

DISTANCE LEARNING TOOLS AND THEIR FUNCTIONS IN TEACHING BIOLOGY REMOTELY

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ABSTRACT

Among renowned scholars A.M. Bershadsky and T.P. Voronina devoted their works to the study of various theoretical aspects of distance education. As for the features of new pedagogical technologies, A.Y. Saveliev and A.K. Skuratov focused on this point in their works [17, 37, 132, 138]. It should be noted that in distance learning, along with the traditional means of education, information and communication technologies are used [11].

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Together with a brief description (opportunities) of these learning tools, this article analyzes the tools which have specific features and particular relevance to teaching Biology remotely. Let's consider educational books (hard copies, paper-based ones and an electronic version of textbooks, educational and methodical manuals, directories etc.). In teaching and learning Biology distantly traditional textbooks, teaching aids, workbooks and other printed publications are widely used. Even in foreign practice of distance learning, where the technical level of equipment of the educational process is high, the share of printed publications is quite considerable high. When developing didactic printed materials for teaching Biology remotely, these kind of "self-teaching" aids should be guided in the first place as follows: manuals' content should be designed in such a way that it should minimize the student's addressing to additional educational information; it is advisable to use the module principle when making (collecting) the structure of the educational material; detailed instructions should be provided for studying the material and organization of independent work; mandatory elements in the manual should be control tasks, a glossary, questions (with answers) for self-testing, training tasks [51, 133]. In general, according to A.A. Andreev [11], a rational structure of manuals for a discipline (course), which is appropriate to the content of the discipline, should include several principal sections.

The introductory part (to Biology) should contain the history of the formation of science, the subject of science, the relevance of Biology in the modern world, the place and relationship of Biology with other disciplines of the program. After the introduction, it is necessary to indicate the developed curriculum for the course. Then the goals and objectives of the study of Biology are defined and methodological recommendations for independent work on the study of this course are given. When forming the course, each topic, each lesson should have its own name, which should be reflected in the table of contents. The main content of the course is structured into sections (modules). Tests, questions, tasks, etc. should be placed in each module in addition to the course material in order to consolidate the studied material and control knowledge. At the end of several modules there is a summary task (test, practical task, independent work, creative task, etc.). At the beginning of the course you should specify the list of literature (main, additional). It is also necessary that the course have information or a link to the page about the course creator.

It can be assumed that the relevance of printed publications will decrease due to the active involvement of information technology in distance education. However, as N.V. Maslova's studies of natural sciences have shown that educational materials can be presented bio-automatically (with natural conformity) [19]. In this point, the educational material is organized as a system of bright reference images filled with exhaustive structured information in an algorithmic order. Various channels of perception (hearing, vision, smell, etc.) are involved here. This makes it possible to put learning information into long-term memory. Teaching books in electronic form (files) in the simplest case are an electronic version of printed learning materials, but they have a number of positive features. These are: compactness of storage in computer memory or on external flash drive; possibility of operative changes and transfer over long distances by e-mail. Thus, the use of educational books (printed or electronic) is a necessary means of distance teaching and learning of Biology. Printed editions allow solving the problem of long-term computer work (which is impossible for many children who study remotely), developing the skills of searching for information in printed publications, improving the skills of reading and selecting information. Electronic versions of books, especially those posted online, can be transmitted and used at any distance, do not take up storage space, and are generally available to all participants in the learning process. However, educational books (printed and electronic) have only a knowledge transfer function. Functions such as the improvement, control and generalization of knowledge using only educational books are not possible.

Another significant tool for distance teaching of Biology is the networked educational-methodical complex. According to A.A. Andreev's [11] research on the structures of the network presentation of teaching material, it was found that the teaching tool should be a networked educational and methodical interactive complex, which refers to the second generation of network electronic textbooks with enhanced functions of interactivity through the use of such Internet services as Usenet, IRC, Iphone. Today, there are many analogues with their enhanced features as these systems have been improved. Such systems include igoogle, various social networks, ICQ, Skype, etc. However, in order to better present the educational material, special shells have been developed for websites that include a suite of software that provides a variety of presentation options as well as substitutes for other software.

Organizational, methodological and technical conditions of distance learning

Several ways of interaction and organization of student and teacher activities have been tested in the process of developing distance learning. Based on the experience of foreign universities, as well as on the experience of remote teaching (distance learning), we can distinguish several organizational and methodological conditions of distance learning. The "external" type of education, oriented on university requirements, was intended for students who, for some reason, could not attend full-time (stationary) educational institutions. Thus, at the University of London, from the very beginning, the main task was to help and conduct examinations for certain certificates for students who had not attended regular educational institutions.

Obtaining education in a single institution is already a whole system of training for students who do not study full-time, but remotely, i.e. on the basis of information and communication technologies. Such programs for obtaining various educational certificates have been developed in many leading universities and higher education establishments around the world. For example, the New University of South Wales in Australia provides in absentia and distance education to 5,000 students, while 3,000 students are studying full-time.

The collaboration of several educational institutions in the preparation of distance education programs makes them more professional and less expensive. This practice has been implemented, for example, in the inter-university tele-education program Kepricon, in which universities in Argentina, Bolivia, Brazil, Chile and Paraguay have participated. Another example of such cooperation is the “Commonwealth (cooperation) in Education” program. The heads of the British Commonwealth countries signed an agreement on organizing a distance education network (1987). The promising goal of the program is to enable any citizen of the Commonwealth countries, without leaving their country and home, to get any education on the basis of colleges, higher education institutions and universities functioning in the Commonwealth countries.

In the world, there are autonomous educational institutions specially created for distance learning. One of the largest is The Open University in London, which provides distance education to a large number of students not only from the UK, but also from many Commonwealth countries. In the USA, an example of such a university is the National University of Technology (Colorado), which trains students in various engineering professions in collaboration with 40 engineering colleges. In 1991, the university united 40 colleges with a distance learning network in close cooperation with the state government and the business sector.

Autonomous educational systems offer training entirely through TV or radio programs, as well as additional printed materials. An American-Samoan television project is an example of this approach to distance education. For distance education in higher education institutions, organizational and methodological conditions were chosen as “on the basis of one institution”. Due to the fact that the distance teaching of Biology in higher education institutions under the conditions of state experiment is not based on their own developed materials, but using a network of educational and methodical complex, we can call the adopted organizational and methodological conditions of teaching Biology as “cooperation of several educational institutions”.

This type of interaction has led to several issues. The use of the networked educational-methodical complex cannot be complete due to the fact that the development of these textbooks was carried out according to the programs approved by the university. Nowadays there is a tendency to organize distance learning on the basis of many higher education institutions, but without their interaction. However, based on the experience of foreign countries, the most successful is the interaction of several educational institutions or the organization of autonomous educational institutions in organization of distance learning (teaching).

The analysis of the literature on distance learning revealed several technical conditions of interaction between a teacher and a student regarding distance teaching of Biology were identified. Single media offers the use of a single means and a channel for transmitting information. For example, teaching Biology through correspondence, educational radio or television broadcasts. In these settings, the dominant means for learning is usually printed material. There is almost no two-way communication, which brings these conditions for distance teaching in Biology closer to traditional distance learning.

Multimedia (approach) have emerged due to the development of new technical means. These technical conditions offer the use of various means in teaching of Biology: printed teaching aids, computer programs for educational purposes in various media, audio and video recording, etc. However, one-way communication dominates here. If necessary, elements of face-to-face

teaching such as face-to-face meetings of students and teachers, final training consultations, face-to-face monitoring, etc. are used. An electronic textbook can be used as the main object of these conditions.

Hyper-media approach for distance learning of Biology of the third generation provide for the use of new information and communication technologies, with the dominating role of computer tools. The simplest form of this is the use of e-mail and teleconferencing, as well as audio training. In further development, these distance learning conditions include the use of a range of tools such as audio, video, fax and telephone (for videoconferencing), while at the same time making extensive use of video discs, various interactive teaching materials, knowledge systems and artificial intelligence.

Principles of application of networked learning tools in distance learning of Biology

The basic didactic principles are the theoretical basis for the organization of distance learning course "The Person and one's health" with the use of network learning tools. The scientific principle in educational material. The application of this principle guarantees a full scientific knowledge of facts, notions approved in science, having world outlook and practical significance [122]. It is expressed in the careful and well-founded selection of the content of distance learning for a university Biology course "The Person and one's health", as well as the content of a network educational and methodical complex. The network educational-methodical complex of a higher education Biology course "The Person and one's health" is developed in strict accordance with the requirements of the state standard, the curriculum corrected and approved by the educational institution (on the basis of I.N. Ponomaryova's program, A.G. Dragmilov's and R.D. Masha's Biology textbook for the 8th grade of general educational institutions), the curriculum of the educational institution. The developed network educational-methodical complex authentically reflects a modern state and logic of scientific knowledge of a course "The Person and one's health". For example, all visual material presented in hyper-media corresponds to natural prototypes (movement in the joint, heart structure, tissue and pulmonary respiration, skin structure, etc.).

This principle reflects such tasks of biological education as formation of scientific worldview in students, their understanding of the scientific picture of the world, familiarization with methods of scientific cognition. The principle of science reveals such requirement as disclosure of interrelations between biological objects and phenomena, identification of cause-effect relationships based on the analysis of facts obtained from the operation of biological material in various activities.

The principle of accessibility offers design (presentation of material), interaction with elements, educational content of the networked educational-methodical complex developed taking into account psychophysical age features of students. It is also necessary to consider the time for mastering this or that element of knowledge or the entire knowledge. For example, due to the psychophysical features of students participating in distance learning, they have disorders of spatial analysis and synthesis. Such disturbances do not allow estimating full features of the studied object in two-dimensional (flat) and monotonous images. In this case, the educational material in the networked educational-methodical complex should be presented in various images (three-dimensional static image, animation, video, etc.).

The measure of accessibility depends not only on the amount of knowledge, but also on how it is presented. In order to master the content better, there must be a link to life, to the facts that are already known to students, to knowledge in other subjects. For learners using networked

educational-methodical complex, there are references to additional educational materials, to material learned earlier, to learning materials in other subjects. The multi-component structure of the networked educational-methodical complexes is presented as a subject module (modular pedagogical technology is being implemented). The module is divided into blocks by subjects studied. In each block the content is presented (in the form of presentation, film, animation, text, tables, etc.), there are links to the textbook. Visual materials, tasks, additional materials, creative tasks, etc. are attached to the teaching material in the block. Such presentation of teaching material in the networked educational-methodical complex offers a gradual assimilation, fixation and control of new knowledge in an individual mode. Different versions of tasks allow to control the learning of knowledge in an interesting, entertaining and diverse form for students (test tasks, exercises, animation, etc.). In addition, the availability of this networked educational-methodical complex to any registered user allows for their rapid introduction into the learning process, as they: - are placed on the Internet; - easily downloadable on a local computer; - require additional software that is freely available, comes in a common package with the operating system, and is offered for installation on the site and easy to install; - do not require special training in working with the content of the manual. Requirements of the principle of accessibility: taking into account the age and individual characteristics of students in distance learning, relying on familiar facts, knowledge, experience and application of appropriate methods of presentation. The principle of clarity of the educational material provides visualization of the objects, processes and phenomena under study. When using a networked educational-methodical complex, the principle of visibility plays a crucial role, as there is a realization of all components of verbal and non-verbal visualization. The networked educational-methodical complex represents the educational information of a course "The Person and one's health" in a complex combination of static and dynamic visual means (images, animation, video, volume models etc.). The static visual means, saturated with the content of the network training-methodical complex, include: hypertext (links to additional material), photographs (for example: people with various diseases, organs), pictures (the structure of organs and systems of organs), graphics, charts, tables, diagrams. Dynamic means are represented by animated diagrams (blood flow through vessels, pulmonary respiration, etc.), dynamic models (movement in joints, etc.), interactive tasks, videos. In addition to visuals, there are also audio media - audio or musical accompaniment of video clips, sounding of text, definitions and conclusions of the training material. This principle is also applied in the organization of knowledge control, as well as providing visibility of the results and achievements of students.

The principal requirement of the principle of visibility in distance learning: a visual image should help to reveal the essence of the object under study, on the basis of which the concept and its essential features could be revealed. In this context, the same learning material is represented by a variety of visual means. It is also related to the psychophysical characteristics of students involved in distance learning and their spatial perception. The application of the principle of visibility in distance learning stimulates the creation and use of visual learning tools for the course "The Person and one's health" and the development of methods for their use.

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