Digital tools for providing eco-friendly and safe educational environment

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Abstract. The study is devoted to establishing a reasonable relationship between the parameters of the material and spatial environment that forms a balanced eco-friendly space and educational environment, formed by the implemented educational process. The objects of the study are the buildings of educational institutions. The subject of the study is the conditions affecting the operating parameters of the main buildings. The aim of the study is to form a new type of complex conditions affecting the operational parameters of the buildings. The applied methodical approach is based on the establishment of relationships and conditions of influence between the parameters of the educational process, educational technologies used in the institution, the conditions of the internal environment of the premises, the parameters of the material and spatial environment of buildings and the educational infrastructure involved. The novelty of the study lies in the justification of the proposal to introduce a new integrated system of engineering parameters – educational and technical conditions. The study uses an adapted mathematical apparatus which allows evaluating the effectiveness of implementation of educational and technical conditions. The approach used in the study involves understanding the environmental friendliness and safety factors of the educational environment as one of the resulting conditions for the implementation of the educational process.

1 Introduction

Ecological problems in the modern world acquire a global scale. Our country is not an exception on this way. From year to year these questions receive more and more attention, new regulations are entered and existing ones are supplemented, federal and regional programs are realized, conferences and forums are carried out. “The basis of state policy in the field of ecological development of Russia for the period up to 2030” approved by the President of the Russian Federation and acting in this direction is based on the fact that the environmental situation in the Russian Federation is characterized by a high level of anthropogenic impact on the environment and significant environmental consequences of past economic activity. Among the core principles of the present basis are observance of the human right to favorable environment, providing favorable conditions of human activity, combination of ecological, economic and social interests of the person, society and the state

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for the purpose of sustainable development and providing favorable environment and ecological safety [1]. These principles apply to the developing urban environment directly. All levels of city authorities, heads of enterprises, state and commercial organizations, managing companies are participants of modern urban environmental agenda. Educational institutions of different levels and types are no exception. Environmental safety of the educational institution, including the ecology of the spaces of educational institutions remains relevant due to the relevance of the topic of health preservation. In Moscow alone, preschool institutions, general education schools and colleges are located in thousands of buildings and occupy thousands of hectares of urban land. They all carry out economic activities, organize the technical maintenance of their buildings and structures, and service the surrounding areas. In some cases it is more efficient, organized and planned, and in other cases it is not. But at the same time, all these activities are carried out in conditions of increased requirements of existing environmental regulations due to the long stay of children and adolescents in educational institutions. Pupils stay in a microsociety for a long time, affecting the education, health, development. If the school observes all the regulations, teaches the basic rules of environmental culture, it is possible to achieve a harmonious relationship with the surrounding world [2]. This study focuses on secondary general education institutions as the most common in our country. It addresses the issues of finding a balance in the work of secondary general education institutions between comprehensive effective operation and parameters of educational activities. It describes modern solutions that can be brought in to address those issues.

2 Materials and methods

The object of this study were the main buildings of educational institutions in Moscow.

The subject of the study was to determine the conditions affecting the operational parameters of the main buildings of educational institutions in Moscow.

The aim of the study was to substantiate the formation of a new type of complex conditions affecting the operational parameters of main buildings of educational institutions in Moscow.

2.1. Research methodology

The main methodological approach to the formation of a new type of complex conditions is based on establishing the relationship and conditions of influence between the parameters of the educational process, the educational technologies used in the institution, the conditions of the internal environment of the premises, the parameters of the material and spatial environment of the buildings and the educational infrastructure involved.

2.2. Prerequisites

These elements are components of the educational environment. The author within the study adopted the following definition of “educational environment”: it is a systematically formed space in which the interaction of subjects of the educational process with the external environment and the internal environment (architectural space) is implemented, as a result of which the individual features of the student personality are revealed. It allows him to get good education, presenting a fairly free choice of an individual educational trajectory [3]. Several works of scientists and engineers of the “Digital construction and architecture” Scientific and Educational Center of the Moscow State University of Civil

Engineering and Architecture are devoted to the research on providing educational environment through material and spatial environment.

The following prerequisites that have emerged in the system of secondary education in Moscow in the planning for the development and transformation of the educational environment identified by the author became the reason for the study:

- growth of consumer requirements to education and educational environment;
- intensive development of educational content and ways of organizing the educational process;
- development of educational technologies and services;
- development of levels and types of education;
- growth in the number of educational institutions in the city;
- in most cases, the material and spatial environment of educational buildings does not meet modern requirements;
- uneven location of educational institutions in the city;
- shortage of experienced teachers;
- inconsistency between the repair and renovation and modernization activities being carried out and the actual development goals of educational institutions;
- inability of maintenance services to organize the necessary material and spatial environment;
- increase in the amount of waste at educational institutions, including computers, office equipment, mercury lamps and unsorted waste.

2.3. Elements of educational environment

Analyzing these prerequisites, it can be concluded that the educational environment is not an established system. Its transformations are associated with a constant search for and implementation of new ideas in the organization and technology of education and their implementation in practice. Initially, the educational environment was seen only as a favorable or well-appointed environment of the educational process, providing the external and internal conditions for the full development of the individual. Later, Witold Yasvin considered the educational environment as a set of opportunities for personal development arising from its interaction with its social and spatial-subject environment, when the educational space is directly related to the educational environment. Unlike space, which represents the factors surrounding the student, the educational environment involves the inclusion of the individual, his active participation as a subject of educational activity [4].

The material component of the educational environment, which includes the educational process, become the building, its structures, rooms, engineering and low-current systems. Usually, students and teachers pay attention only to interiors, adaptability of the building for moving around, sufficiency of space. But the actual material and technical conditions imposed on the educational environment are much more complex and significant. Today, the implementation of the educational program involves ensuring compliance with:

- sanitary and hygienic norms of the educational process (established requirements for water supply, sewerage, lighting, air and heat regime, etc.), which are summarized in the study as the "To_i" group;
- sanitary and living conditions (availability of equipped dressing rooms, toilets, places of personal care, etc.), which are summarized in the study as the "To_{i+1}" group;
- social and living conditions (availability of equipped workplaces, teachers' room, psychological recovery room, etc.), which are summarized in the study as the "To_{i+2}" group;
- possibility of applying necessary educational technologies, which are summarized in the study as the "Toi+3" group;

- the possibility of safe application of the necessary educational infrastructure, which are summarized in the study as the "Toi+4" group;
- requirements for labor protection, which are summarized in the study as the "To_{i+5}" group, and others.

In addition, schools are responsible for ensuring unimpeded access to all objects of educational institution infrastructure for students with disabilities. These requirements mainly refer to the main or training buildings of the educational institution and complexes, auxiliary buildings and facilities, the territory of the institution, and maintained external utility networks. The listed and other requirements depend on quite clear criteria, such as the number of students, the implemented level of education, the technologies involved in the educational process, the parameters of the teaching and technological and laboratory equipment, the provision of conditions for the labor protection of employees and teaching staff. Having allocated the basic requirements for the adjacent territory, among which there is a provision of insolation, minimum sanitary and fire distances, the possibility of placing the necessary set of areas to ensure economic and educational activities, the possibility of equipping the territory, it can be noted that they are also determined by the above criteria [5]. The height of rooms and the layout of floors, the necessary set and placement of rooms for the educational process, their area, lighting, location and size of learning, working, individual studies, sport activities zones are included to the engineering and technical requirements for buildings. Rooms for libraries, rooms for catering of students and for storage and preparation of food, assembly halls, gymnasiums, sports equipment, laboratories, rooms for medical personnel, furniture, office equipment, household equipment, technological equipment are also regulated [6].

The issue of meeting all of these requirements is not easy for educational institutions, even those located in Moscow. The competent, planned work of the management, teaching staff, and administrative and technical staff is required. The situation becomes even more complicated when the school is faced with the need to change certain parameters of its work. These may be simple tasks, such as making the parameters meet the requirements of the new Sanitary Regulations and Norms, or very complex, such as the transfer of the educational process from a mixed format to a divided by stages format according to the age criterion. In the second case, re-equipping the entire building and the accompanying overhaul are supposed. A lot of questions immediately arise: how will the building's capacity change? Where will the specialized classrooms and labs be located? Will the new construction and engineering systems be able to handle the new load? Will the new educational process be accommodated within its parameters? Some of the questions are purely technical and can be resolved by an engineering survey and subsequent preparation of design documentation for major renovations, while others are educational and technological and must be objectively addressed by school management. Unfortunately, practice shows that the development of the city requires the development of schools, but a competent approach to this, the possibility of modernization, major repairs, re-equipment of buildings are quite rare. The formed architectural environment is defined by the space on which the interaction between a particular student and his environment extends. If space realizes the connection from architecture to man, then the educational environment realizes the connection from man to architecture. The architectural or material-spatial environment thus determines the behavior of people who carry out certain activities in the space. Thus, space is a substance of the environment, but is not included in it, as it is perceived as more significant [7].

Educational infrastructure began to play a significant role in school education in recent years. Many schools are equipped with sophisticated modern laboratory equipment, educational stands, models involved in the educational process and aimed at forming

modern scientific, technological, engineering and digital competences of students. Many schools already conduct classes, such equipment provides the opportunity:

- to create and to apply information in various ways;
- to acquire information in different ways;
- to carry out educational experiments, both physical and virtual;
- to create models and collections;
- to apply digital (electronic) and traditional methods of measurements;
- to conduct field observations;
- to use of digital plans, maps, schemes, satellite images;
- to create individual material objects under laboratory conditions;
- to process data and information with the use of teaching and technological equipment and computers;
- to design and construct models with digital control and feedback;
- to place data and work materials in the information environment of the educational institution, and more [6].

The situation described above is not new. It has been developing over the past thirty years in the context of increasing independence of educational institutions, the decline in the application of strategic planning in their activities and in many cases the wrong personnel policy. Traditionally, the most attention is paid to the educational itself, because it is, in fact, the "face" of the school. It is followed by educational technology, but there is considerable heterogeneity in this issue, even within Moscow. Less attention goes to the educational infrastructure due to the fact that schools are not able to fully equip themselves with the necessary equipment, and this also happens irregularly through various targeted programs. The issues of providing the internal environment are very relevant, as they are a direct reflection of the preparedness of the material and spatial environment and the effectiveness of the maintenance service. At present, along with other parameters of environmental safety, Rospotrebnadzor monitors lighting, air temperature, air exchange, relative humidity, noise levels, air and tap water purity in educational institutions. And the least attention is paid to the material and technical conditions itself due to a number of objective and not so objective reasons: lack of technical specialists, poorly organized work with engineering and technical documentation, the work entrusted to the schools themselves to organize repair and maintenance activities, unskillful maintenance. The parameters of the material and spatial environment of an educational institution, regardless of the year of construction of the main and auxiliary buildings, are determined by the parameters of its elements. In terms of their influence, they can be arranged as follows:

- current condition and possibility of modernization of load-bearing and rigid structures, which are summarized into the "$ПМ_i$" group within the study;
- current condition and possibility of modernization of the enclosing and shielding structures, which are summarized into the "$ПМ_{i+1}$" group within the framework of the research;
- possibility of changing the layout, summarize them under the study in group "$ПМ_{i+2}$" group;
- current condition and possibility of modernization of engineering systems and equipment, which are summarized into the "$ПМ_{i+3}$" group;
- current condition and possibility of modernization of low-current systems and equipment, which are summarized into the "$ПМ_{i+4}$" group and others.

Unfortunately, this often affects environmental safety in the form of fires, non-compliance with emission standards and waste management, leaking external engineering systems, irrational use of resources. Summing up the intermediate results, wit can be said that the educational process and technology, educational infrastructure, indoor environment and material and spatial environment exist largely in parallel, develop

independently and not systematically, which in general has a negative impact on the formed modern educational environment.

2.4. Educational and technical conditions

The activities of educational institutions for the prevention of the adverse effects of harmful factors and conditions accompanying their educational activities on the bodies of students are regulated by sanitary and epidemiological rules and standards, which determine the sanitary and hygienic requirements, which are based on the parameters of the main environmental factors. In turn, parameters of the material and spatial environment are regulated separately through these factors, which forms a significant distortion in the development of other components of the educational environment [8]. The certain way out of this situation can be the task on system, joint consideration of elements of the educational environment and allocation of the general, base parameters directly defined by requirements to the educational environment. The task of such parameters will be to combine the conditions for creation and development of the material and spatial environment, educational infrastructure and internal environment. The author proposes to consider "Educational and Technical Conditions" (ETC) as such parameters. In fact, educational and technical conditions can represent a system of engineering parameters – measures of safe and comfortable educational environment. Within the framework of the study, the author proposed the following definition of the educational and technical conditions: it is a set of properties and features of the building, its structures, engineering systems, which determine the ability to meet the needs in the material space, corresponding to the conditions and parameters of the main activities of educational institutions. Figure 1 presents a diagram of the formation of educational and technical conditions for a general education school. It is obvious from the scheme that the degree of mutual correspondence of elements of the educational environment, expressed through the ETC, corresponds to the area of the element areas intersection.

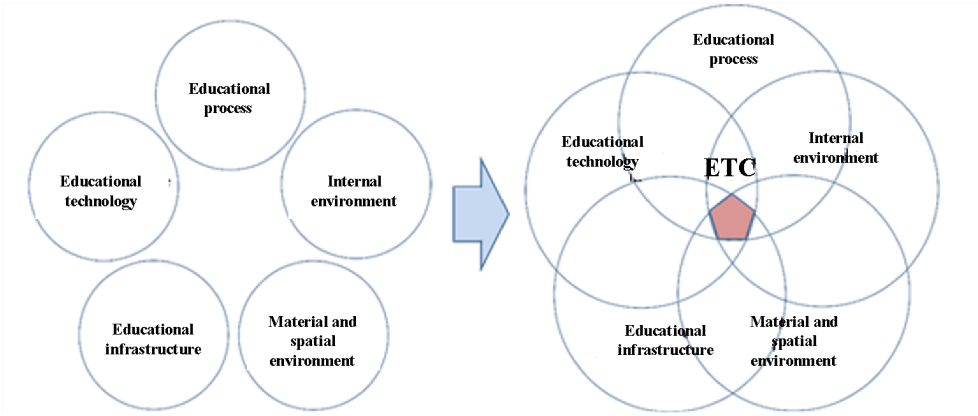

Fig. 1. Formation of "Educational and Technical Conditions".

The following function which determines the level of inclusion of the material and spatial environment parameters depending on the parameters of the educational environment (1) can be applied to assess the effectiveness of the formation and application of Educational and Technical conditions. Substituting in function the earlier revealed values of parameters of a material-spatial environment: $\Pi м_{i,}$ $\Pi м_{i+1,}$ and also parameters of an educational environment: $To_{i,}$ $To_{i+1, \ldots,}$ the matrix 1 (1) is received.

$$\Delta Э = f_{УТУ} \sum_{i=1}^{n=6} Т_О \cup \sum_{i=1}^{n=6} П_М \longrightarrow \max \quad \left\{ \begin{bmatrix} П_{М_i} & \cup & Т_{Oi} \\ П_{М_{i+1}} & \cup & Т_{Oi+1} \\ П_{М_{i+2}} & \cup & Т_{Oi+2} \\ П_{М_{i+3}} & \cup & Т_{Oi+3} \\ П_{М_{i+4}} & \cup & Т_{Oi+4} \\ П_{М_{i+5}} & \cup & Т_{Oi+5} \end{bmatrix} \right\} \longrightarrow \max \tag{1}$$

Due to the impossibility of arbitrary inclusion of parameters of the material and spatial environment in the dependence on the parameters of the educational environment, the dependence will be set in pairs by rows of the matrix. It is not always convenient because the number of parameters may not coincide, and also the parameter of one group may depend on several parameters of another group.

2.5. Digital transformation of the educational environment

The digital transformation, which has been taking place in our country in recent years and is aimed at using end-to-end digital technology and digitalizing all processes and strategies, did not miss the educational environment as well. It is assumed that a well-built and methodologically correct educational environment not only contributes to the effectiveness of education, but also ensures the safety of students and reduces the cost of the educational process. The introduction of a digital learning environment is intended to increase the effectiveness of planning and resource provision of the educational process, to facilitate record keeping and storage of information, to diversify educational opportunities. Creating a full digital educational environment necessarily involves first of all the technical equipment of the educational process and the introduction of new educational technologies [9]. Classrooms are equipped with computers, multiprojectors, interactive whiteboards, provide students with Internet access to electronic textbooks and online platforms.

The following components of the digital educational environment are distinguished in the current strategies:

- applied technical and general software;
- organization of technological and methodological support for the introduction of new educational technologies in the educational process;
- information and reference display of the educational process;
- organization of information storage in digital databases and on paper media [4].

The next step in the digitalization of the educational environment was the inclusion of educational infrastructure, strengthening the position of new educational technologies and the formation of a new information and educational environment. The information and educational environment is currently considered as a set of technological means (computer equipment, databases, communication channels, software, etc.), cultural and organizational forms of information interaction, as well as the competence of participants in the educational process in solving educational and cognitive and professional tasks using information and communication technologies (ICT), as well as ICT support services [10]. The functioning of the information and educational environment must comply with the legislation of the Russian Federation.

The information and educational environment of the educational institution is designed to provide the ability to carry out the following types of activities in digital form:

- planning and control of the educational process;
- placing and saving the materials of the educational process, including the works of students and teachers and the information resources used by the participants in the educational process
- recording the progress of the educational process and the results of mastering the educational program;

- interaction between the participants of the educational process, including remote interaction via the Internet;
- the possibility of using the data formed during the educational process to solve the problems of educational activity management;
- interaction between an educational institution and educational authorities, as well as with other educational institutions and organizations [11].

The federal Digital Educational Environment project, launched four years ago, is intended to create the conditions for implementing a modern and safe digital learning environment by 2024. It is to ensure the formation of values of self-development and self-education among students of educational organizations of all types and levels by updating the information and communication infrastructure, training personnel, and creating a federal digital platform. This is a program that facilitates the learning process for both students and teachers and includes a set of informational educational resources, electronic as well, a set of technological means of information and communication technologies, a number of pedagogical technologies that ensure a modern informational and educational environment [12.]

2.6. Digital changes in the operation of the material and spatial environment

The task of a modern school is to create an effectively functioning model of a safe educational environment, which is characterized by the presence of specially created conditions through which the processes of education and development of the student's personality are optimized, as well as the necessary conditions for successful learning. Comfort and safety of the school environment is ensured by the unity of the actions of all participants in the educational process [13]. The effective operation of educational facilities, which is essentially a series of interchangeable activities that support the educational environment, is an essential component of the development of the social infrastructure of districts and entire cities. In the author's opinion, the provision of effective inter-sectoral interactions in the context of the specific operation of educational facilities can be successfully implemented with the help of tools of digital transformation of the construction industry. Relying on the typical designs, according to which most of the school buildings in Russia are built, it is possible to develop a significant number of digital tools, which allow solving the tasks of modernization and renovation of school buildings comprehensively. The use of these technologies has a positive effect on the maintenance of buildings and repair and renewal measures, makes it possible to improve the quality of work, reduce risks and losses, and minimize errors throughout the entire life cycle. In addition, it simplifies the process of interaction between participants in the field of operation of buildings and structures [14].

It can be defined that the digital transformation of the operation stage of the educational institution consists in the application of end-to-end digital technologies and the transfer of all processes and strategies in digital format, as well as organization of efficient and safe material and spatial environment of the educational institution. One of the most modern tools, which are put on trial in the service of operation, is a digital twin building. Regulatory requirements and parameters of this tool are only being formed, but already operating GOST R 57700.37-2021 gives the following definition: the digital twin of the product – a system consisting of a digital model of the product and two-way information links with the product (if any) and its components. The digital twin is developed and applied at all stages of the product life cycle, changing at each stage. It is still only a product, but soon there will be norms for the formation and handling of digital twins of buildings. A digital twin is a technology that connects the real and virtual worlds, using

real-time data and other sources to improve decision-making. The twin collects data and uses simulations to create a model that works just like its real-world counterpart [15].

The following may be attributed to the identified and evaluated merits of using digital twins in the operational phase:

- regular exchange of real-world data between maintenance procedures, repair and recovery operations, and the digital twin and back for rapid decision-making;
- transparency of procedures and measures for the operator and the ability to objectively assess the quality of work;
- reduced timelines for the works;
- obtaining of objective data for the planning system;
- reduction of the number of errors;
- real-time tracking of safety requirements and more.

Thus, it can be reasonably expected that the digital twin building will be able to qualitatively replace the previously considered material and spatial environment, tracked parameters of the internal environment, as well as information and parameters of the educational infrastructure with its tools, data and interaction system. Reducing the number of elements of the educational environment is expected to lead to its optimization and simplification of its organization. Digital Educational and Technical conditions (DETE) become a universal tool for establishing connection between the parameters of the educational process and elements of the digital learning environment. The scheme of the transformed digital learning environment is shown in Figure 2. Similarly to the above-described educational and technical conditions, their digital analogue, Digital Educational and Technical conditions, can be applied in two basic trajectories. First is when an educational process is selected for an existing building and implemented in this building with due regard for the limitations of the material and spatial environment. The second is when a building is selected or planned for adaptation to an existing educational process with established parameters of its educational environment. It is evident from the diagram that, due to the reduction in the number of elements of the educational environment, their correspondence (the intersection of the areas of elements) is easier to achieve.

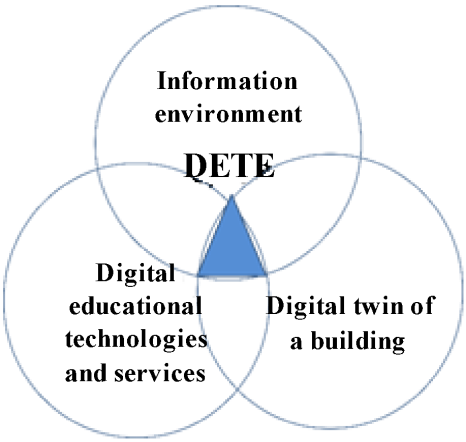

Fig. 2. Digital educational environment formation scheme.

There are already a number of applied digital tools at the disposal of the construction and housing and communal services industry potential of which can be used also in the operational phase. Unfortunately, a small proportion of them are oriented to social facilities according to their cost and technical support. But as they spread, they become more

accessible, and soon educational institutions will be able to assess in practice the effects of digital technologies introduced in the technical operation of buildings, among which are:

- reduced labor costs during the maintenance phase;
- reduced duplication of work during repairs;
- increase of the production culture at the operation stage;
- improved efficiency of maintenance;
- possibility of obtaining reliable information about the parameters of the material and spatial environment;
- application of digital design products during repairs.

All these possibilities can be applied not only in the implementation of operational procedures, but also in the creation or adaptation of the material and spatial environment to accommodate the educational process with certain parameters.

Similar conclusions can be drawn by assessing the effectiveness of the educational environment through the application of digital educational and technical specifications. To do this, it is possible to apply the previously considered function that determines the level of inclusion of parameters and data from the digital twin of the building, depending on the parameters of the educational environment (2). If the previously identified values of parameters and data from the digital twin of the building $П_{М_i}$, $П_{М_{i+1}}$, as well as the parameters of the educational environment To_i, To_{i+1}, ..., are substituted into the function then the Matrix 2 is received (2).

$$\triangle Э = f_{ЦУТУ} \sum_{i=1}^{n=6} T_o \cup \sum_{i=1}^{n=6} П_М \longrightarrow \max \quad \left\{ \begin{bmatrix} П_{М_i} \\ П_{М_{i+1}} \\ П_{М_{i+2}} \\ П_{М_{i+3}} \\ П_{М_{i+4}} \\ П_{М_{i+5}} \end{bmatrix} \cup \begin{bmatrix} T_{Oi} \\ T_{Oi+1} \\ T_{Oi+2} \\ T_{Oi+3} \\ T_{Oi+4} \\ T_{Oi+5} \end{bmatrix} \right\} \longrightarrow \max \tag{2}$$

The use of digital tools provides an opportunity, in this case, to include the parameters of the digital twin in an arbitrary way, depending on the parameters of the educational environment. In this case, the coincidence of the number of parameters and the sequence of their accounting has no affect any more.

The most effective in this case will be the use of digital educational and technical conditions as a specialized integrating digital tool. Apart from a direct influence on the parameters of the material and spatial environment, the formation and use of digital learning and technical conditions will significantly enhance organizational, informational, and engineering security of educational institutions. But no less significant in magnitude and importance is the influence of digital tools on the environmental safety of the educational environment, the structure of which includes fire safety, efficient use of resources, electrical safety. In addition, the system of maintenance of buildings of educational institutions can be well described by the logic of modern programming languages, so the automation of maintenance processes with BIM-technologies is becoming increasingly relevant [16].

It can be assumed that the substantiated effectiveness of the “Digital Educational and technical conditions” tool provides an opportunity to implement it not only as a progressive step in the application and development of educational and technical conditions, but also as the only necessary and sufficient solution, forming not individual types, but a comprehensive security of the educational institution.

3 Results

As part of the study, the author analyzed the situation prevailing in secondary schools in Moscow on the organization and maintenance of the educational environment, corresponding to the parameters of the implemented educational process of a certain level. It was found that this situation is associated with the difficulty of determining the actual parameters of the material and spatial environment, and determining the possibility of changing it. To determine qualitative compliance of the material and spatial environment with the requirements of the educational environment, to determine the numerical values of these parameters, the author proposed a system of engineering parameters – indicators of a safe and comfortable educational environment under the conditional name "Educational and technical conditions". The study has identified environmental parameters as one of the main components of a safe educational environment. The main effect of the application of educational and technical conditions is to reasonably determine the necessary and sufficient list of modernization measures for the appropriate organization of the material and spatial environment. Given the positive results associated with the digital transformation of the construction industry, the author proposes further integration of the capabilities of modern digital tools with the functions of educational and technical conditions and the formation as a result of their new type – Digital educational and technical conditions. It is reasonably assumed that this system of parameters will be able to interact effectively with digital twin buildings.

4 Discussion

Most publications on the organization of the educational environment, the latter is considered solely in terms of pedagogy and features of various educational technologies. The organization of the material and spatial environment is considered from the point of view of the tasks of providing the building operational parameters. This study proposes an expansion of the list of regulated elements of the educational environment, the substantiation of their relationship, the introduction of mechanisms for determining the numerical parameters of their relationship. The study is a logical continuation of the work of the author and his colleagues on the development of school educational environment.

5 Conclusion

At the present stage of the school education system, ensuring environmental safety of the educational environment is an urgent task. It requires a comprehensive approach that combines improving engineering and technical safety, fire and electrical safety of the material environment, as well as measures to maintain and develop an ecological culture of production. Compliance with legislative norms in the field of environmental safety is not limited only to waste management, reduction of resource saving and maintenance of engineering networks. The norms are ultimately aimed at ensuring an environmentally friendly educational environment, which in this case can also be seen as a way to ensure a comfortable environment. Provision of these conditions and requirements allows organizing the activities of an educational institution competently and professionally, including the reduction of environmental risks and contributing to its development. Modern methods of analysis allow moving from a heuristic solution to a mathematically rigorous model of the formation of the conditions of the educational environment. The author expects that the proposed mechanism of applying Digital educational and technical conditions will contribute to reducing the number of system errors in the operation of educational institutions, reducing the number of operational and environmental risks, increasing the efficiency of resource consumption, improving the quality of repair and maintenance work,

safe inclusion of modern educational equipment in the educational process. In further research, the author intends to work on the application of Digital educational and technical conditions in the system of higher education with the shortage of effective operational and technical staff.

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