Adapting the architecture of school buildings in the context of humanizing the environment

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Abstract. Designing a modern school space includes focusing on certain models of education. The sheer volume of projects over the past few decades shows numerous ways in which the artificial environment shapes the educational experience of schoolchildren. We argue that the development of school building architecture is insufficient without considering the possibility of education for the disabled. New approaches to the adaptation of the children's environment dictate the mandatory inclusion of children with disabilities. The article forms design techniques that meet the requirements of universal design. Currently, architectural design is based on the use of environmental factors. The study examined the impact of the urban situation, the natural environment and accessibility for all. These aspects allow you to create an interconnected structure of the school development environment. The proposed elements: identity, sound and light comfort, proportionality and clear navigation, are the criteria for assessing the accessibility of a school building.

Keywords: Childhood learning environments, Universal design, School architecture, space adaptation, Accessibility, Architectural techniques.

1 Introduction
The modern world is changing rapidly and these changes affect the improvement of the educational and developmental area. Rich, transformable, multifunctional, variable and accessible- such an environment is necessary for modern children. They are much more responsive to changes in their environment than adults, and are highly dependent on spatial conditions. During training, the child receives basic knowledge and develops a specific behavior model. Modern educational space should be saturated with all socialization systems.

The history of the emergence and development of educational spaces coincides with the history of humankind. The evolution of the educational environment clearly reflects the specific features, main stages and patterns of human history. In ancient times, humankind had a need to prepare children for independent life, to pass on the accumulated experience to them. This was carried out in the process of the natural course of life in the family and community, when the older ones taught the younger ones, introduced them to work, and instilled the necessary skills. Communication developed in the course of work, it became one of the main means of influencing the development and behavior of children. In the future, education was an inseparable part of the formation of a person and society, the system of social inheritance.

The current situation in Russian education is characterized by intensive search for ways to update its content, the creation of original methods and means of upbringing and training, the use of new forms of organization of the educational process. The experience of developing foreign preschool education is actively used. In Russia, special attention is paid to the comparison of various aspects of home and social education, and new types of institutions are emerging that focus on the individual characteristics of the child. In this regard, we consider combining the education of healthy children and children with some problems of physical development. In the school environment, such trends are directly related to the desire to improve the general level of development of children, to reveal different abilities of the child.
2 Materials and methods

2.1 Theoretical framework

Necessary to use all methods to adapt the architecture to the environment of human activity who has special requirements for it. It will focus on adapting the development and learning spaces for children with disabilities. The wide range of social life that people with disabilities take part in proves that the majority of foreign countries that have adopted the UN Convention on the rights of persons with disabilities have approved the principles of universality of the environment. They are the basis for States' policies towards persons with disabilities. A significant role in this is played by the artificial environment, the creation of stylistic features of the environment [1, 2]. The importance of space ergonomics in modern research has a very wide range—from the design of the urban environment to the ergonomic principles of housing design. Ergonomic design principles are the main ones for creating comfort. Aspects of the influence of various internal architectural spaces on subjective feelings are studied [3, 4]. Design approaches also take into account the peculiarities of building sensory and visual spaces, including in children's educational institutions. With regard to child disability, social policy aims at the development of a disabled child. This involves a whole network of rehabilitation and psychological centers. Their location should be considered as a resource for urban planning [5, 6, 7] schools and colleges have special classes that consist of children with various physical disabilities, and there are classes that teach only a few children with disabilities. If it is not possible to fully include a child with serious intellectual disabilities in the General education system, the organization of special schools provides the necessary educational conditions. This practice of maximum inclusion of children with disabilities in the General education system distinguishes most developed countries: Australia, the United Kingdom, the United States, Germany, Belgium, Italy, and others. Today, a wide range of social priorities and areas of public consciousness include the needs of children in developing spaces where they will be comfortable and safe [8, 9, 10].

Automation systems study people's habits, movable mobile walls turn rooms into free spaces, and solar panels move to track the sun. But adaptability is not always a technology. In an artificial environment, static, non-functional spaces are often created that do not meet the age development of children [11]. The adaptation of the architecture of educational spaces directly depends on the learning process and the formation of the child's personality.

2.2 Architectural models of adaptation

In the modern world, educational and development spaces are organizations with specific purposes, tasks and functions. But at the same time they differ significantly from each other: the ways of organizing activities, the means of forming the architectural environment. Often such means are methods of including children in the environmental planning process [12].

The search for new and differentiation of established methods of forming the architecture of children's spaces is dictated by the need for a variety of architectural environments, the significance of its influence on emotional and behavioral perception in a dynamic transformation of the surrounding world.

Schools in America, Europe and Asia were considered in the course of research on this theme. The article presents typical examples of modern buildings for children's spaces.

In California there is an independent alternative school that uses the educational model of the pedagogy of Rudolf Steiner. The school's design includes a corner roof that gives each interior room a different shape. The plan was also designed so that each room avoids similar forms, instead creating a variety of open and personal areas for learning. The large school complex is located in the immediate vicinity of a large lake and is surrounded by a park. It uses the principle of interaction with the environment, which emotionally affects a particular person. When developing the project, the architects sought to design a building with a positive impact on the surrounding area.

There are examples of developing children's institutions with sustainable design in mind. The project in Vietnam aims to create a model of sustainability that takes into account the characteristics of the tropical climate, which allows children to acquire the necessary environmental skills and
knowledge from a very young age. Similar ways of interacting with the natural environment can be traced in the earlier years of formation of education. They were often formed in rural regions, stimulating classes in agriculture [13]. The roof surface is covered with grass and plants, so an additional green space with beds is created. Climbing to the roof is possible from both sides on the ground, providing easy and safe access, which is an important requirement. All internal rooms are spacious, with large openings and a free layout of spaces flowing into each other. Thanks to the light, numerous niches, window and door openings, cabinets visually seem more spacious. The techniques mentioned above help children develop creative thinking and imagination, which contributes to motivation for learning and development.

In Denmark, a gymnasium was designed with the principle of visual interconnectedness in mind. Here, instead of traditional classrooms, open classrooms are preferred. In other words, the open space approach is used, where the internal environment is one large room, almost without partitions and doors. One class moves smoothly to the second, the second-to-the third, and the third – to the entertainment and recreation area. In reality, this architecture helps to develop creativity, self-education, interdisciplinary approach and social skills.

The application of behavioral characteristics of young children (5-8 years old) is reflected in school projects in the Netherlands and France. The form of the Galjoen School in the Hague is made in the form of a crocodile, which, according to the designers, makes it more attractive to children. The school building is low, without stairs, in order to make it easier for children to move from class to class. Safe playgrounds are also part of the concept, which has a beneficial effect on children of different ages. Various forms and functions of the architectural environment, compositional solutions subconsciously cause changes in the psyche, leads to positive emotions and feelings in this building, as well as in similar spaces.

The French experience is also represented by a small two-story school for young children. Ergonomics of spaces is expressed in accordance with the proportions of the child; that is, doors, Windows, interior, various architectural elements are planned for children of low growth. One of the building's facades is set with Windows of different sizes, located at different angles in order to get as much sunlight as possible. The main courtyard is located in the center of a two-story building and is designed not only for outdoor games, but also to focus sunlight for natural interior lighting.

The analytical result for architectural models received a number of criteria (Figure)
3 Results

Based on the study of objects of developing and educational spaces, the categories of factors that are necessary for the formation of a favorable adaptive-developing environment are identified. The basis for determining the location of the school, its proportionality to the environment is the *Urban Planning situation*. The natural and landscape aspects are justified by it. The location factor determines the distance of the object from the city center and busy highways, the presence of social infrastructure nearby, and other conditions. The study showed that all analyzed children's educational spaces are located on the territory of the city, or at an average distance from it. A comprehensive assessment of landscape and climate design features is the basis for further development of options for functional zoning of the territory of the selected site. In the context of green landscapes, the values of attractiveness and stimulation in the form of sound comfort, sound orientation, and sound diversity are used [14].

Studies of the potential of the city’s territories justify the use of ways to create a navigation system of architectural and landscape dominants, "inner streets" of public open spaces that provide comfort of movement around the city. In the architectural and artistic aspect of the design of accessible environment, there is a need, along with the features of typological signs of construction, to identify individual characteristics of territories, buildings, and environmental objects. First of all, it is the attitude of city residents to the architectural environment, the manifestation of certain patterns and behaviors. By anticipating and using techniques and methods to create an identity of a place in the life activity of children, it can improve the comfort and safety of staying on the territory, change the architectural environment and behavior of the child in it. In this area, architectural science finds new forms of creative interaction with other fields of knowledge, such as sociology, psychology of perception, medicine, cultural studies, and others [15].

The *Sustainable design* is interaction with the natural environment. An environmental situation is defined as a particular state of the environment caused by the interaction of nature and the activities of a child. All this determines the ecological relations of the children's environment with the natural environment [16, 17, 18]. Open spaces and interaction with nature are important environmental factors that influence the organization of children's space. Methods of interaction with the territory can be traced not only in the external environment, but also in the interiors. To do this, visual and spatial connections are made as diverse and open as possible, with the elimination of visible barriers. This method the openness of the planning structure of children's developing spaces.

Accounting for climate conditions is characterized by features due to changes in the background conditions of the regional climate. Knowing the characteristics of the environment state and having various recommendations for its improvement, possible contradictions are taken into account. Spatial solutions using modern technologies lead to the appearance of new architectural forms and original planning techniques [19]. When designing small schools, an important condition is the abundance of lighting. For example, in French schools, a large amount of natural light is a prerequisite for adaptation. This is done by wide anti-aircraft lights, a combination of smooth shapes and rounded upper Windows that create sufficient illumination in the daytime.

Energy-saving and resource-saving technologies are an important condition for adaptation. Their organization and implementation are an important stage of modern design. In projects of European schools use the basic technique of sustainable design: solar panels installed in the southern part of the building provide more than half of the required electricity for heating.

The *Universal Environment* is shaped by architectural features that can affect our feelings and influence our behavior. Different types of rooms can correspond to different behaviors and learning styles. The light of a table lamp in the dark may be preferred by one person, while the other requires a large amount of natural light. Some people like small spaces, while others find their own space in large open spaces. That is why the best learning environment is formed in a diverse space in which the child can find a preferred place.

The spatial planning aspect of design in the organization of accessibility is a fundamental and integral factor that determines not only the possibility and convenience of life activity in buildings, but
also the humanization of the artificial environment. Spatial accessibility is based on the principles of universal design. They do not exclude the use of special devices, but they do not distinguish any group of users of the artificial environment. At the same time, warning devices are used for safety in areas with large crowds. Spatial accessibility is always related to the processes for which functional zones are intended [20, 21, 22]. This can be movement, waiting, communication, learning, and so on. Therefore, in accordance with each action, its own algorithm for constructing an environment with accessibility conditions is developed. The activity of a person with mobility restrictions will require the correct distribution of human flows in the building, taking into account the size characteristics of the premises and functional areas. In architectural - spatial schemes are developed: access to premises, communications, the most direct and understandable ways. Thus, the universal design is implemented according to the principles of flexibility, sufficiency of size and space.

4 Discussion
The study of adaptation techniques that are used in spaces for children with physical or mental disabilities is a continuing topic. Dimensional characteristics of the premises are determined by the capacity of the classes and anthropometry. They are known quantities. A more difficult solution would be not to increase the physical dimensions of the spaces, but to adapt them using design ideas. The expression that "everything in the world is relative" was the most correct designation of the humanization of architecture. The types of criteria for assessing architectural adaptation have helped to develop factors affecting school spaces.

5 Conclusion
The study reinterpreted the adaptation of school buildings as a developing environment. The rejection of the traditional approach to design focuses on the learning process itself. Today it should be considered as a continuous incentive to communication, which occurs not only in the classroom, but also in the dining room, recreation areas, the surrounding area, etc.

The model of the developing educational environment is seen in the systematic application of the principles of architectural and urban planning aspects. The main idea is to create an effective, comfortable and favorable environment for learning and development by means of universal design. In particular, the most significant results of adapting school buildings are achieved by techniques that provide intuitive clarity. This allows children who have difficulties in orientation and perception of sensory information to more effectively master the artificial environment, and healthy children to be involved in humanization.

Many ways of building a space that forms an accessible environment are necessary when designing comfortable and ergonomic areas for children with mental and physiological disabilities. For this purpose, use dimensional characteristics, optimal visibility zones, color and noise comfort, tactile diversity, illumination, architectural and spatial clarity of the artificial environment. Accessibility is best demonstrated when it is "embedded" as an integral part of the design and construction process.

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