Modern Models of Public-Communication spaces of General Education Establishments within the Process of Social Adaptation of Students

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Abstract. The article is devoted to the issues of formation of internal and external public-communication spaces in civil buildings, in particular, during the development of spatial planning decisions of general education establishments. The possibilities and conditions for the formation of the project potential using innovative engineering technologies that undoubtedly determine the life cycle of the building and its further typological development are considered. The main factors that determine the relevance of the problem of communication and coordination of information and cultural relations, especially in educational buildings, are given. These factors allow to evaluate the need for investigation of stated problems. The idea of a school building as a standard organizational structure with a set of core functional blocks tightly interconnected can be reconsidered and substantially supplemented. To a large extent this concerns issues of personal and public communications, which are doubtless important for all potential participants of the educational process and for the development of educational programs. The article presents typological analogs from the world design, architectural and construction practice, as well as the results of the research and project approbation of the model of the ecopositive school building on the criterias of sustainable development, as part of the residential area of the perspective construction of the village "Polevodstvo" in the Yekaterinburg (Russia).

Keywords: school building, eco-sustainable architectural environment, social and communication space, forum, interactive ladder, social adaptation.

1. Introduction

In the modern society, one of the main tasks in the field of architecture is the creation of a comfortable environment for people, in other words, a harmoniously organized eco-sustainable architectural environment, as the surrounding space, along with the functional component, affects a person's well-being, emotional state and his formation as a person. Particular importance in matters of social adaptation in the process of forming the architectural space of most public buildings is assigned to its important component - public spaces. "Public space is a space for communication and social activity, organized in accordance with the dominant function" [1,2,3]. At the same time, the public space is projected as elements of the general communication inside bonded framework system and by filling it

with new meanings it transforms to public-communication space. The influence of social factor and the aspects of the formation of public spaces can not be underestimated - this is expressed in the phenomenon of reproduction of the public sphere as a whole, when people go beyond their usual social circle and expand it, they must correctly react to other types of behavior, preferences, ideas and traditions. There social interactions occur on the verbal and non-verbal levels [4, 5].

Within public spaces classification mostly sporting and entertainment facilities, museum-exhibition, cultural-leisure and commercial buildings, multifunctional complexes, including universities, are considered. In the buildings of general education establishment, spaces for communication are especially necessary, since students spend most of their day at the school. Today these spaces actively "participate" in the process of education and upbringing. Modern models of the organization of public spaces are quite diverse. It can be various internal and external spaces, including atriums, open courtyards-atriums. All of them with the right organization can become a recreation, a place for holding social events, a center for communication, contacts, meetings, birth of ideas.

2. Russian and world practice of organization of internal public spaces

Particular importance in the organization of public spaces in the educational building is given to qualitative characteristics: universality and ability to layout transformations. In the same way are organized forum spaces (forum - the area where public life was concentrated in the cities of ancient Rome) in educational buildings. In the educational institutions, the forum can be organized in the zone of a concourse group or in a general center of school, integrated with the foyer of the assembly hall, combined with a winter garden or an exhibition hall [6]. This is how the transformation and universal use of them for different scenarios of "school" life takes place. Often the forum becomes the core of the complex volumetric and planning structure of the school building, the center or one of the centers (branched compositional scheme) of communication and bond structure. It combines the main functional blocks, creates the formative accent in the constructive structure, in the interior and exterior appearance, thus defining its spatial morphology. One example of such public spaces is the courtyard, an open or enclosed atrium courtyard; the size, shape and design decisions of which depend on architectural and planning, constructive solutions, climatic and historical factors, as well as from the design assignment and the author's concept.

Figure 1. Atrium of the school in Erestad (http://boombob.ru/img/picture/Oct/15/650b9ee737cd84ce8bbf4a0b412e8be7/9.jpg).

An example of such a solution is the school of the architectural bureau Tate Snyder Kimsey "Silverland" in the state of Nevada, USA (Fig. 1). The courtyard under the open sky unites the dining hall, the media center with a reading room, a sports zone, a cinema under the open sky. The open multifunctional space of energy efficient and full light of the school becomes not only a recreation

place for rest and communication, but also a site for various school and social events. Public spaces in the form of amphitheaters and open "interactive" staircases are widely used in the planning of a school building. Architects combine these forms of organization of space with various methods of natural lighting. In addition to all the known advantages of atriums from the point of view of creating physical comfort and planning organization of the internal environment, they meet the criteria for organizing a modern public space - "transparency" and openness, visual communication with the environment. In many countries, school buildings use the already widespread spatial planning approach: a large single space surrounded by game and studying zones (rooms) of various occupancy that are able to transform depending on the changes in processes or their participants, from local and group to public spaces. The innovative project of the architectural bureau 3XN for the Danish gymnasium in Erestad (the district of Copenhagen) is a large space in which study areas are located around the main atrium with a staircase. The concept of design embodies the idea of the unity of teamwork and own thinking (Fig. 2).

Figure 2. Atrium of the school in Erestad (http://boombob.ru/img/picture/Oct/15/650b9ee737cd84ce8bbf4a0b412e8be7/9.jpg).

In 2016 in Irkutsk (Russia) the Danish company CEBRA developed the innovative project "Smart School". The round shape of the building symbolizes the "unifying community" (Fig. 3). The separately standing volumes are united in a ring under a common roof and are grouped around the open courtyard. The internal space in the open air is the central connecting point of intersection of spatial and functional connections. The peculiarity is that this is also a training area for classes [7–9]

Figure 3. The project "Smart School" in Irkutsk, a general view **(**https://ru.wikipedia.org/wiki/Умная_Школа**).**

According to the authors of the project, the circle symbolizes the unity of people and involves all students in the learning process [10].

Particular attention is devoted today to the semantic organization and design of internal open staircases, which are not only constructive elements for uniting levels in a building, but also in a certain sense a "uniting" social space for its inhabitants, a sort of "vertical place" for all-round communication, exchange of information and ideas. Students will always prefer the stairs to elevator, since are located in an attractive atrium space of three or four storey school buildings. "The ladder of the future" should look like this - "active", "information", as a symbol: "a ladder to the heights of knowledge." This, of course, is about ladders not included in the calculation of evacuation routes in accordance with fire safety standards. Such stairs also require safety in case of fire or emergency. This is due to the use of modern technologies: the use of fire curtains, the design of structural elements of stairs with the necessary requirement of fire resistance, the use of modern systems of automatic smoke removal and fire alarm.

"Greening" of atrium spaces by creating internal landscapes in school buildings is becoming especially urgent today. Mini-greenhouses, winter gardens, green corners (Fig. 4) serve as recreations, biodiversity laboratories or aquaponics (technology of growing crops). Through these buffer zones an integration of natural components into the internal environment of the building is happening, a semantic and visual connection with nature or urban environment is born [8].

Figure 4. The project "Smart School" in Irkutsk, a general view **(**https://ru.wikipedia.org/wiki/Умная_Школа**).**

The above-mentioned planning elements under the general name - forums, besides the organization of functional and visual interrelations of the internal premises, play the role of social and recreational zones of public activity and social adaptation of all participants, and in a certain sense are an extracurricular continuation of the main educational processes in the school building. In other words, the internal space should be as open as possible, have many inputs and outputs, be "transparent and responsive", while functionally zoned and have a flexible zoning structure. Although vertical communications and the supporting framework are among the least variable elements (anchors) in a building, they, at the same time, play a key role in the proper formation of public spaces. These qualities to a large extent determine the *planning potential of the building* as a basis for transitional typological development, and meet the basic criteria of eco-stability and viability of the architectural object.

3. Methods of research

The authors of the article have investigated modern trends and problems of the formation of a school building in the context of an interconnected and integrated system: participants - processes -

architecture - eco-sustainability. Considering the school as a social institution, a modern strategy of research in this field was adopted, in which, together with constructive and technological reliability, are considered such important properties [11, 12] as:

- *Communicativity* – accessibility and "openness" of the building, including social, architectural and planning, technological;
- *Adaptability* – universality and ability to transform internal space without loss of integrity and bearing properties of the object; technological - to the development of an infrastructure network; psychological - by creating various premises from private zones to large public areas;
- *Interactivity* – the possibility of reorganization or development of the architectural volume, the ability to respond to changes in the needs of society and to the reforms of training programs, the opportunity to get acquainted with the latest technologies in the field of ecology and energy efficiency in theory and on practice.

It can be concluded that practically all system properties and modern criteria for the formation of a school building imply the need to include public spaces in the general structure, more specifically, taking into account their linkage functions – public-communication space, which will ensure its viability and ability for subsequent development.

4. Model of a school building in the Sverdlovsk Region

As an approbation of the results of the research, the authors have developed a conceptual project proposal "Model of the school building the residential area of the perspective construction of the village Polevodstvo (Sverdlovsk Region, Yekaterinburg)".In addition to solving basic typological problems, the project proposes the creation of an interconnected system of various internal and external public spaces for movement, recreation and communication of all participants. The main planning method and the core of the composition of the building is a semi-enclosed internal open courtyard with a main entrance and a playground for various school events. The yard is surrounded by glazed gallery-recreations, which act as buffer zones between the courtyard and the main premises of the school. In addition these galleries provides opportunities for natural lighting and passive ventilation (Fig. 5).

This solution gives the building a natural appearance, security and safety for its inhabitants, while preserving the openness and visual connection with the external space. This model is the starting point for the development of the system of "anchors" in the structure of the building.

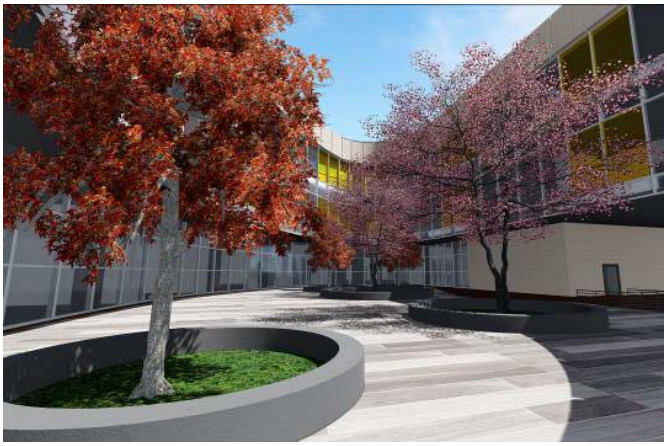

Figure 5. The courtyard.

In this project "anchors" are internal public spaces for various purposes: recreation galleries, halls, lobbies, foyer, staircase-forum, atrium, greenhouse "Edible Yard", green maintained roof. The authors

consider the possibility of expanding the social functions of the educational building as a center of communication and cultural activity of the residential area due to the autonomous use of the gym, library, workshops and assembly hall during the time free from the main functional process (Fig. 6).

Figure 6. Layout of public-communication spaces.

5. Systems of ecocertification of school buildings

Already at the design stage, the authors considered modern voluntary eco-certification systems that fully take into account the "life cycle" of buildings, from the beginning of construction to reconstruction and the demolition of obsolete objects, taking into account the issues of green and sustainable development of the building (Figure 7). In particular, during the study of school buildings, it was concluded that the requirements for educational facilities should differ from other types of buildings, since it is necessary to take into account the specificity of the typological properties of the object: the number and age characteristics of the participants in the process, as well as the purpose and objectives of the functional processes, planning requirements. Therefore, we turned our attention to the assessment system for school buildings LEED for School Green Building Rating System [7, 13].

The LEED assessment system for school buildings recognizes the unique nature of designing and building schools. This system is designed to address issues that the authors considered in the context of the topic of this article:

- *the sustainability of the construction site* or how to make the school a more integrated part of the community, allowing the building and its playing fields to be used for extracurricular activities and other functions;
- *the use of regional materials,* that is, to increase the demand for construction materials and products that are produced and produced in the region, thereby supporting the use of local resources and reducing the environmental consequences associated with transportation;

- *daylight and visibility* and thereby ensure for the people in the building the connection between the inner rooms and the outside through the access to the natural daylight and its sufficient quantity in the rooms with the regular stay of people;
- *the school as a learning tool* or the integration of the sustainable functions of a school building into an educational program.

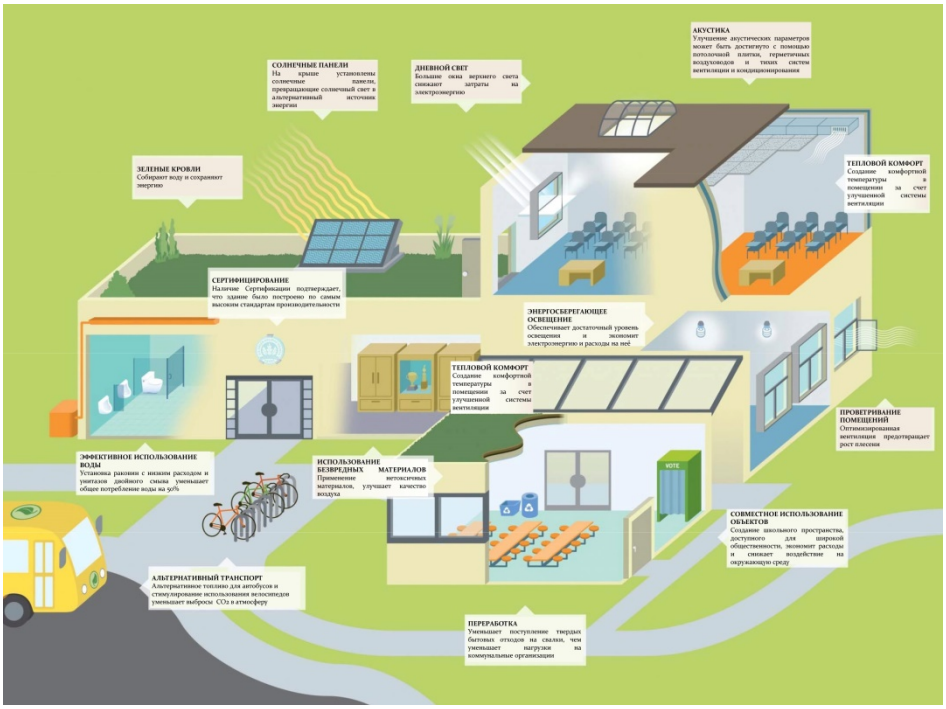

Figure 7. Certification of school buildings according to the LEED system (https://ehp.niehs.nih.gov/wp-content/uploads/2009/10/ehp.117-a448.g002.png).

Addressing the uniqueness of school premises and the health of children, the LEED for School Green Building Rating System provides a unique, comprehensive tool for schools built in accordance with green standards and sustainable development criteria, with measurable results. LEED for schools is a recognized standard for high performance schools that are safe for people's health, comfortable and cost-effective.

6. Conclusion

The problems of educational institutions are not only the development of educational programs and information technologies, qualified teachers and sufficient financing, but also the construction of modern school buildings that should become a full-fledged and comfortable architectural environment for learning and communication, connected with the surrounding society. In this environment, the diversity of forms of spatial organization must take into account the individuality of each student. The authors advocate the multivariate nature of the formation of school public spaces and agree with the words of M. Sartan, the General Director of Smart School, who says "... about the choice, about forks in the path of this choice, about the educational route, about the individualization of education and that everything bases on public spaces"[8]. These particular tasks the new architecture of school buildings must solve, in order to "participate" in the learning process, thereby becoming completely viable.

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