens theoretical knowledge and enables phenomenological *empathy* and increased sensitivity. The three areas should be conducted concurrently, intertwined with each other, to transfer the entire spectrum of knowledge regarding the movement and functioning of people with functional limitations in residential and public spaces.

The knowledge to be transferred is underpinned by two disability models:

- Medical model - presenting disability as an individual problem, requiring medical care; a person with a disability should be treated individually with the assistance of specialist medical care.
- Social model - presenting disability as a social process and phenomenon; attention is focused on psychosocial aspects requiring individual and collective responsibility.

The main emphasis is on the social model. Activities are focused on changes in the environment and prosocial thinking to help overcome the barriers limiting the efficient movement and functioning of people with disabilities. Such a model requires significant changes in social attitudes, recognition of human rights, and minimisation of physical and psychosocial barriers [8]. The social model provides support for implementing universal design in education.

An important aspect of education based on universal design is to simulate the functioning in urban space of people with physical and cognitive limitations. According to Ceresnova and Rollova, one of the positive aspects of simulation workshops is the concentration of students' attention, not only on the visual aspect of architecture but also on multi-sensory experience involving all senses, i.e. also hearing, smell, touch [9].

UNIVERSAL DESIGN AND STUDENT PROJECTS

At the FA-WUST, a course called Design Study: Housing Architecture for the Elderly at the second level of education has been conducted for several years. Students gain extensive knowledge of the shaping of architectural objects dedicated to seniors, with a particular emphasis on universal design during the conceptual stage. In the 2018/2019 academic year, a competition for the conceptual design of a model hospice was conducted as part of the course. Students learnt of a real hospice operating in Wrocław. The conceptual work fully realised the universal design of the model hospice.

Two of the final conceptual designs are described here. One was a model hospice designed in the shape of a circle (Figure 2), with a circulating communication system consisting of three functional rings dedicated to separate zones. The central ring is the medical and administrative zone, as well as doctor's offices and pharmacy. Another functional ring is a set of rooms for relaxation and the rehabilitation of patients. The third, largest ring, was the patients' private rooms, constantly monitored by medical staff.

The principles of universal design have been applied at every level of the design: meeting the basic needs of patients, providing functionally efficient medical facilities combined with rehabilitation and private areas to meet the social, cultural and spiritual needs of the hospice's residents. Good connections were possible because of the circular shape.
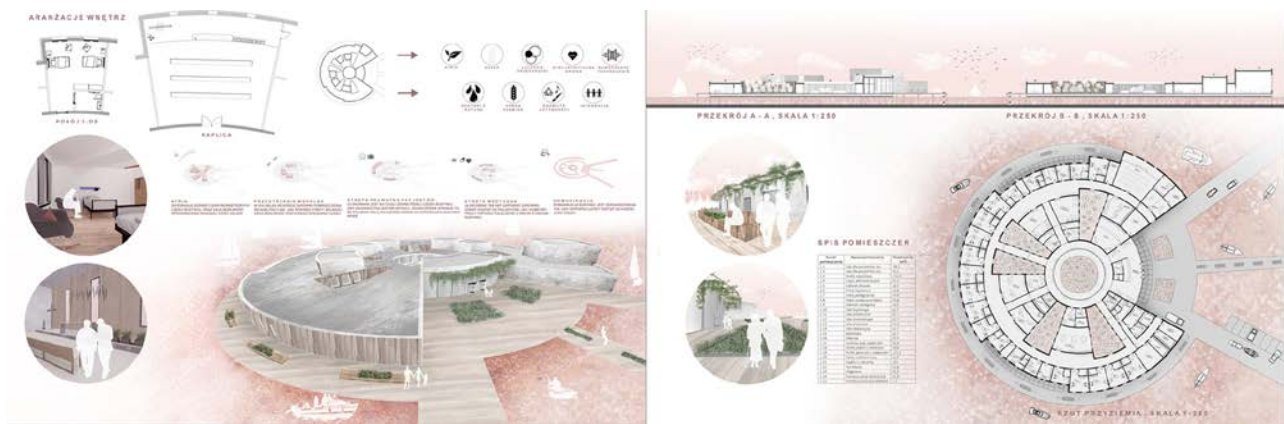

Figure 2: The model hospice (students: N. Kuropka and W. Drozda; tutor: B. Gronostajska).

The second project was based on a square projection (Figure 3). The system is two-storey, with a central part intended for recreational and cultural functions. Individual patient rooms are located on the second floor, with access by lift. The concept was created with universal design principles based on meeting the functional, cognitive, social and spiritual needs of hospice patients.
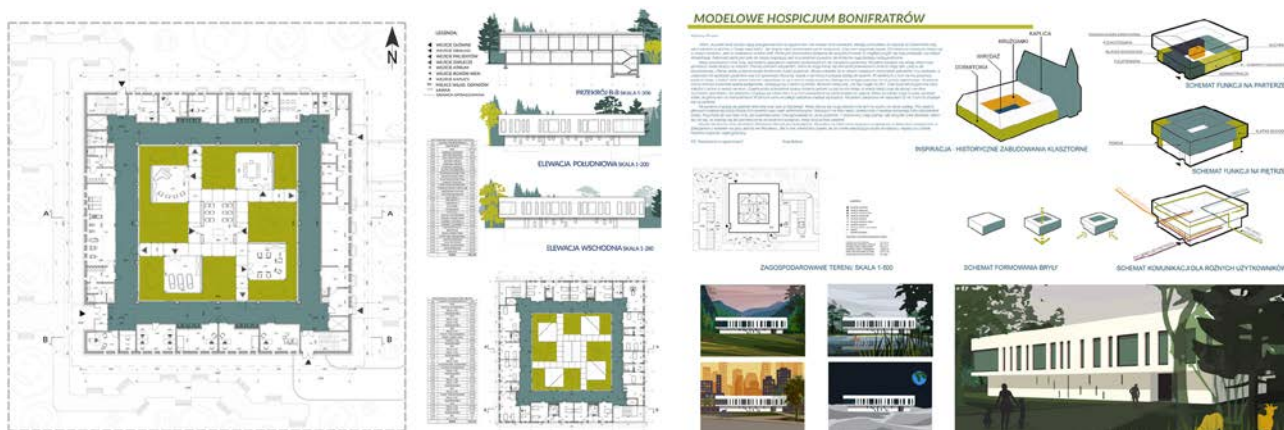

Figure 3: The model hospice (students: M. Niewiera and A. Narwojsz; tutor: B. Gronostajska).

Another example was a project to expand and adapt a hospital for the elderly in Görlitz, Germany, with universal design principles. In the 2017/2018 academic year, students learnt of the existing facility and gained an understanding of its limitations and the needs of patients, as well as medical staff. Developing student projects was a joint initiative of the Centre for the Elderly and the City Hall of Görlitz. The existing hospital was built in 1873 and served for 150 years as a facility dedicated to the elderly.

One of the projects was based on creating additional frontage from the Lutherplatz to provide a separate entrance adapted to the needs of the disabled, and increase the number of rooms for patients. The 19th Century building was

functionally connected through a glass connector. The whole structure is consistent with the historical context of the city of Görlitz and is a full implementation of the principles of universal design by meeting the functional, social and spiritual needs of older people (Figure 4).

Figure 4: Expansion and adaptation of the existing centre for elderly people in Görlitz (students: M. Wieczorek and K. Walaszek; tutors: B. Gronostajska and A. Berbesz).

UNIVERSAL DESIGN AND INNOVATIVE ARCHITECTURAL SOLUTIONS

Designing a fully available, contemporary architectural space may require adapting architecture to the effects of natural disasters and technical failures (in Polish law, definitions within the meaning of the Act on the State of Natural Disaster of 18 April 2002). The second quarter of 2020 shows the need to adapt public space to a possible epidemic threat that paralyses the functioning of urban spaces. The SARS-CoV-2 pandemic demonstrates that design needs to transform and adapt to changing conditions.

One of the possible responses to changing bioclimatic and social conditions is responsive, portable and mobile architecture, so that objects can be moved to places affected by natural disasters, armed conflicts and epidemic epicentres. Mobile and portable architecture appeared in numerous projects from the turn of the 20th Century for a wide range of functions, from housing to public utilities. Mobile medical facilities can be moved to places affected by natural disasters, armed conflicts, and so on. One of the largest mobile hospitals was Saba Palaye in Karbala (Iraq) in 2019.

CONCLUSIONS

Architectural design must reflect changes in civilisation, technological and medical progress and in the socio-psychological perception of people with disabilities. While the design approach will changing existing structures, it should focus on creating new solutions, reflecting the universal design principles. The approach to education based on universal design should include simulations that go beyond standard architectural practice.

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