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TEACHING METHODOLOGY OF NATURAL SCIENCES IN CONDITIONS OF INTEGRATION WITH THE ENGLISH LANGUAGE

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ABSTRACT

The article introduces integrative approach to the development and implementation of a model of educational work for students in natural sciences in conditions of integration with the English language. A pedagogical integration approach to learning can be presented as a set of pedagogical measures and conditions for their implementation. The paper shows that the use of the relationship between natural sciences and the English language when selecting content, choosing methods and forms of educational work in natural sciences in secondary school will lead to increased motivation and interest of schoolchildren in studying natural sciences, as well as to an increase in the level of development of bilingual information and communication competence of students.

Key words: teaching methodology, interdisciplinary integration, natural sciences, approach, foreign languages

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1. INTRODUCTION

In modern world, the trends of integration and globalization are gaining momentum. These trends in the development of society are reflected in the changes taking place in secondary education. According to documents of the European Union, among the main priorities of modern education are the formation of general scientific literacy of learners, which primarily implies their competence in using scientific information, and the preparation of each pupil as a multilingual individual, that is, a person capable of effectively communicating in several languages. In connection with the entry of many countries into the Bologna process, there is a need to coordinate the content of education, organizational forms and teaching methods used by teachers in different countries. A contradiction arises between a significant array of newly developed integrated courses by teachers in the education systems of different countries and the need to coordinate their goals, content, organizational forms, methods and means. However, in the work practice of most teachers, only one of the components of this complex is present - an integrated lesson. There are several opinions about what kind of lesson can be considered integrated. The most common, in our opinion, are integrated lessons, in which the conceptual and informational sphere of educational subjects is combined. Such lessons can be conducted with the aim of better memorizing any facts and information, accompanying repetition, and introducing additional material to the topic.

2. METHODOLOGY

A more serious approach to conducting integrated lessons is associated with the tasks of comparative and generalizing study of the material and is expressed in the development of learners' ability to compare and contrast phenomena and objects. The deepest level of integration is at which learners themselves begin to compare facts and judgments about the same phenomena and events, establish connections and patterns between them, and apply jointly developed learning skills. According to F.B. Okolnikov [1], learners' attempts to independently compare various information, find connections and patterns that contribute to a holistic perception

and explanation of a certain phenomenon can be considered a result, an indicator of the success of pedagogical integration. An important feature of integrated lessons is also the fact that the material of most of them is almost not submitted for current or final control in the subject, which causes a frivolous attitude towards such lessons on the part of many pupils. Without generally denying the value of such lessons as such, it should be noted that the formal, overly simplified understanding by most teachers of the main idea of integrated lessons and the associated features of their planning and implementation is dangerous due to the emergence of spontaneous integration. By spontaneous integration we mean the episodic use of pedagogical integration, most often at the level of subject content, without setting clear goals and without determining the place of the integrated lesson in the educational process.

In modern schools, the low effectiveness of this kind of integration is becoming increasingly obvious. The reason for this lays not so much in the disconnection in time of the processes of studying related subjects, but in insufficient attention to the student's personality as the most important integrating factor. Any result of the integration process must have a personally significant meaning for each student, otherwise only formal integration takes place, which, due to the peculiarities of organization and implementation, turns into spontaneous. The problem of activating students in a natural sciences lesson, the obvious difficulties on the part of the teacher when designing personally significant lesson goals for students in almost every lesson can be resolved with the help of pedagogical integration mechanisms. The teacher himself must be prepared to use pedagogical integration, and the success of using pedagogical integration in the educational process largely depends on the teacher's preparedness. As mentioned above, any components of the pedagogical process can be integrated into the lesson: goals, principles, content, methods and means of teaching. In the process of integrating educational content, any of its components can be identified: concepts, laws, principles, definitions, signs, phenomena, hypotheses, facts, events, problems, ideas, etc. At the same time, such content components as intellectual

and practical skills can also be subject to integration. These components from different disciplines, combined in one lesson, become system-forming, around them educational material is created and brought into a new system. The main thing in organizing a lesson is the system-forming factor reflected in its goal, since the methodology and technology for constructing the lesson that will be further developed will be determined by this factor. F.B. Okolnikov developed an integrated laboratory workshop, which implemented the idea of effective interaction experiments in the classroom through an integrative activity approach to teaching, natural sciences and biology at school.

The creation of integrated courses is another possible way to implement interdisciplinary connections. The trend towards interdisciplinary integration is clearly expressed at different levels of education in Europe and America. We consider it necessary to trace how the integration of natural sciences and other disciplines, both from close and distant educational areas, is realized in the conditions of specialized training in a foreign school.

Firstly, a number of integrated courses of academic disciplines have been developed and successfully applied. Often such courses are generally accepted at the national level. For example, in many countries, in high school, students are offered a Science course, combining physics, natural sciences and biology. Students can study each of these disciplines separately or as part of an integrated course, but most students choose the integrated course. According to statistics, more than 60% of English schoolchildren study an integrated science course at school and take a final exam, the grade for which is taken into account by most universities and colleges in the UK when recruiting applicants. Individual natural sciences courses are chosen by students planning to continue their studies at a university or college in the geographical or natural science department. The integrated natural science course contains the most general concepts, laws and facts from the field of natural sciences; it is focused on the needs of everyday life and is usually taught in module form. The Science course is chosen by schoolchildren who have not yet decided on a future career, some humanists, as

well as those who study natural sciences in the form of individual disciplines. Partial duplication of the material being studied is not prohibited; students are also allowed to take final exams in both natural sciences and the integrated course.[2] A.N. Dzhurinsky [3] mentions the use of integrative curricula and courses in schools in the USA, Great Britain, France and other countries.

A set of general logical methods corresponding to mental techniques is widely used in linguistics and, in particular, in teaching a foreign language, as they contribute to the formation of the skill of “linguistic guessing. This skill helps learners to determine the meaning of a foreign word or an obscure scientific expression without looking up in a dictionary. It is essential to getting knowledge and conversing about scientific subjects, so it improves learners’ communicational and informational awareness and helps them comprehend and take in scientific terminology, which helps them develop their area of study capabilities. In a broader pedagogical sense, this situation makes use of transference of knowledge through the creation of new logical connections as well as intra- and inter-subject integration of previously acquired knowledge. The works of K.I. Novoselsky [4], N.P. Ochirova [5], N.N. Trubaneva [6], and others highlight the significance of mastering the ability of "linguistic guesswork" for knowledge transfer.

In the monograph by A.V. Konyshcheva “English language Modern teaching methods”[7], the following methods of teaching a foreign language are highlighted, which, in our opinion, should be classified as general pedagogical: the communicative method, which implies the construction of teaching based on verbal communication; the main principles of constructing training based on the communicative method are speech orientation, functionality, situationally, novelty, personal orientation of communication, modeling; a gaming method built on the basis of a game, that is, a type of activity that simulates life situations in an entertaining way; According to the nature of the gaming methodology, games are divided into subject-based, role-playing, plot, simulation, and dramatization games; problem-based method, which involves the creation of problem situations under the guidance of a teacher and active independent activity of students to

resolve them, resulting in the creative acquisition of knowledge, skills and abilities and the development of mental abilities; project method, which involves students conducting independent research with a pragmatic focus; a programmed teaching method that involves the formation of clear activity algorithms for students, in particular, using a computer. All these methods are equally widely used both in teaching a foreign language and in teaching natural sciences, and therefore have the potential to integrate these subjects. In this case, integration is carried out primarily through the content of educational activities using the listed methods. In particular, in the section devoted to forms of extracurricular work in natural sciences, we will consider in more detail the use of the project method to implement the integration of natural sciences and a foreign language.

3. DISCUSSION

Methods of teaching natural sciences correspond to methods of natural scientific research. These include: observation of objects of natural sciences and their images; a body of knowledge about natural objects; phenomena and processes; description of objects of natural sciences ; explanation of chemical facts and phenomena; prediction of natural scientific facts and phenomena, solving environmental problems. In the methodology of teaching foreign languages, there are different views on the problem of specific methods. The two most common points of view are the following: (1) the main methods of language teaching include technological operations - familiarization, training, application and control; 2) in language teaching, general pedagogical methods are used, implemented through a system of linguistic methodological techniques, each of which, in turn, corresponds to a set of exercises. Obviously, it is possible to consider the possibilities of integrating methods of teaching natural sciences and methodological techniques for teaching a foreign language. Since there are several dozen methodological methods for teaching language, it is difficult to take into account all possible integration options in one study, so we will dwell on several examples that we used when organizing a pedagogical natural scientific approach.

Thus, the pedagogical integration of the academic subjects of natural sciences and a foreign language is carried out not only due to the use of scientific English as a means of communication between teacher and student, but also due to the formulation of tasks taking into account regional studies material, about which students were informed. As an example of an integrated lesson in natural sciences and English, one of a series of lessons, we present a methodological development for conducting a practical lesson “Solving problems on the topic “How does water change from one state to another?”. “The purpose of the lesson: to continue developing students’ skills in applying acquired knowledge to solve experimental problems in natural sciences in a bilingual (bilingual) communication environment.

Lesson objectives include: 1. repetition, generalization and improvement of knowledge on the topic “How does water change from one state to another?”; 2. familiarizing students with solving experimental problems in natural sciences; 3. consolidation and development of skills and abilities to work with laboratory equipment; 4. implementation of the “natural sciences-English language” relationship based on interdisciplinary integration, development of bilingual-integrative knowledge and information and communication skills (consolidation and improvement of knowledge necessary for planning an experiment, describing observations and formulating conclusions in vernacular and English - teach pupils to use your knowledge to give descriptions of natural resources, natural phenomena and comment on your observations of changes in the course of water change process in English, orally and in writing; gaining experience in foreign language communication using natural sciences material.)

When repeating, as well as during the introduction (presentation), of the lexical minimum, we propose to group words into semantic groups. Thus, better assimilation of foreign words is ensured and logical connections between natural sciences terms are consolidated. Such a recommendation is based on the use of such a property of scientific terminology as its systematicity, which allows you to introduce vocabulary not as a list of isolated lexical units, but as a system of interrelated and interdependent terms, in their totality covering a certain thematic

field corresponding to a separate section of science. When working on the assimilation of terms, many researchers recommend the use of structural and logical diagrams that identify connections between concepts. In announcement of the topic of the lesson in vernacular and English, explanations of the task and a brief safety briefing students are motivated to complete the upcoming work, and the general algorithm of students' actions in the lesson is revealed.

This stage of the lesson is conducted in vernacular or English. In the second case, it is necessary to actively use visual supports (notes on the board, equipment and reagents necessary for work) and carefully monitor how much students understand what is being said to them (feedback). If the task and comments to it are offered in English, students should ask questions about what they heard in vernacular. Students perform natural sciences experiments, record the results of observations in notebooks for laboratory work in natural sciences and on cards in English, answer the teacher's questions in English. Students should be involved in situations of bilingual communication on the surrounding world topics. At this stage teachers use a group form of work. Students perform practical work in teams of 4 people (two are "experimenters", two are "observers"). Teachers carry out the functions of organization and control. A laboratory assistant, who was also present at the lesson, helps teachers with organizational issues and compliance with safety regulations. Teachers moves around the classroom, observing students' work, giving instructions and advice, asking questions, listening and correcting answers. One of the teachers works in English, the other in mother tongue. Before conducting the experiment, students have to think through a solution to a practical problem and write down the equations of the process of changing the form water, after completing the experiment - observations and conclusions in notebooks, and also fill out the cards provided in English.

For students with insufficient knowledge of a foreign language, it is also advisable to offer the design of posters or placards. When designing posters and posters, verbal material (in native language or a foreign language) is minimal, the main goal of completing the task is to realize students' creative abilities and skills

of working and communicating in a group. Teachers also believe that doing this type of activity helps students gain experience in value relationships, which is an important component of information and communication competence. When publishing wall newspapers, three main stages can be distinguished they are preparatory, main and final. At the preparatory stage, the teacher, together with the students, determines the name of the newspaper and what it will be dedicated to. It is advisable to devote wall newspapers to any significant events in the field of natural sciences or the environment; problems of ecology, local history, modern achievements of science, biological professions, etc. that concern students. At the main stage, students follow an algorithm of joint actions. Students must select the material, think over its correct and beautiful arrangement in the newspaper layout, and develop illustrative material and artistic design of the newspaper. At the final stage, students, together with the teacher, discuss the results of the work done, share their experience in performing this type of task, and identify difficulties that arose during its implementation. The purpose of making stands is the development of chemical, linguistic and bilingual-integrative knowledge of students, the development of graphic and information and communication skills in a situation of direct bilingual communication. The specifics of this type of activity include a large volume of design work. At the preparatory stage, the teacher motivates students to make and design a stand, and informs them in a preliminary conversation about the algorithm of their actions. Students, together with the teacher, determine what their stand will be dedicated to. It is recommended to include nature laws, rules, and histories of natural scientific discoveries, necessary diagrams and tables, and a minimum dictionary of scientific terms in native language or bilingual in the material of the stands.

The stand can be designed either in a foreign language entirely or with elements of a foreign language (writing headlines, using terms in a foreign language), depending on the preparation of students. At the main stage, students select the necessary natural scientific and linguistic material, think over its location on the stand and adequate means of visualization, and then directly design the

stand. The main act of bilingual communication in this type of group activity is translation work (working with a dictionary and grammar reference book). Whenever possible, students use material completed during individual extracurricular work. At the final stage, students, together with the teacher, discuss the results of the work done, share their experience in performing this type of task, and identify the difficulties that arose during its implementation. Classes in the natural sciences circle play an important role in organizing extracurricular work in natural sciences, since it is through the circle that the preparation and holding of mass events in natural sciences takes place. Working in a circle helps to unite a team of students who move towards a common goal, helping each other, feeling responsible to other members of the circle.

4. CONCLUSION

It has been established that at present, in connection with the globalization and integration of modern society, as well as in connection with the modernization of general education, one of the urgent tasks of educational work in natural sciences is the formation of information and communication competence of students, that is, their ability and willingness to communicate and use information on environmental topics. Great opportunities for solving this problem are opened by the use of methods for studying natural sciences in secondary school in conditions of integration with a foreign language. A concept has been formed, and on its basis a theoretical model of educational work in natural sciences at school in conditions of integration with a foreign language can be developed. The model represents the unity of leading ideas (modernization, integration, humanization, communication), methodological approaches (comprehensive, integrative-communicative, systemic, activity-based, personality-oriented and competency-based), principles (development of natural sciences and linguistic knowledge, integration of natural sciences and a foreign language, bilingual communicative activity, continuity with natural sciences and foreign language lessons) and a complex of various integrated methodological techniques and forms of teaching using the communicative capabilities of a foreign language. It has been proven that the methodology of

studying natural sciences in the conditions of integration with a foreign language ensures an increase in the level of formation of bilingual information and communication competence of students, which is expressed in a sufficiently high level of assimilation of bilingual integrative knowledge, in a high level of formation of information and communication skills; experience of bilingual communication. It is shown that the use of the developed methodology stimulates students to study natural sciences with the help of the communicative capabilities of the English language, and, thus, helps to increase the interest and motivation of schoolchildren to study natural sciences. The developed methodology is most clearly manifested in classes and schools with in-depth study of a foreign language. However, its use may be useful in other educational institutions. The development and dissemination of bilingual methods of studying natural sciences and other subjects in secondary school is closely related to the improvement of the qualifications of subject teachers in the area of language training.

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