Forming Typical School Architecture in the USSR Depending on Educational System Development Process

L V Zadvernyuk

1Department of Architecture and Urban Studies, Pacific National University
apt. 25, house 50, Trekhgornaia st., Khabarovsk city, 680054

E-mail: lusyzadver@mail.ru

Abstract. In the 20th century a design of schools in Russia was subject to critical transformations. Each of them was a response to the development of the system of a comprehensive secondary education. The architecture of school buildings also transformed and changed from the comprehensive schools for the vocational profession training to complex educational institutions with a flexible layout. The objective of the research is to identify the dependence of school architecture on the needs of the state education system. The analysis of correlation processes between the education system and volumetric & spatial composition in the architecture of school buildings (exemplified by typical projects) allows showing the architectural practice response to the education system needs. The development of the unified school architecture in the USSR is justified not only from the positions of economic profit but also from the positions of a country-wide mass school construction. A school building model was formed in typical projects and was intended for providing a necessary space for everybody. The identified interdependence of the school education system and architecture today makes it possible to develop a modern invariant for a volumetric & spatial design of a school building accessible at every Russian region. The issues of modern unification of a school space will be considered in the future research.

1. Introduction

School architecture is formed under the impact of multiple factors. The key of them include state education programs, education technologies, social needs and state needs in the quantity and quality of citizens completing secondary education. It is impossible to consider the process of school space formation in the context of the educational process evolution or state interest in the development of education system without considering the changes this system underwent and the impact of these changes on the school space organization. Today the problem of modern school architecture in Russia is being studied by many scientists. At the moment, school architecture is declared as unique and aimed at the individual development of a child in the first place. The school space is gradually becoming an interactive place providing the freedom of choice and teaching methods. However, an individual approach to every school building projects seems impossible to be implemented on a vast territory of Russia as apparently, the opportunities are not equal both in various regions and inside one region also. The expertise of the Soviet school is of great importance for the evaluation of the education system impact on the quality and comprehensive nature of general education as well as on the quality and peculiarities of the school building spatial environment. Another factor which should be considered comprises the industrialization of a construction industry with the unification of not
only construction but also spatial solutions in terms of mass, quick and accessible school construction all over the country.

2. Research methods
This research dwells upon the evolution of school architecture in the Soviet Russia. The purpose of the research consists in the identification of the peculiarities of the influence of the state education and pedagogical system on the school architecture formation. To reach a set purpose, the authors consider the crucial points of transformation of architectural&layout concepts in mass school architecture as the response to the changes of the state policy in general secondary education. The research identifies the stages that clearly show the trends of school architecture development. The revealed interconnection of the process of the education system development and educational institution architecture allows defining further ways of the school evolution in Russia.

3. Analysis of results
In the 20th century the Russian school architecture was subject to numerous transformations. During the period of establishment and strengthening of the Soviet government the issue of general education consisted in the development of the optimal solution for the Soviet system of staff training. The school education programs were subject to frequent and radical changes. This process can be divided into several stages. Each stage is characterized by a certain response of the architectural practice to the state opinion about the content and logic of the education system.

First stage 1917 - 1935. During the period the main point of the teaching system was labor education. The establishment of a subject education system started from the formation of curricula for the schools of the 1st and 2nd stages in 1920. In 1923 the state started to introduce a complex system with general program schemes uniform for the RSFSR. Soon, a lesson system was reinstated for all school courses alongside with the current and final knowledge check. Mandatory primary education became comprehensive, and general state levels of comprehensive mandatory education were defined. In the rural areas a primary 4-year education was in place, while in the cities - a 7-year education. Since that time schoolbooks became uniform for all the RSFSR territory. In the period 1933-34 the uniform levels of the general education system were identified. The school system included the following levels: a) primary school – four years, b) incomplete secondary education – 7 years, c) secondary school – 10 years [1]. The need to fight with illiteracy, which had been urgent since 1919, persisted until the 1930-s; as a result, the state bodies not only developed uniform educational programs but also organized a mass construction of new school buildings. In the 1920-21 academic year the number of secondary schools increased more than two times comparing with the 1914-15 academic year and equaled 4,163. In the 1914-15 academic year in the rural areas there were 72 secondary schools while in the 1920-21 academic years their number was equal to 2,144 [2]. In the 1924-25 academic year the number of primary school students in the RFSFR increased by 13.3% comparing with the 1914-15 academic year [3].

Until 1935 the secondary school architecture had no any unification features. However, the work on typical solutions was in progress. For example, in 1926 for the primary school the typical projects of small schools (schools with 1 teacher and 2, 3 or 4 teachers, correspondingly) were developed by the assignment of the People’s Commissariat of Education. These were small buildings consisting of a range of classrooms and utility areas [4]. In the cities, from mid 1920-s to early 1930-s, the 7-year schools were being constructed for 500-2,500 students. Such a large size was explained by a general state educational policy intended for the establishment of comprehensive schools. The education system was practice-oriented, and the number of out-of-class rooms was greater than the number of classrooms. Such schools had a lot of workshops, laboratories, sport areas, sometimes school rooms included cinema halls and observatories. New city schools were built in the areas in the vicinity of production zones. This was the trend which later manifested itself in the organization of a micro-district development. The prevailing in 1920-s constructivism had its impact on the school exterior [5]. In this period a functional and layout division into zones and blocks of a school building was formed.
Although the workshops were main premises in the school, each building had a clear division into teaching, extracurricular work, catering, leisure zones. In addition, the schools were already divided into zones according to student ages (Figures 1, 2).

![Figure 1. School No. 104 n.a. M. S.Kharchenko in Leningrad (architect Vladimir Munts, 1932) [5].](image1)

![Figure 2. School of 10 years of October in the Stachek ul. in Leningrad (architect A. Nikolsky, 1926–27) [5].](image2)

Large school sizes, the need to organize good lightning in the workshops, laboratories and classrooms led to the elongated communication passages in the building. Long corridors formed extended blocks, and in general, they could show a reasonable use of space. It should be noted that in the early 1930-s the architects also searched for a school building form; it should be convenient and functional in terms of the educational process (because of long corridors the students were late for classes). This period coincided with the change of a dominating style in the Soviet architecture: constructivism was replaced by neoclassicism. One of such examples was the school at Dangaurovka in Moscow by the project of D. Fridman (1931). The school is U-shaped (one of the main forms of the building plans for further decades), the faces have decorations (Figure 3).

![Figure 3. The school at Dangaurovka in Moscow by the project of D. Fridman (1931) [5].](image3)

This period is characterized by the construction of small rural schools as practice-oriented education in the village did not require the construction of workshops and laboratories because the labor efforts were associated with agriculture mostly. In the cities large schools were constructed, and most of them were located in the vicinity of production zones. Such schools have more rooms for practical lessons than for general education. The school space was organized to solve the tasks of acquiring practical skills rather than to facilitate the educational process in general. Long inconvenient corridors made the workshops functional.

Second stage 1935 - late 1950 yy. This period was marked by a critical change of the approach to general education. The need to introduce a system complex education resulted in the growing importance of the general education subjects in school learning. Already in 1934 the Central Committee of the All-Union Communist Party (Bolsheviks) and the Council of People's Commissars adopted a resolution “On Primary and Secondary Schools” setting three types of schools: with 2 teachers for 880 students and 22 classrooms, 1 teacher for 400 students with 10 classrooms and incomplete secondary school for 280 students with 7 classrooms. For each type of school appropriate building bulks and a set-up of rooms (both studying and auxiliary) were defined [6]. In 1935 classroom and extracurricular activities were organized more efficiently. It was strictly observed that the number of class hours was not excessive [1].

The construction of schools kept gaining the pace. This led to the necessity of multiplying the most successful architectural&layout solutions in all the USSR regions. Before and after the Great Patriotic War the state was implementing the program for school education development adopted in 1935. The
The most widely spread school building design was the building for 880 students. By means of the reduction of space, stipulated for one student, from 35 m$^3$ to 15–17 m$^3$ it became possible to increase the number of schools constructed. The schools of this period were mostly 4-storey and U-shaped (Figures 4, 5).

In the post-war period the archeologists continued their search for an optimal architectural&layout solution of a new Soviet school. One of the most typical projects of this period was a school building designed for 400 students No. 256 (No. 2-02-05 after revision in 1950) developed in 1947 by architects Vavirovsky N. M. and Dilaktorskaya L.L. From the architectural and design workshop of the Ministry of Enlightenment of the RSFSR (Figures 6, 7, 8) [7].

The school of such size were mostly built on the territories of urban outskirts or in the residential zones of industrial plants. To provide this territory with educational institutions, a school for 400 seats would be enough. As a rule, such types of school were two-storey [7].

Since mid-1950-s one can point to the transition to the mass industrial construction of schools in the USSR. One of the examples of a typical block school design in mid-1950-s were the projects developed by the workshop No.3 of the Special Architectural and Design Bureau at the Architectural&Planning Directorate of the Moscow City Executive Committee - MYu MS (architects A.M. Stepanov and I.A. Chekalin) (Figure 9). For the considered period in Moscow alone 365 five-storey block schools were built by this design [10].
This stage of the school architecture development is marked by the following architectural response to the state tasks in the general education system. The U-shape allowed reducing the length of corridors. The classrooms were mostly oriented towards one side providing a good lighting of corridors. Large rooms (active zones, exercise classes) were mostly located at the upper floor of a central planning block. The structures were brick or block ones. Despite the tendency towards reducing the area of schools, they still meet the needs of the educational system. The reduction of workshops, increase of special subject classes, allocation of auxiliary rooms for sciences correspond to the complex education requirements. The school design is divided into functional blocks. The wings of the building had large recreation rooms, light corridors. One can also note that the building is divided into zones by the student age. The share of areas allocated for the classrooms increased from 35% to 60-65% comparing with the previous norm due to a significant reduction of lab rooms and workshops [11]. One can also point to the increase in the number of stories. The schools constructed were four- and five-storey.

Third stage late 1950-s – mid 60-s yy. At this stage education reforms continued. This period is also marked by significant changes both in the requirements to the educational process and in the functional&planning solutions of school architecture. In 1958 7-year secondary education was transformed into 8-year education. At the end of 1950-s the school education was divided into stages: three years of primary education, eight years of secondary education and eleven years of full secondary education. [12]. This reform continued until the mid 60-s of the 20th century. The educational process was subject to mass democratization and humanization. At this stage the learning and teaching activity was characterized by the search for new methods of teaching, new extracurricular forms, orientation towards the education of a socially oriented citizen [13].

Significant changes affected not only the duration of learning. The need to “train technically literate staff for the industry and agriculture” stipulated for production training and practice. Two days a week the undergraduates of day schools should work at the companies or in the agricultural area [14]. In the elementary school the classes for manual labor training were extended while for 5-7 classes the practical classes in training workshops. In general, the time allocated for practical classes, including the curricular practical training in the senior classes, was extended more than twofold. The number of PT lessons also increased [13].

Mass school architecture also continued to change responding to the education reforms. One should note that for the first years of the considered stage typical block buildings of early 50-s were still built in the regions. At the end of 1950-s and early 60s the schools were still built by the typical designs of 1954. For example, in Orel in 1958-60-s yy. The schools were built by the designs 2-02-17 (520) 2-02-27 (2-02-27K (620)) (Figure 10, 11) [15].
New typical designs occurring at the end of 1950-s and early 60-s were already different from the previous generation (Figure 12, 13). A five-storey building becomes three-storey. The U-shaped plan is gradually replaced by H-shaped. The school design has clear sections: sport block, applied labor block, catering block. Such development of the layout solution allowed not only reproducing a more obvious functional zoning, age-by-age zoning but also reduced the number of storeys. This was also quite important in the conditions of industrial construction. Such layout plan provided large internal open platforms used for various educational, teaching and sport tasks. This architectural stage is marked by the introduction of SNiP II-L.4-62, the regulation for a general education school. Learning differentiation, a socially oriented approach, the development of labor and sport skills declared by the state were quite successfully introduced in the typical solutions suggested by architects. This type of school building became the most wide-spread in the micro-district

Fourth stage second half of 1960-s-70-s yy. This period in the area of the education system development was marked by the further improvement of a system approach in upbringing and education. Since mid 1960-s yy. the transition to the comprehensive secondary education became the priority of the state policy [12]. That time no crucial changes in general educational programs (similar to those occurring at the beginning of the Soviet education development) were made, this was a period of experience accumulation both in the pedagogical theory and in teaching practice. The state order in the area of comprehensive secondary education was clearly formulated in the school presentation as a main component of the individual intellectual and physical development and as a main component of the formation of the world view, the responsible and creative attitude to labor, research&technology knowledge and production economic basics as well as the knowledge of advanced technology and technics [16]. Such trends can be traced in the school architecture of this stage. The architects tried to implement new ideas in the designs responding to the demand of the educational process humanization. The search for new forms made the architects thinking over the development of the school space as a self-contained space with various recreation options (closed and open), with the
components of functional use transformations. This period includes the search, study of foreign expertise, application of flexible layouts, non-standard solutions. However, in addition to the task of a harmonious schooler development, the state still faced the challenge of the provision of mass general secondary education. In 1970-80s of the 20th century a situation of “secondary education shedding” occurred: a flow of entering the secondary school programs was significantly larger (by 300-500 thousand people each year) than the number of students who finished the 8th class in the current year [17, p.20]. The need of teaching the increasing number of students (not only children but adults also) led to the development of the unified solutions accessible for the implementation in the territory of all state (Fig. 14, 15).

The volumetric spatial composition of school became more complex. Architects played with certain blocks arranging them in a compact way around an inside yard. In general, such schools were designated for 1,000 students. The main blocks were still mostly three-storey. The classrooms for main subjects with a conventional layout, multiple recreations, room for extracurricular activities. One can point to the increasing attention to flexible layouts. Traditional lesson educational forms preserved a class as a key school planning component. The face architecture has no any small decorations which was explained by the prevailing panel construction in those times.

Five stage 1980-s yy. The late 70-s and early 80-s are marked by the development of the educational process optimization. By the time a vast expertise was accumulated in pedagogics both in the area of integrated educational process and in its certain components [18]. In the mid-1980-s the professional pedagogical representatives discussed the issues of formulating the concept of school renewal. Pioneering methods and experimental schools were developed. In the late 80-s the reforms were introduced systematically. In 1989 the state adopted a new curriculum with a strengthened humanities component (from 41 to 50%). In general, this was the period when the authorities started to give up the idea of the uniform school education system [19].

The school architecture in 1980-s included a lot of trends towards the complexity of spatial solutions. But the search for new forms was not completely individual. The issue of state provision of an appropriate number of schools was still relevant, and this required rapid construction according to ready designs. That is why a typical school design made of assembled reinforced concrete structures was further used in construction. By mid 80-s a lot of typical designs had been already developed. In most cases they were marked by a centrally planned composition and the flexibility of planning layout because of the frame use. Large halls and perimeter lightning provided for more rational functional zoning. This aspect allows planning classrooms for certain subjects with a well-developed system of utility rooms, including laboratory rooms. Mid 1980-s (1985-86 yy.) are marked by the appearance of numerous interesting designs of school building (Fig. 16,17, 18). By the end of 1980-s - beginning of 90s this process gradually stopped.
Six stage 1990-s yy. This stage is characterized by economic and political crises in the USSR, the destruction of social relation in a socialistic community. Under new conditions education was subject to crucial transformations. The Federal Law “On Education” No. 3266-1, adopted in 1992, declared the cancellation of a mandatory general secondary education. The Russian school lost the directive control of the educational process. Free education became one of citizen’s rights, but not the obligation [17, p. 28]. Educational programs were not uniform any more for a whole state, and they comprised three components: federal, regional and school. A lot of experimental schools, private schools an education models occurred. The educational technologies from the developed capitalistic countries were borrowed [19]. A large number of alternative programs and textbooks appeared. This broke the succession of the secondary and higher school and lowered the level of student knowledge [23]. In 1990-s the state lost the monopoly for educational process forming. One could note that there was no more any uniform state order in school education. A depression was also observed in the school architecture of the period. By a mere inertia, in 1990-91-s yy. typical school designs were still developed. But in general, they reminded the previous decade designs.

4. Discussion
Having considered the evolution of the school space in Russia in the 20th century, one can identify that the precision of architectural design response to the issue and the efficiency of educational space will depend on the clearly formulated state tasks for the education system in the schooling methods and results. In 1920-s the school with a focus on obtaining a profession or vocational skills was oriented towards the tasks of a certain region, and the classes comprise only a small part of the educational process; a large part of time the students spent in the workshops or at agricultural works. That is why, despite the development of typical designs, in general, the school building space couldn’t be called completely harmonized for getting comprehensive knowledge. The state needs in a citizen with a well-developed complex and system mindset gradually transformed both educational programs and the architecture of educational institutions, correspondingly. The most stable period in the school designing in Russia (RSFSR) was in 1960-s and 70-s yy. Yet, one should point to the fact that the end of 70-s already marked some crisis of architectural forms. That time active creative search for new structures and compositions was started; the architects introduced the ideas of flexible layouts and polyfunctional spaces. The interconnection between educational programs and functional&layout and shape solutions for schools, their optimization in the framework of a uniform system resulted in the multiplication of the most “successful options”. The designs with multiple options, having various combination of blocks and a well-developed spatial structure, polyfunctional, with the recreations,
centrally planned compositions and large open spaces relate to the period of 1980-s. In 1990-s typical designs mostly copied the main composition ideas of the previous period.

5. Conclusion
In general, one may note that the formation of the school architectural space in the Soviet and post-Soviet Russia was essentially influenced by the system of education and the methods of education activity control, which, in its turn, pay more or less attention to the social needs in that regard. The degradation of education system caused the degradation of architectural design in terms of the development of an optimal and organized academic space which can be reproduced multiple times.

The search for unconventional ideas of school space organization oriented towards new programs results in the development of individual design solutions. However, taking into account the area of Russia, it is impossible to conduct individual school construction that is why the development of appropriate typical projects is inevitable, and the work on this issue is in progress. The analysis and understanding of state demand for a general secondary education allows formulating a model of the school and school space at the contemporary stage.

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