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**POSITIVE AND NEGATIVE ASPECTS IN THE DEVELOPMENT OF THE SYSTEM
OF DOMESTIC CHEMICAL EDUCATION OF SCHOOLCHILDREN
OF THE SOVIET PERIOD**

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Abstract. *The system of school chemistry education today requires significant modernization of the targeted content, technological and gnostic components. However, when choosing the vectors for the development of the system of chemical education for schoolchildren, it is necessary to pay the retro experience of the Soviet education system. The national traditions of the Soviet attention school and the positive experience accumulated during the Soviet period should be associated with new concepts and strategies for the development of chemical education in Russia. The article presents the results of a historical and pedagogical research of the positive and negative aspects of the development of chemical education for schoolchildren in the Soviet period. The character traits of the development of schoolchildren chemical education in 1917–1930, which were due to the reconstruction of the existing school education system and the active testing of new forms, methods and means of education are described. The trends in the development of chemistry education for schoolchildren in 1931–1957, which were the result of changes in the main educational paradigm a return to the pre-revolutionary classroom system, the resumption of subject education, and the separation of chemistry into a separate school subject are considered. The features of the development of the schoolchildren chemical education in 1958–1991 which were the result of significant changes in the political, socio-economic, cultural spheres of society, which was accompanied by the transition to universal compulsory secondary education, strengthening the material and technical equipment of schools and out-of-school educational organizations, increasing quality of training of future teachers of chemistry are indicated. The main features and characteristic trends of the gradual development of Soviet school chemical education are identified, the consideration of which is necessary for the implementation of the productive legacy of the Soviet system of chemical education of schoolchildren in modern conditions.*

Keywords: *chemical education in the Soviet period, education of schoolchildren, chemical education, educational reforms, positive and negative aspects of Soviet chemical education.*

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**ПОЛОЖИТЕЛЬНЫЕ И ОТРИЦАТЕЛЬНЫЕ АСПЕКТЫ В РАЗВИТИИ
СИСТЕМЫ ОТЕЧЕСТВЕННОГО ХИМИЧЕСКОГО ОБРАЗОВАНИЯ
ШКОЛЬНИКОВ СОВЕТСКОГО ПЕРИОДА**

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Аннотация. Система школьного химического образования сегодня требует значительных модернизационных изменений целевого, содержательного, технологического и гностического компонентов. Однако при выборе векторов развития системы химического образования школьников необходимо учитывать ретропедагогический опыт советской системы образования. С новыми концепциями и стратегиями развития химического образования в России должны быть сопряжены национальные традиции советской школы и накопленный за советский период положительный опыт. В статье представлены результаты историко-педагогического исследования положительных и отрицательных аспектов развития химического образования школьников в советский период. Описываются характерные особенности развития химического образования школьников в 1917–1930 годы, которые были обусловлены реконструкцией существовавшей школьной системы образования и активной апробацией новых форм, методов и средств обучения. Рассматриваются тенденции развития химического образования школьников в 1931–1957 годы, которые являлись следствием изменений основной образовательной парадигмы – возврат к дореволюционной классно-урочной системе, возобновление предметного обучения, выделение химии в отдельный школьный предмет. Обозначаются особенности развития химического образования школьников в 1958–1991 годы, которые стали следствием существенных изменений в политической, социально-экономической, культурной сферах жизни общества, что сопровождалось переходом ко всеобщему обязательному среднему образованию, укреплением материально-технического оснащения школ и внешкольных образовательных организаций, повышением качества подготовки будущих учителей химии. Выявлены основные особенности и характерные тенденции поэтапного развития советского школьного химического образования, учет которых необходим для имплементации продуктивного наследия советской системы химического образования школьников в современных условиях.

Ключевые слова: химическое образование в советский период, образование школьников, химическое образование, образовательные реформы, положительные и отрицательные аспекты советского химического образования.

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Introduction.

Ensuring the national security of the country is a global task of the Russian Federation today. Chemical technologies, as the basis for the production of most modern materials, play a crucial role in technological development and economic growth. The chemical and petrochemical industries are of undeniable importance in the global economy, influencing key industries, construction and agriculture.

For a scientific and technological breakthrough in the field of chemistry, appropriate specialists are needed, whose thorough professional training is not possible without a key basis - high-quality school and out-of-school chemistry education.

Realizing the importance of improving the domestic education system, taking into account national interests, this problem is being solved at all levels. Modern priorities for the development of the education system are indicated in the strategic planning documents of the federal level: “National Security Strategy of the Russian Federation (2015)”, “Strategy for Scientific and Technological Development of the Russian Federation (2016)”, “Economic Security Strategy of the Russian Federation for the period up to 2030 (2017)”, “Information Society Development Strategy for 2017–2020 (2017)”, “The Concept of Additional Education for Children until 2030 (2022)”, Decrees of the President of the Russian Federation “National Goals and Strategic Objectives for the Development of the Russian Federation for the Period until 2024 (2018)” and “The National Development Goals of the Russian Federation for the period up to 2030 (2020)” update the importance of the effective development of the general education system aimed at ensuring the global competitiveness of Russian education and its inclusion in the top ten among the countries of the world in terms of quality.

In the key of the main vectors of the innovative development of chemical science and industry, taking into account the priority tasks of the educational policy of the state, in the context of chemical knowledge, the Concept for teaching the subject “Chemistry” in educational institutions of the Russian Federation that implement the main educational programs (2019), which outlines the priority vectors for solving the problems of school chemistry education, was approved by the decision of the Board of the Ministry of Education of the Russian Federation.

Thus, there is a contradiction between the requirements of educational policy for general education and chemical education of schoolchildren, in particular, outlined in strategic planning documents and disclosed in the new federal educational standards and the state of school practice, which does not allow ensuring the tasks of the state in the real educational process. There is an urgent need to modernize the system of chemical education for schoolchildren, to get rid of Western stereotypes. However, a competent de-westernization of chemical education should take into account the retropedagogical process and focus on the positive and negative aspects of the development of basic and additional chemical education for schoolchildren of the Soviet period.

We believe that the solution to the problems of improving the modern practice of chemical education of schoolchildren should proceed from the position of a historical and pedagogical analysis of the development of chemical education of schoolchildren in the Soviet period in order to

draw lessons from the past that characterize both its achievements and failures and further improving the chemical education of schoolchildren in line with domestic scientific education.

The purpose of the article is to determine the positive and negative aspects of the development of basic and additional chemical education for schoolchildren in the Soviet period, which must be taken into account when implementing modernization transformations, taking into account the productive legacy of the Soviet system of chemical education for schoolchildren.

Results and methods.

To achieve this goal, we used the analysis of scientific research literature, both modern researchers and historical and pedagogical works of the Soviet period. The field of our study included articles on various aspects of the development of chemistry education, as well as authentic sources (government decrees, decrees, curricula, school textbooks). In addition, an analysis of 315 dissertations was carried out, presented in a scientific article [].

The choice of research methods is determined by the specifics of approaches to the study of the problem of the formation and development of chemical education of schoolchildren in the Soviet period, which led to the use of methods: theoretical – analysis, synthesis, comparison, generalization, systematization and classification of facts, data of the source base, the study of advanced pedagogical experience in order to understand the nature of the processes that took place in the system of chemical education of schoolchildren in soviet period; special methods of historical research – chronological and comparative historical analysis, periodization, establishment of logical and causal relationships between the revealed facts, phenomena and processes.

Results.

Earlier, on the basis of the identified historical patterns in the development of the system of chemical education of schoolchildren, predetermined by the determining factors of the social environment, three stages were distinguished in the development of chemical education of schoolchildren in the Soviet period. The first stage – 1917 – 1930 – the development of the chemical education of schoolchildren in the conditions of a change in the political system and cardinal educational reforms. The second stage – 1931–1957 – the development of the chemical education of schoolchildren in the conditions of centralization and unification of public education. The third stage – 1958–1991 – the development of the chemical education of schoolchildren in the context of the transformation of the educational paradigm [].

Analysis of works [3; 4; 6; eleven; 16; 17; 20-23; 26] made it possible to identify at the first stage the following characteristic features of the development of chemical education in schoolchildren.

The development of chemical education for schoolchildren in the period 1917 – 1930 was due to the active reform of the entire system of public education, which was manifested in the introduction of a comprehensive system of education, reformatting the internal organization of the pedagogical process of the new labor school, its maximum orientation towards an inseparable connection with life and the acquisition of research skills.

1. The tasks of labor education, polytechnic education, and the combination of education with socially useful work in a unified labor school were actively implemented.

2. There was a departure from the classical classroom and popularization of the studio system of school education.

3. A comprehensive project approach to the study of school disciplines was being implemented using new forms of organizing the educational process; the project method and the Dalton plan were being introduced.

Such modernization had both a negative and a positive impact on the chemical education of schoolchildren.

The positive results included extensive testing of new forms and methods of teaching chemistry, the search for perfect ways to implement the educational tasks of polytechnic education,

the development of new methods for teaching chemistry, the introduction of a chemical experiment and the improvement of the arrangement of chemical laboratories, the active use of excursions, the development of higher chemical education and methods of teaching chemistry, popularization of additional chemical education and the formation of a network of out-of-school educational institutions.

The negative results of the educational policy in the period 1917 - 1930 included the inconsistency of the chosen forms and methods of teaching chemistry with the goals and objectives, the lack of stable textbooks and corresponding stable programs. The selected "Moscow" project of chemistry programs could not implement the polytechnical principle of education, was overloaded with information and did not correspond to the age characteristics of students, and the massive use of project methods that had not been previously tested in practice led to the deprivation of students of simple and systematic knowledge of chemistry necessary for further education in higher education or work activities. The transfer of the educational process to the production laboratory and the use of the studio system of education actually led to the destruction of the classroom system.

Materials of sources [3–5; 7; 10; 12; 14; 15; 17; 21–23] prove that on the second stage, the following general trends in the formation of the post-revolutionary educational system were manifested, which influenced the development of the chemical education of schoolchildren:

1. Formation of a new school model with a return to the classroom system. Expansion of the chain of general education schools. Closing of vocational schools and factory schools.

2. Return to the knowledge approach - the content of education is presented as a set of knowledge, skills and abilities that the student had to.

3. The relationship of school education with the advanced achievements of science and technology, which was ensured by the new content of chemical education and its compliance with progress. Thanks to scientific research in the field of chemistry and the results obtained, chemical education took a leading role in the further industrialization of the country.

4. Optimization of the system of polytechnical education - a large-scale polytechnicalization of the chemical education of schoolchildren was aimed at overcoming the separation of school from life, increasing the scientific level of chemical education of schoolchildren;

5. The introduction of industrial training for schoolchildren – schoolchildren were involved in work in agriculture and industry, and for more efficient production activities they were trained in special optional courses.

6. Development of the ideological aspect of education - the methodology of the materialistic approach was put at the head of the formation of the content of each academic subject, including chemistry. The educational tasks of a chemistry teacher included the mandatory disclosure of the basic ideas of the dialectical-materialist worldview.

7. Expansion of the chain of institutions of additional education, which were assigned cognitive, motivating and career guidance functions, due to the polytechnical vector of education development. The main tasks of out-of-school and extracurricular activities were shifting from the position of eliminating illiteracy to the development of a harmoniously developed personality. Following this, a methodology for conducting extracurricular work in chemistry was being developed.

8. Care for the cultural and leisure activities of schoolchildren was implemented to a large extent through the publication of popular science books, manuals and magazines. Within the framework of large-scale polytechnicalization, publications with a chemical orientation were popularized and it can be said that they were one of the catalysts for the development of chemical self-education of schoolchildren.

9. Elimination of the practice of teaching chemistry by unqualified specialists by expanding the chain of pedagogical institutes. Improving the system of higher pedagogical education by

introducing polytechnic courses into the curriculum - for the future teacher of chemistry, it became mandatory to study the course "Chemical Technology".

10. Large-scale of scientific research in the field of searching for new pedagogical technologies, teaching methods and techniques that contributed to the active cognitive activity of schoolchildren. And as a result, the beginning of the development of methods for teaching chemistry as a science.

On the second stage (1931-1957), the development of the chemical education of schoolchildren was associated with the following specific changes:

A study of the characteristics of the development of the chemical education of schoolchildren from 1931 to 1957 showed that the distinguishing features of this stage had been the reform of the domestic education system and a radical change in the educational paradigm. This led to the following changes: moving away from the study of chemistry in the format of complex topics and recognizing chemistry as a separate school subject, defining its goals, objectives and content, both programmatic and extracurricular, developing methodological issues for organizing and popularizing out-of-school chemistry education.

The positive results included the fact that in search of ways to improve the quality of chemical education, there was a departure from the methodical chaos common in the 20s of the twentieth century and the creation in the 30s of the twentieth century of a new model of school chemical education, which had been based on the modern content of science and chemical experiment as the leading method of cognition of the material world.

The new stable program was aimed at the complete restoration of the systematic curriculum of chemistry and the maximum strengthening of its educational and educational impact on students, and theoretical training in chemistry was closely connected with practical life, corresponded to the achievements of modern chemical science. In these years, the priority principle of polytechnical teaching of chemistry proved its effectiveness in the training of specialists of a special formation, which had provided a scientific and technical breakthrough in the second half of the 50s of the twentieth century.

The negative results of the educational policy at this stage included, first of all, the processes of centralization and unification of public education, significant ideological pressure on the educational space from the authorities, which had not contributed to methodological activity among teachers, hindered the qualitative development of chemical education for schoolchildren.

These negative consequences should be taken into account in the present and be very cautious about attempts to mechanically adjust federal educational standards to the standards of educational systems in other countries. Preservation of historical and pedagogical experience, methodological traditions, years of proven forms, methods and means of teaching chemistry, training of future teachers is the basis for preserving the spiritual and cultural heritage of Russia.

Analysis of works [1-4; 8-9; 12-15; 21-23; 25] made possible to identify the following features of the development of chemical education of schoolchildren at the third stage:

1. The implementation of universal compulsory secondary education throughout the country - the combination of studying the basic sciences and polytechnic education became a priority task in the educational work of the Soviet school.

2. The main vector of the transformation of education was the combination of education with production work - when compiling new curricula; an orientation was adopted to strengthen the connection between school and life, to implement labor and polytechnic training of students in the course of mastering scientific knowledge. The interdisciplinary, polytechnical and labor orientation of the content of schoolchildren's education dominated.

3. The chemicalization of the national economy was becoming the leading direction of scientific and technological progress - the school chemistry course occupies an honorable place in the system of polytechnic education, and the understanding of the importance of chemical education

for schoolchildren by the governing bodies led to an increase in the number of hours for its study and strengthening the provision of school chemical laboratories with educational equipment.

4. Continuity of complete secondary education was carried out regardless of the type of educational institution - a holistic course of chemistry was studied in full, regardless of the chosen option for obtaining a complete secondary education.

5. Active learning methods were defined as leading in the implementation of the triune goal of education - new forms and methods of active learning were being tested, new technologies were being introduced, and new forms of knowledge control were being sought. The attitude towards taking into account the knowledge of schoolchildren is changing - both the reproductive and creative application of basic knowledge and skills were taken into account, and controlling and teaching functions are assigned to the accounting of knowledge.

6. The educational nature of education prevailed and a large-scale program of comprehensive scientific and cultural development and education of Soviet people was being implemented - the educational tasks of chemical education were oriented towards the formation of a dialectical-materialist worldview and patriotism.

7. The educational and material base of school and out-of-school education was being improved - popular science literature on chemistry for schoolchildren, scientific and methodological literature for teachers of chemistry, and extracurricular reading in chemistry were being published, new educational films and visual aids in chemistry were being created.

8. The chain of out-of-school institutions was expanding - additional chemical education in varying degrees of depth was provided by chemical sections in the homes of pioneers, stations for young technicians, chemical scientific societies, small academies of sciences, etc.

9. Attention was being paid to improving the quality of teacher training; methodological work with chemistry teachers was being improved to improve their qualifications.

10. Scientific-theoretical and practical searches of scientists were being carried out to determine ways to optimize the educational process, the number of scientific dissertations on pedagogy and teaching methods were increasing, the accumulated pedagogical experience was generalized and, as a result, scientific works on the methods of teaching chemistry appeared. Actual areas of pedagogical research were: individual approach, problematic approach, problems of didactic support of the educational process and the organization of independent work of schoolchildren.

At the third stage (1958-1991) of the development of the chemical education of schoolchildren in the context of the transformation of the educational paradigm, the following specific changes appear:

- chemical education was focused on the study of production processes in accordance with the tasks of the global chemicalization of the national economy and strengthening the polytechnic training of schoolchildren;

- implementation of an improved program in chemistry, developed by the program commission in chemistry, headed by Academician of the Academy of Sciences of the USSR M.A. Prokofiev (1957), and chemistry programs for an eleven-year school (1985);

- elimination of the gap between the level of development of science and the level of teaching the subject at school in new programs in chemistry;

- system-activity and problem-based approaches were determined as the leading ones in education;

- the dominance of interdependence and interconnection of the principles of learning proposed by M.A. Danilov: the accessibility and scientific nature of education, the systematic nature of education and the connection between theory and practice, the consciousness and activity of students with the leading role of the teacher, the strength of the assimilation of knowledge and

the comprehensive development of cognitive interests, frontal, collective and individual learning in their optimal combination;

– implementation of active teaching methods developed by L.V. Zankov and V.V. Davydov: learning at a high level of difficulty, a fast pace in the study of program material, the leading role of theoretical knowledge, students' awareness of the learning process, the assimilation of theoretical knowledge through analysis, planning and reflection, purposeful and systematic work on the development of all students, including the weakest;

The study of the development of the chemical education of schoolchildren at the third stage from 1958 to 1991 made possible to determine the positive trends in this process, due to changes in the social, political and economic life of the country and cardinal changes in the educational paradigm.

Changing the target settings in education, systematic updating of the content of education in accordance with scientific and technological achievements and the requirements of its interface with life determined the corresponding dynamics in the development of the components of chemical education for schoolchildren: setting practice-oriented educational goals; strengthening the polytechnical orientation of chemical education; the use of interdisciplinary connections in the process of teaching chemistry at school; increased attention to the formation of the foundations of the scientific worldview among schoolchildren; raising the level of patriotic education by strengthening the historical approach; popularization of optional courses and strengthening of professional orientation to chemical professions; increasing the effectiveness of school and out-of-school chemistry education by improving the forms, methods and means of teaching chemistry, corresponding to the improved content of chemistry education.

Out-of-school additional chemical education was carried out in three main areas: teaching schoolchildren in out-of-school educational organizations; work with schoolchildren in extracurricular activities / electives; mass distribution of additional popular science chemical literature. In the development of out-of-school chemical education, a positive role was played by chemical circles, clubs and electives, the work of which was aimed at attracting schoolchildren to reading popular science books and chemical journals, designing chemical production facilities, modeling and conducting chemical experiments, and organizing excursions to chemical enterprises. Among rural students, the agricultural direction was widely used, suggesting an enhanced practical orientation in the study of biochemistry, agrochemistry, geochemistry, food and household chemicals. In large industrial cities, extracurricular work in chemistry was focused on the study of chemical technology, the formation of basic labor skills in working specialties, and its content was determined by the specifics of nearby enterprises.

Among the negative consequences of the transformations in the chemical education of schoolchildren at this stage, we denote the popularization of profiles, which negatively affected the general accessibility of chemical education and the large-scale, unjustified introduction of test methods, which subsequently radically changed the priorities in assessing students' educational achievements, shifting the emphasis from their practical component to purely theoretical ones. .

The search for ways to optimize learning and eliminate the learning overload of schoolchildren by the mid-80s of the twentieth century contributed to the elimination of a significant amount of laboratory and practical work, which served in previous periods as a means of educating future experimental specialists, people who not only practically prove the likelihood of many bold hypotheses, but also define new ways of creative search.

Analysis of the stated results. The research showed that the components of the system of chemical education of schoolchildren in the Soviet period underwent significant changes at each stage of development. Particular mobility was observed in determining the content of chemical education, which was transformed under the influence of ideological and socio-economic trends and scientific and technological progress. The change in educational paradigms and the dominant target

setting in education, the evolution of the content of chemical education determined the peculiarities of teaching methods and forms of its organization. The features of the change in the content component in the period under study were: a change in the volume and redistribution of time for studying chemistry at school, structuring it by years of study and determining the volume and content of out-of-school chemistry education at each stage of development.

Conclusion. Actualization and study of this productive historical heritage of the Soviet system of chemical education for schoolchildren, against which a large-scale war is being waged today by all possible means (reducing study time for studying chemistry, abolishing a chemical experiment, large-scale humanitarization of school education, minimizing additional chemical education, etc.) is extremely necessary to solve modern educational problems and determine the strategic vectors for the development of modern chemical education for schoolchildren, taking into account national traditions and the positive experience of the Soviet education system.

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