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CITY – EDUCATION – ARCHITECTURE IN THE CONTEXT OF VIRTUAL REALITY

MIASTO – EDUKACJA – ARCHITEKTURA W KONTEKŚCIE RZECZYWISTOŚCI WIRTUALNEJ

Abstract

The article raises issues related to the educational role of public spaces, both real and virtual. What is a modern city? Is there a virtual, parallel city? The young man perceives the contemporary city through the lens of his experiences with it. In a real city, he often travels by car, which definitely changes his understanding of distances and connections between important points in the city. Virtual reality often replaces the personal experience of space – it becomes an important element of this education, often not intended by the creators of the virtual environment. Therefore, a re-evaluation of the existing paradigms regarding the space of the modern city and its educational values seems to be necessary, but the direction of these changes requires attention and reflection.

Keywords: educational spaces, foresight, virtual city

Streszczenie

Artykuł porusza kwestie związane z edukacyjną rolą przestrzeni publicznych, zarówno realnych, jak i wirtualnych. Czym jest nowoczesne miasto? Czy istnieje wirtualne, równoległe miasto? Młody człowiek postrzega współczesne miasto przez pryzmat swoich z nim doświadczeń. W prawdziwym mieście często podróżuje samochodem, co zdecydowanie zmienia jego rozumienie odległości i połączeń między ważnymi punktami. Wirtualna rzeczywistość często zastępuje osobiste doświadczenie przestrzeni – staje się ważnym elementem tej edukacji, często niezamierzonym przez twórców środowiska wirtualnego. Konieczne wydaje się zatem przewartościowanie istniejących paradygmatów dotyczących przestrzeni współczesnego miasta i jego walorów edukacyjnych, jednak kierunek tych zmian wymaga uwagi i refleksji.

Słowa kluczowe: przestrzenie edukacyjne, foresight, wirtualne miasto

The best way to predict the future is to invent it.
Alan Kay[1]

1. THE MODERN CITY – REAL CITY OR VIRTUAL?

The contemporary city remains in constant motion. Its dynamics depend on numerous factors – transportation, the flow of people and tourism enhance it, while gentrification,

[1] Alan Curtis Kay is an American computer scientist best known for his pioneering work on object-oriented programming and windowing graphical user interface (GUI) design. (GUI), https://en.wikipedia.org/wiki/Alan_Kay (access: 26.06.2023).

depopulation, or lack of job opportunities diminish it. New investments, renovations, and reconstructions continually change the physical space of the city, without allowing for a gradual acclimatization and learning of its functioning principles. Cities expand, sprawl, and rise upwards with the increasing number of floors in skyscrapers. New neighbourhoods, places, and landmarks are created. The rhythm of the city sets the pace of its inhabitants' lives. Various means of transportation alter the perception of distance and the ability to orient oneself in the terrain. Cars make life easier for parents, but constantly chauffeuring children to school and extracurricular activities results in the youngest citizens of the city irreversibly losing the opportunity to directly experience their immediate surroundings and develop their spatial competencies and the ability to establish relationships between its elements based on them.

In addition to physical space, a parallel layer of the city is developing – the virtual one[2]. The city buds, finding its reflection in thousands of websites, email addresses, web pages, and online stores. On Google Street View, we can see an alternative version of space, frozen at a specific stage of development or season, but at the same time, for many users, it is the most real and trustworthy. Images of places shift, giving the illusion of a virtual stroll. Like in Italo Calvino's ethereal cities[3], the boundary between what is real and what is merely an illusion, a reflection of reality, becomes blurred. Inhabitants immersed in their phones simultaneously exist physically in a particular place and are outside of it. The ability to stay in constant contact with almost the entire world, acquiring knowledge in real-time, causes the average person to no longer be fully present in the here and now.

The Covid-19 pandemic has widely opened the doors to a new, digital version of the world, thereby changing the expectations and needs of the residents. While the older generation gladly abandoned digital conveniences after the end of the epidemic (along with the restrictions), representatives of younger generations are increasingly eager to explore the possibilities hidden behind new technologies. Video conferences, chats, shared files replace direct communication, and any point with internet access becomes a place of work. Artificial intelligence and GPT chat challenge the role of traditional education. These changes, although sometimes difficult to accept, become part of the present and, perhaps more importantly, they transform the environment in which future generations are growing up.

2. SPATIAL EDUCATION IN THE CONTEXT OF CHANGE

The development of spatial competencies and the acquisition of visual-spatial skills begin from an early age. The environment in which a child grows up has a significant impact on this process, in addition to genetic factors. Access to toys and educational games, puzzles, building blocks, and other objects that stimulate spatial thinking can help in developing this type of intelligence. However, direct (independent) exploration of the principles governing space is also of great importance. This process usually occurs spontaneously through a child's daily interaction with their immediate surroundings: the family home, the backyard, the streets, the playground, preschool, and school, as well as on an urban scale – the family's town or village.

[2] W.J. Mitchell, *City of Bits*, MIT Press, Cambridge 1996.

[3] I. Calvino, *Niewidzialne miasta*, Grupa Wydawnicza Foksal, Warszawa 2013.

Individuals with high spatial intelligence[4] are able to pay attention to the details and features of their environment: colours, patterns, and shapes. Although according to Gardner's theory, different types of intelligence are not subject to evaluation (each person has their own intelligence profile and develops according to the resources provided by nature), it is possible to influence the improvement of competencies in a particular area by selecting appropriate stimuli during the period of heightened development. Providing children and youth with diverse spatial experiences and supporting their actions in this regard (by complementing the cultural-historical context, indicating non-obvious connections between different elements of the environment, etc., providing high-quality aesthetic experiences) will enable them to fully utilize their potential in the future and appreciate the merits of well-designed surroundings.

Additionally, the development of visual-spatial intelligence positively influences other aspects of education, such as problem-solving abilities in mathematics, creative thinking, and creativity. Visual thinking can lead to innovative approaches to solving abstract problems and generating original ways to develop new theories. From a psychological standpoint, the impact of spatial competencies on shaping one's own "self" awareness (body awareness) may also be significant, which, in the broader perspective, can influence the development of characteristics such as one's placement in society, level of social integration, self-realization, and personal growth.

On the other hand, limited spatial experiences (e.g., through aesthetically and spatially deprived environments, lack of independence, excessive safety control, disruption of spatial continuity – car, subway) can lead to underutilization of the potential of children and youth, reducing their planning and anticipatory skills in various domains, and ultimately, cultivating a society with limited spatial competencies and a low awareness of the significance of well-designed space.

While it is evident that a society requires individuals with diverse competencies for proper functioning, enhancing the level of spatial intelligence remains in the broader societal interest – from the benefits of living in well-designed environments to a greater awareness of the consequences of decisions regarding spatial organization, including in the context of ecology and climate change.

The role of virtual space, also known as virtual reality (VR), in the development of spatial competencies is difficult to assess unequivocally today. On one hand (typically from the perspective of individuals born before 1990), it is seen merely as an addition to the physical world, mostly associated with entertainment and short-term experiences that do not leave lasting effects. On the other hand (especially for younger people born after 2000), it can be a significant extension of physical space that competes with real-world experiences. If we consider the definition of spatial competencies as the ability to understand, interpret, and manipulate space, the ability to orient oneself in space and perform tasks related to it, virtual space can effectively serve educational purposes. It provides users with realistic and interactive spatial experiences that can influence their perception and development of visual-spatial intelligence. Virtual reality offers simulations of various experiences in an immersive and realistic manner. Users of VR gaming can explore three-dimensional environments,

[4] One of the eight types of intelligence, according to the theory of multiple intelligences, developed in the early 1980s by Howard Gardner. H. Gardner, *Multiple Intelligence: New Horizons in Theory and Practice*, Basic Books, New York 2006.

observe relationships between elements, their structure, and develop the ability to recognize and understand space. Solving tasks related to directions and location helps shape skills in navigation, map reading, and spatial orientation. The opportunity to practice different versions of spatial simulations, such as in games related to space design (e.g., Minecraft VR, Job Simulator, Tilt Brush, Fantastic Contraption, Sims), positively impacts the development of spatial thinking skills and understanding of proportion and scale. Additionally, some applications utilize miniature models of real cities to create realistic environments, allowing users to familiarize themselves with their architecture and urban layout (e.g., Microsoft Flight Simulator, Google Earth VR, Cityscape Repairman VR). In adventure games, creators of virtual environments often strive to maintain the authenticity of architecture, street layouts, landmarks, or the atmosphere of a particular city to provide players with a more engaging and immersive experience (e.g., Assassin's Creed, Grand Theft Auto) – although it is important to note that these examples may have less educational value due to the presence of violence and behaviour inconsistent with ethics and laws.

Looking at the continuously rapid development of the VR gaming industry, it can be predicted that their impact on the spatial education of future users in real cities may be significant in the future. However, in addition to purely entertainment products, there is a range of other products that complement the above offer and undoubtedly influence the changing approach to VR and the increasing influence of virtual space on the lives of contemporary urban residents. These include various simulators that allow for effective training and improvement of specialized workers in safe conditions – ranging from transportation, aviation, and aerospace to medicine and construction. Even modern spatial planning and architectural design increasingly utilize the possibilities offered by virtual reality, enabling the real-time exploration of designed spaces, often using VR goggles. The growing availability of spatial scanning options (laser scanners, RGBD cameras, or photogrammetric scanners), including the use of mobile phones (LIDAR), allows for the creation of photorealistic visualizations of planned spaces or reconstructions of non-existing or deteriorated objects. This can be particularly significant for locations with high cognitive values that are inaccessible or threatened with destruction – by placing their virtual reconstructions in the Internet space, people from around the world can visit landmarks, ruins, or museums, and closely observe works of art without the need to change their physical location. Virtual reality enables the experience of space not only in three dimensions but also in four dimensions (time) – all phases of the creation of a given object or complex can be recreated, along with showcasing the historical context of a place. From the perspective of spatial education, this can be an invaluable source of experiences and knowledge acquired in the simplest way for young users – through direct experience.

All of the above tools allow for the expansion of real experiences by exploring physically non-existent spaces, building real experiences that impact the development of cognitive competencies in users. Ignoring their influence on the development of spatial intelligence is currently impossible. At the same time, the extremely rapid development of the VR industry poses both opportunities and threats to architectural education. Virtual reality does not adhere to the laws of physics – although they are partially replicated by its creators, there is a risk that in real-life situations, virtual experiences may fail, causing minor or major damage. It is important to remember that the intention of VR creators is typically not to faithfully replicate the real world but rather to create a realistic and coherent vision that achieves the desired effects for a given application, sometimes omitting less significant elements. Contemporary

VR environments do not assume that they will be the primary source of knowledge for users, although this may change in the coming years given concerning trends among children and youth. Even preschool children now use applications utilizing virtual reality, often replacing traditional toys such as puzzles, building blocks, or colouring books. On a tablet's surface, children can "experience" interactive adventures, solve puzzles, and sometimes even create three-dimensional sculptures or experiment with various artistic expressions. However, it must be remembered that such interactions cannot replace real experiences that often require increased effort and involve physical contact with materials such as clay, paint, paper, brushes, etc. Awareness of the consequences of lacking such experiences is essential for parents and educators; otherwise, future generations may lose the necessary skills for proper spatial experiences, such as developing fine motor skills, the ability to experiment and experience different textures, patience, and collaboration. The absence of reference to real experiences can lead to errors in perception, visual-motor coordination, and manual dexterity.

However, what is characteristic from the perspective of architectural education is that the consequences of the changes occurring today in both the physical and virtual spaces of cities will only be visible in the next 20–30 years. The current urban residents mostly developed their spatial competencies before the technological boom, internet maps, and the aforementioned applications. Their aesthetic sensitivity and visual-spatial intelligence are often the result of years of practice and gradual improvement. What defines the standard of living for children and young people today – the lack of the educational role played by the streets, squares, or playgrounds, the constant connection to the internet through mobile phones, the absence of chance interactions with peers, transportation to schools and kindergartens, the ubiquity of virtual reality – was unimaginable just a few decades ago.

The Covid-19 pandemic, along with the intensification of activities in the virtual world, has shown that the spatial context of life, including education, can change in an instant. The effects of this situation are difficult to predict today, but they indicate the need to consider the perspective of time and attempt to predict future phenomena in spatial planning, so that current actions can be appropriately planned. It seems indisputable that the existing paradigms regarding the spatial aspects of the contemporary city and its educational values should be reassessed, but the direction of these changes requires additional attention and reflection.

3. FORESIGHT-TYPE RESEARCH – STUDIES ON THE FUTURE OF CITIES

Thinking about the city in the context of spatial education requires a change in the time perspective. The contemporary city is already educating future generations of residents, just as today's schools are educating workers whose professional careers will begin in 20–30 years. Studies on the future encompass planning, precognition, and futurology – building hypotheses about the future allows for choosing the most advantageous options and finding ways to implement solutions that will guarantee further development. The idea of foresight research appears to be an interesting proposition for architectural design and spatial planning research as well. Every present investment has a real impact on the future. Foresight originates from the need for a critical analysis of the consequences of contemporary actions in terms of their influence on future reality – it looks to the future, but always refers to current decisions. The goal is to apply research results – implementing specific

actions for entities, which will ultimately allow the envisioned future vision to be realized. Scientists, specialists in various fields, and decision-makers are invited to the discussion. The proposed solutions usually affect many areas of operation – from economics, politics, and broadly understood science to spatial planning, architecture, and construction. At the same time, there is a strong emphasis on education – both as an element to convince society of the sacrifices resulting from the necessity of implementing less popular solutions that require sacrificing comfort or generating additional costs, and as a means of educating future generations.

An interesting example of conducting this type of research is the development of future visions for cities. This goal guided, among others, the Saint-Gobain Group in creating the report "Polish Cities of the Future 2050." Experts from the Polish Society for Future Studies were invited to collaborate on the project, and the final study focused on the future of several major Polish cities[5]. The experts developed three parallel future scenarios and, for each of them, elaborated on the characteristics of the actions taken in the areas of housing, work, water-sewer infrastructure, transportation, education, and recreation. The presented scenarios are not wishful thinking – they often describe a somewhat pessimistic vision of a possible future, hence in the extended version, the experts focused on identifying solutions that, although not yet common, have the potential to improve the situation in terms of building structure and equipment.

Conducting research in the manner described above also has a significant impact on spatial education. Discussing various scenarios allows for better planning of future actions, convincing others of their validity, and when conducted at the school level, it ensures societal support for planned actions. Unfortunately, this is a lengthy process that requires meticulous long-term planning: a continuous cycle of design-program-implementation-education with effects manifesting in adulthood, a time frame of at least 20–30 years. Reality shows that such actions in education are rarely taken, and the implemented changes often indicate a lack of planning and thorough decision-making. Most reforms do not keep up with the changes occurring in the surrounding world, fail to adapt to the evolving reality, and do not project into the future beyond a few years. The virtual space of the city allows for a shift in thinking about spatial education. In this concept, the city's plane becomes a gaming plane, an internet connection, a means to explore physical places, but also to explore and build non-existent places that do not adhere to Newtonian laws of physics.

Foresight methods[6] utilize various actions that can also be helpful in building scenarios for the directions in which a city could develop – including its part that is not based on physical space. These methods allow for scanning current trends and analysing user preferences, new technologies, and tools that can influence their development. Mapping key stakeholders (architects, educators, users, software producers, programmers – using the Delphi method) can aid in better understanding different perspectives and identifying potential threats. The use of a matrix for identification, verification, and systematization of possible development directions, and ultimately for selecting key solutions that should be

[5] Warsaw, Katowice, Wrocław, Gdańsk, Kraków, Poznań, Łódź, based on: Saint-Gobain, *Report Polish Cities of the Future, 2050*, https://www.saint-gobain.pl/sites/sgpl.master/files/Raport_Polskie_Miasta_Przysz%C5%82os%CC%81ci_2050_-_strony_B5_-_29.06.2022_poprawiony.pdf (access: 23.06.2023).

[6] On the basis of a study 4CF, The Futures Literacy Company, https://4cf.pl/metody-foresightowe (access: 23.06.2023).

considered when planning the spatial development strategy of a city (physical and virtual), can also be helpful. Looking into the future largely relies on detecting "weak signals" of change. These can be any signs indicating the possibility of significant events that can change the world, such as the emergence of the Internet or smartphones. They are often imprecise and difficult to perceive. Developing different scenarios allows for better adaptation to changes, preparation for them, and optimal utilization of emerging opportunities while minimizing the associated risks.

4. SUMMARY

A person perceives the city through the prism of their experiences with it. Nowadays, in the physical world, people often move in ways that do not allow for a personal perception of space – by car, bus, or subway. This significantly hinders the experience of real distances and connections between important points in the city. A similar impression can be felt by a traveller when they suddenly emerge from the dark space of the subway into a sunny square dominated by a cathedral – a square whose connections to the rest of the city, its centuries-old tradition, and urban concept will remain hidden unless they make the effort to explore further. Virtual reality complements personal spatial experiences and has become an important element of life. Long journeys, which just a few years ago were marked by a great deal of mystery, now become as simple as a trip near one's place of residence. Modern technologies provide direct insight into many aspects – one can see the place where they will be staying, check public transportation, find a restaurant, view menus and prices, and see user reviews. On Google Maps, one can see where the bus we are waiting for is, rent a locker for luggage on a website, or purchase a ticket.

The appearance of the city of the future depends on many factors. Foresight-type research allows for the generation of knowledge and information that can serve as a basis for making strategic decisions when designing new activities in urban spaces. This also applies to new technologies and the generation of virtual reality. However, it is important to remember the limitations arising from the speculative nature of such considerations, resulting from the difficulty of forecasting and the large number of factors that can change the future. Foresight research should be regarded more as support for making strategic decisions, but at the same time, flexibility should be maintained, and planned actions should be monitored and adapted to changing conditions.

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