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The Use of Modern Pedagogical and Information Technologies in Biology Lessons

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Abstract. The article discusses the practical application of modern pedagogical and information technologies: didactic games, problem-based learning, modular teaching technologies, collaborative learning technologies in biology lessons. Lessons using information technology products are information-rich, and the teacher differentiates and individualizes with the students. This creates the opportunity for training. this creates the basis for monitoring and evaluating learning outcomes. With the correct use of pedagogical and information technologies in biology lessons, students can develop a system of critical thinking, thirst for knowledge, love for the Motherland, protection of the environment, and a sense of trust. To do this, biology teachers need to master the skills of using modern information and communication technologies. With the correct use of pedagogical and information technologies in biology lessons, students can develop a system of critical thinking, thirst for knowledge, love for the Motherland, protection of the environment, and a sense of trust. To do this, biology teachers need to master the skills of using modern information and communication technologies.

INTRODUCTION

Modern specialists should be able to freely use information technology in their professional activities, regardless of their field of activity. In particular, biological science and a new stage in its teaching cannot be imagined without information technology. The solution and achievement of biological problems, as well as other areas, are largely related to the widespread use of modern information and communication technologies. Therefore, the future development of biological mature generation using modern computers and telecommunications, improving the education system and improving the quality of education.

Currently, the goals and objectives of modern education are changing. At present, it remains obvious that in order for a student to become a mature specialist, it is necessary to inform the branches of science, intellectualize educational activities, deepen integration processes, and improve. the use of computerized (new information) components, the widespread introduction of communicative competencies in education, improvement of the infrastructure of the educational system and its management mechanisms [1].

To increase the effectiveness of biology teaching, it is necessary to organize it on the basis of communicative competencies, create electronic literature, distance learning courses, and monitor the effectiveness of teaching activities [2].

The merit of Western scientists in studying the problems of introducing information technologies in biology lessons, using distance learning technologies, and integrating their technical means is incomparable.

Research was conducted by researchers such as A. Berglund, D. Geladze, H. Long, M. Sugata, K. Wattananarong, P. Alfred, B. Means, V. Olatokun, K. Peters, J. Traxler, B. Furuholt [2].

In recent years, the introduction electronic resources and their implementation in practice have acquired urgent importance in improving the education system [3].

An innovative approach to biology lessons and the competent use of electronic resources will allow students to develop a system of creative thinking, a thirst for knowledge, love for the Motherland, protection of the environment and a sense of trust. To do this, biology teachers need to master the skills of using electronic resources. (As a result of the large-scale reforms currently being carried out in our country, including the attention paid to the education system at the state policy level, all educational institutions have all the conditions for learning and make full and rational use of these opportunities.

Lack of knowledge, since the XXI st century is the century of information and communication technologies, the teacher's lack of sufficient knowledge in this area also negatively affects the positive organization of lessons [4].

The rapid growth of information technology in the XXI st century, the positive and negative consequences of the intense and significant influence of information systems on human development, their dangers and risks as an environmental problem, and not as a social problem, as well as the impact on the education of the younger generation, research has also been conducted on about the secret [5, 6].

From the analysis of the literature it is clear that one of the pressing issues of our time is the comprehensive development of information technologies by specialists conducting research in the field of modern biological education.

MATERIALS AND METHODS

As is known, the use of pedagogical and electronic technologies is defined as an important task in the regulatory documents of the "lifelong education" system, adopted in order to increase the efficiency of the educational process in biological education. In fact, in the era of information globalization, increasing the effectiveness of learning using an innovative approach and electronic resources in the educational process is considered an urgent problem. To use an innovative approach and communicative competencies in teaching natural sciences, including biology, it is necessary to take into account the specifics of the content of biological education.

Using computer technologies in teaching biology, it is possible to develop students' learning motives, monitor and evaluate students' acquired knowledge, organize differentiated learning, and organize students' independent and creative research.

Information technologies used in teaching biology solve the following problems:

1. The educational goal is to provide students with important resources on the topic being studied, including a graphic organizer, glossary, mind map, important concepts and their explanations, laboratory and practical exercises.
2. The task of guiding students' educational activities is to teach students to develop skills in working with information, working with simulated and control programs, as well as animation, preparing a person in the "information society" and thinking creatively.
3. Demonstration function - unlike other teaching aids, information processing devices, information process software, operating systems allow students to visualize biological processes (text, spreadsheets, presentations, graphs, databases and their management systems), thanks to the presence of modern multimedia systems, their role in the educational process is invaluable.
4. The task of control is to control and evaluate the acquired knowledge, skills and abilities of students in all forms of teaching biology: lesson, laboratory work, practical exercise, as well as at all stages of a biology lesson.
5. The development goal is the ability of students to apply theoretical knowledge in practice, improve research skills and the ability to make optimal decisions.
6. Educational task – as a result of students' work with electronic programs, economic, physical, environmental, international and mental work skills develop.
7. The task of forming a scientific worldview is to study nature and its objects in 2 worlds: the macro- and microworld, and in content - biological science, in most cases, the microworld: the life processes of cells, tissues, molecules of chemical elements, atomic structure such as material and energy metabolism, educational materials are developed expanded.

Considering above functions information technologies in teaching biology, determining how to use them in implement them in practice is considered one of the pressing problems of our time.

The use of information technology in the teaching of biology prepares the ground for the implementation of the following didactic goals:

- information technologies create the basis for collecting, sorting, didactic processing, distribution and use of educational material in the educational process, which ensures the implementation of educational, educational and developmental goals provided for in the teaching of biology.
- in accordance with the talents, needs, interests and educational motives of each student, the trajectory, pace of learning, as well as the reuse of information programs when necessary, can be determined.
- radically changes the structure of biology classes, the course of the lesson, the character, and cognitive activity of students from object-subject relationships to subject-subject relationships, that is, students become active participants in the pedagogical process to achieve educational goals.
- prepares the ground for students to develop independent, creative, logical and systematic thinking skills.
- in cases where it is impossible to implement in an educational institution (there is no necessary equipment, experiments are harmful to the health of students, they take a long time, mastering the technologies of production enterprises), virtual experiments make it possible to demonstrate.
- prepares the ground for the development of students' creative abilities, intensification of students' educational activities, and acquisition of educational motivation.
- to determine the effectiveness of the educational process, there is feedback, that is, the ability to determine and evaluate the acquired knowledge, skills and abilities of students in a short period of time.

One of the important tasks of a teacher working in the system of continuing education is to increase students' interest in mastering the fundamentals of science, ensuring their competence in developing independent and creative thinking skills. Information technology products play an important role in solving these problems [7].

Lessons using information technology products are rich in information, visual, interactive, use time effectively, each student learns at his own pace, and the teacher differentiates and individualizes with students, creating the opportunity to implement learning, and at the same time, this creates the basis for monitoring and evaluating educational outcomes [8].

In the content of biological science, students will not have the opportunity to directly observe the processes of a cell, tissue, chemical element, molecule, atomic structure, metabolism and energy, photosynthesis, protein biosynthesis, biotechnology and genetic engineering, but it is possible to bring these processes into a visual state that gives the desired result, including:

- students will be able to imagine, abstract and remember the processes of cellular, tissue, chemical elements, molecules, atomic structure, metabolism and energy, photosynthesis, protein biosynthesis;
- taking into account the motives and level of assimilation of students, it allows repeated training and filling gaps in students' knowledge when necessary;
- virtualization of biological processes in the form of animation prepares students for visual thinking and full assimilation of educational material;
- the use of animation in a biology lesson leads to increased cognitive activity of students at all stages of the lesson.

The following information technology products can be used in teaching biology:

- carrying out a demonstration based on the content of each topic, i.e. presentation materials.
- animation of biological processing.
- virtual laboratory and practical work.
- virtual tour of production plants.
- model program for biological processing.
- educational programs on biological processing.
- test programs for monitoring and assessing students' knowledge in subjects.
- educational and information sites for independent learning and work of students.
- animations based on a didactic game.
- a program of creative tasks of varying levels of complexity.

RESULTS AND DISCUSSION

The possibilities for using information technology in teaching biology are enormous. Like all sciences, natural tools play an important role in teaching biology, but visual tools can be stored in computer memory and used during the learning process [9].

Information technologies are recommended to be used for the following purposes:

- exhibition instruments. multimedia presentation - exhibitionism.
- organization and management of students' cognitive activity through modular programs.
- collecting additional materials and working on them independently is development.
- control and assessment of students' knowledge through control programs and test tasks.
- didactic games, puzzle solving - tasks that satisfy the need to gain knowledge and develop interest. As can be seen from the above, not only the pedagogical, but also the harmonious use of information technologies in teaching biology is highly effective and allows us to develop the interests and needs of students in mastering the fundamentals of science. Based on the content of the topic being studied, the teacher studies electronic textbooks, versions and multimedia products of information technology and analyzes them, the possibilities of realizing the didactic goals of the topic, the use of educational, simulated and control programs, multimedia tools. paths need to be determined. To do this, it is necessary to determine ways to use these information technology products in biology lessons, to develop ways to organize the cognitive activity of students.

The teacher's work in this regard will consist of the following algorithms:

First stage.

- identify the specific characteristics of information technology.
- was a product of recommended information technology.
- viewing electronic textbooks and multimedia.
- determine the possibilities and advantages of educational topics for the implementation of didactic goals.
- second phase.
- analyze educational programs and determine ways to use them in biology lessons.
- analysis of control programs and determination of ways to use them when organizing independent study of students.
- analyze simulated programs and determine ways to use them in biology lessons.
- analysis of multimedia, determination of ways to use it in organizing biology lessons and independent study of students.
- determine ways to use selected multimedia materials in biology lessons.
- it is necessary to determine ways to organize students' cognitive activity, prepare assignments and tests that students must complete in class.

Having completed these tasks step by step, the biology teacher must solve the problems of harmonizing pedagogical and information technologies.

Harmonization of pedagogical technologies with information technologies in the educational process organized in the system of lifelong education is an urgent problem. Therefore, it is necessary to determine its didactic functions for the use of information technology.

It is known that information technologies give the desired effect when used in the educational process in harmony with pedagogical technologies. In this process, the functions of information technologies, such as informing, organizing and managing students' cognitive activity, visualizing, monitoring and assessing students' knowledge, activating students' cognitive activity and increasing their interest, are based on the harmonization of modern pedagogical and information technologies.

Realizing the possibilities and importance of didactic games, modular, problem-based learning, cooperative learning technologies that are used in teaching biology at a special methodological level, organizing and managing the cognitive activity of students, information technology, demonstration, control and assessment of student knowledge is important for enhancing the cognitive activity of students. In conference classes based on didactic gaming technology, it is not possible to implement this function, since the cognitive activity of students is organized and controlled according to the plot and rules of the game, but information technology can provide information, demonstration, and control of student actions. knowledge and it is possible to implement such functions as assessment, intensify the cognitive activity of students and increase their interest.

In presentation lessons of didactic gaming technology, it will not be possible to implement such functions of information technology as a source of information, organization and management of students' cognitive activity, since students reflect on current problems of a specific chapter or subject. All functions of information technology can be implemented when students solve creative problems in creative game lessons of didactic game technology.

Since a game related to didactic gaming technology involves monitoring and assessing the knowledge, skills and abilities acquired by students in lessons with exercises, information technologies will not be able to serve as a source of information.

All modular educational technology programs are used in the classroom to serve as a source of information, organize and manage students' cognitive activity, demonstrate, monitor and evaluate students' knowledge, activate students' cognitive activity and increase their interest in it. there is a possibility of direct implementation.

During these lessons, the biology teacher should store the module program and modules in the computer memory, based on the content of the subject, program the questions of the module program and the content of the modules for sequential display during the lesson.

In lessons using cooperative learning technology, the biology teacher must explain topics that are difficult for students to master, and students must independently master factual and additional educational material, that is, the source of information on a certain part. the subject can perform such functions as organizing and managing students' cognitive activity, demonstrating, monitoring and assessing students' knowledge, activating students' cognitive activity and increasing their interest.

Since in classes where the team teaching method and cooperative learning technology are used, it is envisaged that the educational process will be organized by dividing students into teams, an information source of information technology, organizing and managing the cognitive activity of students, demonstrating, o the implementation of such functions as control should be planned and assessing students' knowledge, activating students' cognitive activity and increasing their interest.

To do this, the biology teacher should store in the computer memory the educational tasks and content of the subject completed by students during the lesson, and program the sequential presentation of educational tasks and content during the lesson.

In saw-tooth or zig-zag collaborative learning classes, students are divided into groups twice, i.e., first "experts" are trained on a certain part of the topic, and then a "meeting of experts" group is created. organized, information technology. It is impossible to implement the function of organizing and managing the cognitive activity of students, but it is possible to implement the functions of a source of information, demonstration, control and assessment of students' knowledge, activation of students' cognitive activity and increasing their interest.

In lessons based on the method of organizing creative research in small groups, collaborative learning technology, information source of information technology, organization and management of students' cognitive activity, demonstration, students

In addition to the functions of monitoring and assessing knowledge, activating students' cognitive activity and increasing their interest, it becomes possible to master the operations of mental activity necessary for students' creative search.

In lessons on the technology of collaborative learning "Let's learn together", the content of the topic is divided into parts, students are distributed into groups, each group member studies a certain part of the topic, and during the lesson, group members discuss the topic together, since it is assumed that the content will be developed as a whole, then it is not possible to implement the function of information technologies to organize and manage students' cognitive activity, but they are a source of information; demonstration, control and assessment of students' knowledge, such functions of students' cognitive activity as activation and increased interest can be realized.

Since the cognitive activity of students is aimed at solving problem situations in lessons using the "brainstorming" method of problem-based educational technology, it will not be possible to implement the function of information technology in organizing and managing the cognitive activity of students, but a source of information. In addition to such functions as organizing and managing students' cognitive activity, demonstrating, monitoring and assessing students' knowledge, activating students' cognitive activity and increasing their interest, it is possible to develop students' independent activities. and creative thinking skills. A biology teacher must have a good knowledge of the types of teaching methods, their methods and ways of using them in the process of harmonizing pedagogical and information technologies.

For the effective use of pedagogic technological and educational processes, we need to determine the method of training, the introduction and the composition, the teaching method, and the formation of the internal system. It is known that for all forms of the educational process, including at different stages of one lesson, teaching methods are used in harmony with each other, as well as learning tools. For the effective use of pedagogic technological.

Taking this into account, a group of teaching methods included in pedagogical technologies has been defined. In the process of education, organized in the system of continuous education, a guarantee of effectiveness is considered to be the comprehensive use by the teacher of pedagogical and information technologies, complete knowledge of the types of teaching methods included in pedagogical technologies.

A teacher must have certain methodological knowledge, skills and qualifications in order to correctly and effectively use pedagogical and information technologies, teaching methods in the educational process.

The teacher must determine the use of the above pedagogical technologies at the local or special methodological level in accordance with the content of the subject studied in the lesson, determine ways to organize and manage the cognitive activity of students in the lesson based on technological maps, taking into account the didactic goals of the lesson, in this case it is necessary to form educational goals for students, analyze the results obtained and make certain changes in the educational process in accordance with the results obtained.

When organizing classes, the teacher must adhere to the principle of integrity of the content of education, methods and teaching aids developed in didactics, determine from the beginning of the school year what type of pedagogical technologies will be used in educational work. a complex and thematic plan created in subjects that meet the goal.

CONCLUSION

The training of modern specialists who have acquired new knowledge in information and communication technologies in modern biological education is of great scientific and practical importance in the higher education system today. Organization of educational activities with the help of information technologies is necessary for the transition to a new stage of mastering the content of education by students.

The use of computer experiments has significant advantages in the form of the ability, using direct experiments, to calculate and numerically evaluate complex or completely unattainable features of the phenomenon being studied. The use of information technology in modern biological science and education leads to progressive development in this area.

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