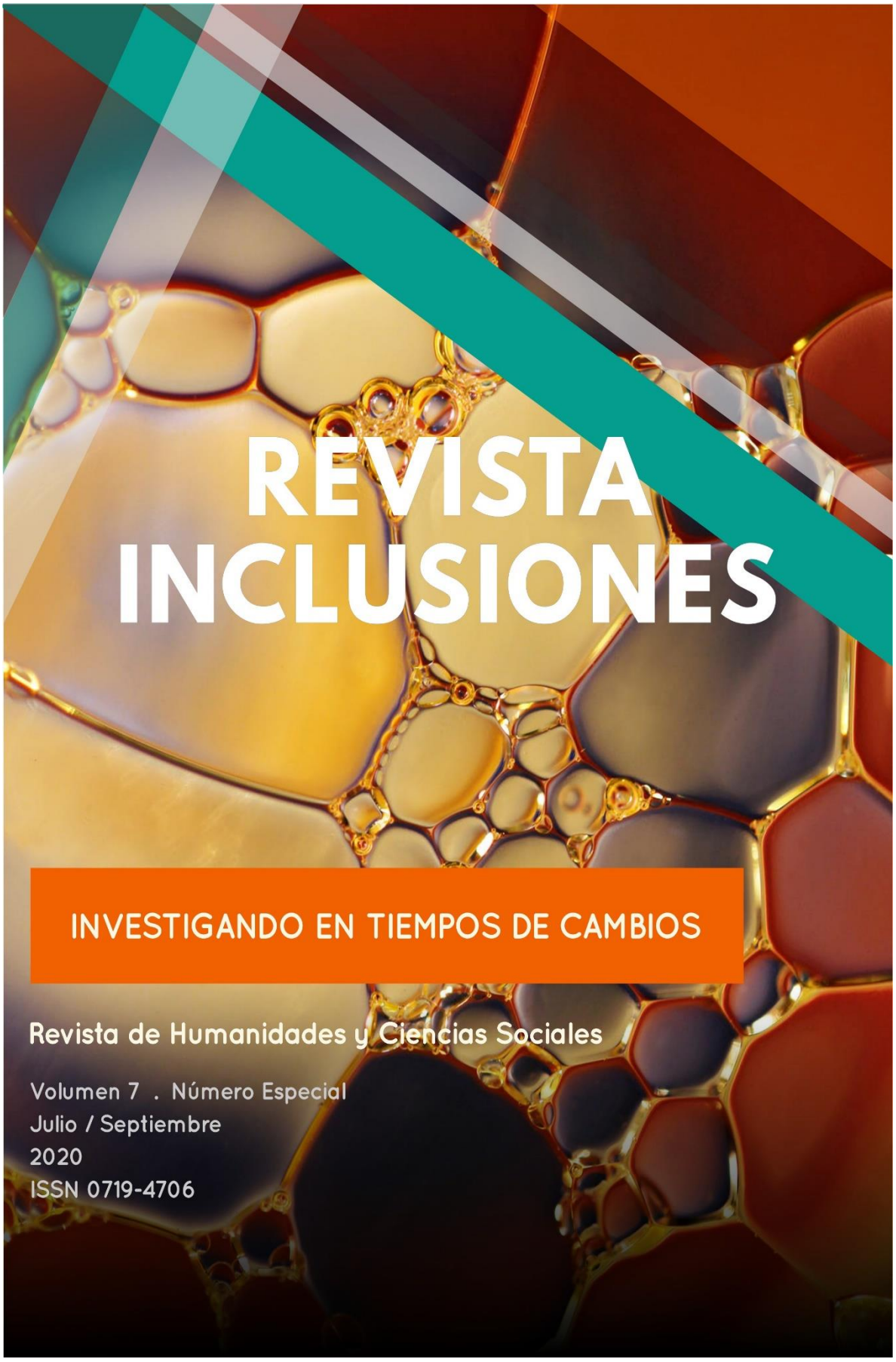

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# METHODOLOGICAL FOUNDATIONS OF INTERDISCIPINARY INTEGRATION IN THE TEACHING PRACTICE

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## Abstract

Socio-economic and scientific integration profoundly affect the development of general education in Russia. The need for a school graduate to have a holistic picture of the world is one of the central issues facing Russian pedagogy and the research field of education. The issue of interdisciplinary integration has long been one of the core elements of educational policy in Russia and abroad. It is reflected in the educational standards and curricula of many countries and international organizations.

## Keywords

Teacher – Methodology of activity – Interdisciplinary interaction – Integrative lesson – Project

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## Introduction

Despite the differences in the implementation of the integrative approach in national educational systems, in various countries the most common forms of interdisciplinary interaction are:

- interdisciplinary connections between two or more subjects;
- combining material on topics, concepts or skills;
- use of the information from various disciplines in a project and research work.

The interaction of various academic disciplines purposefully and / or spontaneously has long been used as one of the elements of teaching in Russia and abroad. However, until now, Russian pedagogical science lacks a clear understanding of the organization of interdisciplinary interaction in modern Russian and foreign schools, the forms, technologies and difficulties of its implementation, and optimal ways to overcome existing challenges and risks.

A common problem for teachers is the lack of competence in the following issues:

1) determining interdisciplinary goals, defining and evaluating integral outcomes;
2) building constructive networking with colleagues;
3) using of special methods and techniques of interdisciplinary teaching and learning.

## Literature review

In Russian pedagogy, the issue of relations between academic disciplines in order to create a holistic picture of the studied object has deep roots. So, the founder of Russian pedagogical theory K.D. Ushinsky (1823-1870) emphasized the special importance of interdisciplinary connections as a way to systematize knowledge by similarity, time, place, etc. However, it seems possible to speak about the emergence of scientific approaches to the issue of interdisciplinary interaction only in relation to the beginning of the 20th century.

The implementation of interdisciplinary interaction at the level of integration of knowledge and skills developed by J. Dewey, W.H. Kilpatrick, was used in the Soviet school in the 20-30s of the 20th century in the form of a project method in the interpretation of P.P. Blonsky, S.T. Shatsky and others. In the middle of the 20th century, the theory of interdisciplinary connections began to be considered from the standpoint of cognitive activity. The authors of this approach were Russian scientists N.S. Antonov[1], M.N. Skatkin[2] and others. They believed that interdisciplinary integration should form the basis of the educational content and its methods. At the end of the 20th century, theoretical issues of didactics were actively studied by I.D. Zverev[3], H.A. Loshkareva[4], V.N. Maksimova[5] and



[1] N. S. Antonov, On the essential features of the concept of “interdisciplinary communication”. In Interdisciplinary communication in the process of teaching the foundations of sciences in high school (pp. 30-35) (Moscow, 1973).
[2] M. N. Skatkin, Problems of modern didactics (Moscow: Pedagogy, 1984).
[3] I. D. Zverev y V. N. Maksimova, Interdisciplinary communication in a modern school (Moscow: Pedagogy, 1981).
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others. They believed that interdisciplinary connections could contribute to the implementation of didactic principles.

Interdisciplinary integration was of interest to researchers as a way to integrate the content of education and the development of the student's integral worldview, integral thinking.

In modern foreign pedagogical science, there are different views on the issue of goals, optimal forms and effective ways of organizing interdisciplinary interaction. There are various approaches to understanding the types and levels of interdisciplinary integration. Three-component integration model in school education (multi-, inter- and transdisciplinarity) presented by S.M. Drake and R.K. Burns[6] is only one of the options for interpreting the conceptual integrative triad, which is used in foreign scientific and pedagogical literature and educational practice. Indeed, multi-, inter- and transdisciplinarity in essence are particular strategies of a general integrative approach to interdisciplinary interaction[7]. Their main task is to combine the potential of various subjects to achieve a common goal, which is the development of generalized picture of the subject[8] and universal skills, or competencies, among which life skills[9] occupy an important place.

The generalization of various approaches and points of view to the issue of scientific understanding of integration was the subject of a special study of scientists from the UK Seongsook Choi and Keith Richards "Interdisciplinary Discourse: Communicating Across Disciplines"[10]. The authors introduce interdisciplinarity, identify the opportunities and difficulties involved in interdisciplinary engagement.

Most foreign educators consider the interaction of disciplines as:

– a modern tool used to study the picture of the world and knowledge about it[11];

– an approach to teaching and learning using the methodology and language of more than one discipline[12];

– pedagogical tool that stimulates and increases students' learning activity[13];

[6] S. Drake y R. Burns, Meeting standards through integrated curriculum (Virginia: Association for Supervision and Curriculum Development Alexandria, 2004).
[7] I. Yu. Sinelnikov y T. G. Zharkovskaya, The willingness of teachers to intersubject interaction: realities and prospects. Proceedings of the international scientific-practical conference "Educational space in the information age" (EEIA-2018). (Moscow: Institute of Education Development Strategy of the Russian Academy of Education, 2018).
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[10] S. Choi y K. Richards, Interdisciplinary Discourse: Communicating Across Disciplines (Palgrave Macmillan, 2017).
[11] C. Broersma, "Is it Time to Change? Infusing the Transdisciplinary Approach into Social Work Studies", Journal of Sociology and Social Work Vol: 2 num 2 (2014): 145-154.
[12] J. Paterson, Teaching Literacy Across the Curriculum, Middle Ground. 2007. Retrieved from: http://files.eric.ed.gov/fulltext/ED497117.pdf
[13] K. Bellisario y L. Donovan, Voices from the field: Teachers' views on the relevance of arts integration. (Cambridge, MA: Lesley University, 2012). Retrieved from:

– a special system of educational process, requiring the integrated instructional strategy within the framework of a single integrative curriculum[14].

Theoretical and practical aspects of the integration and interdisciplinary communications at different levels of education were also studied by Russian researchers A.B. Usova[15], G.F. Fedorets[16] and others. However, so far it has not been possible to reflect the whole diversity of content and organizational forms of the relationship between and within the disciplines. The question of teacher's activities and technologies is not sufficiently developed. O. Soboleva believes that for the effective implementation of interdisciplinary connections at school, it is first of all important to take into account the ability of teachers to work in collaboration and the level of development of students, to be able to choose ways to implement interdisciplinary connections adequate to the educational tasks[17].

## Proposed Methodology

In the process of research, we determined that the teacher today is faced with at least two problems. The first problem is the need to provide students with conditions for their achievement of the meta-subject educational results, which, among other things, includes interdisciplinary concepts and universal learning activities. However, the difficulty lies in the fact that there is no single interpretation of the term "interdisciplinary concepts"; a list of these concepts is not defined. The second problem is how to organize the interaction between the curriculum content and teaching practice. Today, in the context of the regional variability of the curriculum, the multiplicity of textbooks and subject-specific educational and methodological complexes, the interaction of various educational subjects across the country is objectively difficult and hardly feasible. It should be noted that the Bulgarian educators, with whom we partnered, also noted the same problems. So, 25.73% of the teachers participating in the study in Bulgaria confirmed the complexity of preparing an integrated lesson, 21.14% pointed to the autonomy of the subjects content and weak interdisciplinary integration, 18.17% mentioned the difficulty of coordinating the activities of teachers, integrating their efforts around one topic[18].

Thus, the study revealed a number of problems indicating a low level of professional competence of teachers in the question of interdisciplinary teaching and learning. We tried to solve these problems within the framework of the Federal Experimental Site of the Federal State Budget Scientific Institution "Institute for Strategy of Education Development of the Russian Academy of Education". The project "Implementing an Interdisciplinary Approach to the Training and Development of Gifted Children" was based on the Irkutsk Secondary School No. 39 named after P.N. Samusenko (headmaster S.N.Mitrofanova). We came to the following conclusions after the survey of teachers regarding the issue of interdisciplinarity:

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http://www.artsedsearch.org/summaries/voices-from-the-field-teachers%E2%80%99-views-on-the-relevance-of-arts-integration

[14] A. Adams, Cooperative learning effects on the classroom. 2013. Retrieved from: http://www.nmu.edu/education/sites/DrupalEducation/files/UserFiles/Adams_Anthony_MP.pdf

[15] A. V. Usova y A. A. Bobrov, The formation of student learning skills (Moscow: Knowledge. 1987).

[16] G. F. Fedorets, Interdisciplinary communication in the learning process (Leningrad: LSPI, 1983).

[17] O. Soboleva y D.V. Kusin, Methods of teaching social studies: a textbook and workshop for academic undergraduate (Moscow, 2016).

[18] A. P. Sukhodymtseva y M. G. Sergeeva, Meta-subject approach in education in Russia and Bulgaria. Proceedings of the II International Scientific and Practical Conference «Actual issues of psychology and pedagogy» (pp. 39-42) (Penza, 2016).

– despite the fact that majority of teachers have declared their understanding of the term “interdisciplinary”, a very small number fully understand its essence;

– half of the teachers understand the importance of interaction, but demonstrate unpreparedness and unwillingness;

– teachers are inclined to implement interdisciplinary interaction only within the framework of their own activities and do not understand the importance of planning such work;

– almost 40% of all respondents claim that they conduct integrated lessons together with colleagues, have notes on integrated lessons, but most likely (given the lack of understanding of the essence of the term “interdisciplinary”), the reality and quality of these lessons could be doubted.

Within the framework of the experimental site, it was proposed that cross-subject integration should be considered in the aspect of interdisciplinary interaction.

Interdisciplinary interaction is a methodological principle of the educational process at school, ensuring the integration of the content of educational disciplines (subject areas, syllabuses), teaching methods and technologies, both within and beyond educational disciplines with the aim of forming a holistic picture of the world and developing life experiences.

A new approach to interdisciplinary research consists in harmonizing all the constituent elements of the school education (goals, outcomes, content, forms and methods of teaching and learning) in three aspects: conceptual, curriculum content, organizational and methodological. Teachers of different subjects tried to compile an optimal list of interdisciplinary concepts in textbooks of a basic school (5-9 grades), consisting of 55 concepts. Here is a fragment of it (Table 1).

| Interdisciplinary concepts | School subjects |
|---|---|
| *System* | History, Social Studies, Biology, Chemistry, Information and communication technology, Physics, Astronomy, Mathematics |
| *Channel* | History, Geography, Information and communication technology |
| *Connections* | History, Citizenship, Biology, Chemistry, Information and communication technology, Physics, Astronomy, Mathematics |
| *Progress* | History, Citizenship, Biology, Information and communication technology, Physics, Astronomy |
| *Motherland* | Russian language, the Surrounding World, Reading, Music |
| *Business* | Citizenship, Basics of Economics, English language, Mathematics |
| *Space and time* | English language (Grammar), Physics, Physical education, Astronomy, Mathematics |
| *Number* | Mathematics, Russian language, Design and Technology, Geography, Physics, Astronomy, Information and communication technology, English language |
| *Distance* | Mathematics, Geography, Physics, Art, Drawing, Physical education, Astronomy |

Table 1
List of interdisciplinary concepts in textbooks of basic school

Researchers identified interdisciplinary concepts and described their didactic characteristics. For example, the concept of “civilization” can be used on two subjects: in History classes in grade 5 students learn about the civilization of ancient Egypt, the emergence of the state in ancient Egypt, and in the Art classes, students learn about the characteristic features of decorative and applied art in ancient Egypt, creating sketches of jewelry (bracelet, necklace). The concept of “business” is studied in grade 8 in three subjects: in Social Studies, the issue of “entrepreneurial activity” is considered. Further, it is used in speech in English classes when speaking about career choices, and in Technology lessons in the framework of the topic “Types and forms of business”.

Interdisciplinary communications were highlighted not only within the framework of one academic year, but also between levels of education. So, working with the concept of “distance”, teachers traced the connection of five subjects studied in grades 5-11. We give an example.

In grade 5, the concept of “distance” is given as the distance between two points, the length of the segment, the degree of remoteness of objects from each other. The concept of “distance” is used in the study of scale. In grades 9 and 11, the distance between points on the plane and in space is considered. In Geography classes, the concept of “distance” is studied in grade 6 as geographical latitude, geographic coordinate that specifies the north-south position of a point on the Earth's surface. In Physics classes, the concept of “distance” is associated with the path length, displacement, trajectory, and is used in problems of mechanical motion. In Art classes, the concept of “distance” is used for measuring the size of the depicted object, the image of objects made on an exact scale. In Physical Education lessons, the concept of “distance” is used in running, jumping, lining up in rows and could serve as a means of developing discipline, accuracy.

Working in collaboration, teachers identify cross-cutting topics and ensure the requirements for meta-subject learning outcomes in terms of interdisciplinary concepts. Previously, these topics were learned by students separately. Now teachers could systematically rely on interdisciplinary concepts that students have learned before, and also take into account the level of development of interdisciplinary skills.

Thus, interdisciplinary concepts, highlighted and used by teachers of various subjects, allow us to convey to the students the versatility of their characteristics and show the holistic picture of the world.

## Result Analysis

The success of interdisciplinary interaction largely depends on the personality of the teacher. The search for a way out of the contradiction between the existing content and structure of the educational process and the needs for holistic, systemic knowledge of students has led to the active use of integration ideas in education. Within the framework of the experimental site, all the teachers presented a brief outline of integrated lesson in the project form, which contained the demanded interdisciplinary components. Based on this, we identified the most frequent types of integration:

- learning about the educational object from the point of view of various sciences and the development of relevant competencies;

- learning about the educational object on the basis of one leading subject, when the remaining educational subjects, integrated with it, contribute to the development of knowledge, its deepening, awareness of their connection with real life and the development of relevant competencies;

- learning about various educational objects, which assume the use of generalized systematic tasks, when both subjects are equivalent;

- learning about educational objects in the study of the interconnected material of two subjects and the development of relevant competencies.

We illustrate the result with one example.

The lesson project in the 3rd grade of primary school reflects the integration of the Russian language, Mathematics, and the Surrounding World. The project was developed in collaboration with two teachers of the Irkutsk Secondary School No. 39 named after P.N. Samusenko (Gleb N.V. and Selyugina L.V.). The lesson reflected the interdisciplinary idea “Are the meanings of “root” in a word the same when solving equations or in the life of plants”. The material used is represented in syllabuses of the Russian language, Mathematics and the Surrounding World. The logic of integration of these subjects is explained by the type of lesson - the systematization of knowledge regarding the interdisciplinary concept of “root”. The integrative goal of the lesson corresponded to the requirements of the Federal State Educational Standards of the Primary school was to generalize the students’ knowledge about the concept of root:

• in the Russian language the root is a part of a word and a common part of related words, the simple element inferred as the basis from which a word is derived;

• in Mathematics the root is a tool for finding an unknown component in solving problems; a solution of equations;

• In the Surrounding World the root is the main part of a plant that grows down into the earth to get water and holds the plant firm in the ground.

The expected integrative outcomes reflect a general methodological orientation:

- students know the definition of the root as part of a word, they can distinguish it in a word (the Russian language syllabus), etc.

- students know the root like the underground part of a plant, the importance of the root for plant life, use this knowledge to grow cultivated and indoor plants (the Surrounding World syllabus), etc.

- students know that to solve the equation means finding its root (Mathematics syllabus).

The project traces the interdisciplinary links created by two primary school teachers from the point of view of various sciences: the Russian language, Mathematics, and the Surrounding World.

Teachers used the problem method, which contributes to the activation of students’ mental activity at all stages of the lesson.

The optimal choice of didactic tools to achieve the integrative goal of the lesson: a game, a slide illustration, training and control cards (cards with tasks for pair work, group work, expert evaluation sheet), textbooks. They correspond to the methods of educational work in the interdisciplinary field (exercise, observation, search, work with text), the age of the children.

This allowed the project to achieve the expected integrated learning outcomes - students should freely give examples of groups of related words, make equations with one unknown and solve it, show the root on any plant.

Thus, integration is presented in two aspects:

- as the purpose (creating a holistic view of the world around students, systematization of knowledge regarding the interdisciplinary concept of “root”);

- as a learning tool (students search for interdisciplinary knowledge “Are the concepts of the meaning of “root” in the word the same, when solving equations, in the life of plants”), obtaining knowledge independently.

The results of the study allowed to build the activities of teachers in three aspects: conceptual, content, organizational and methodological. It was assumed that the teachers formed the idea that the interdisciplinary skills:

- contribute to the optimization of the teaching and learning process;
- implement the link between the assimilation of ready-made methods of activity and independent actions;
- rank among universal learning activities;
- can be used in new learning situations.

Development of interdisciplinary skills should be one of the important directions in the continuing professional development of a modern teacher.

## Conclusion

Analysis of the scientific and methodological literature and modern educational practice in Russia and abroad allows us to identify the best ways for implementing interdisciplinary interaction, which can be successfully used in a Russian school. One of the main directions for implementing the integrative ideas is the use of the project approach to the organization of interdisciplinary interaction. The project allows to develop turn-based algorithm, systematize the work of the participants in the educational project, and successfully achieve the project goals in a required period of time, taking into account the allocated resources. In foreign school systems, the range of educational practices is wider and more diverse. There are the practices of integration implemented within the framework of multi-, inter- and transdisciplinary strategies, the practice of interpenetration, inter-merging of academic subjects; practice of simultaneous learning of topics as “parallel disciplines”, various kinds of social practices, group themed immersion, interdisciplinary events, etc.

Despite the fact that the question of interdisciplinary interaction is reflected in the basic documents of the field of general education, widely and variedly presented in the educational practice of the modern Russian school, nevertheless, the approaches to the regulation and practical implementation of the idea of integration, as well as the results of this activity, are ambiguous. The insufficient use of interdisciplinary connections in integrated lessons, the vast majority of teachers lacking understanding of the essence of interdisciplinary integration and the need for their systemic organization, lack of the ability to set interdisciplinary goals and determine integrated learning outcomes indicate that today the Russian school has more problems and shortcomings than successes and achievements. The proposed approach to interdisciplinary interaction in modern Russian education can contribute to the development of uniform didactic requirements, the commonality and consistency in the organization and conduct of interdisciplinary teaching and learning, to guide the educational activities of students, understanding methodological categories. Obviously, this approach can be used and is used by educators to develop teaching methods aimed at achieving specific goals, which are defined and regulated by state standards.

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