

# **The Use of ICT in Higher Medical Education**

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Healthcare requires from a modern doctor new skills and experience of working with data sets in informatization environment. The training process of a future physician is being reformatted and directed to the use of ICT, including the use of multimedia lectures, dynamic images, tutorial videos, electronic manuals and educational resources.

Keywords: information and communication technologies (ICT), educational process, future doctor.

Modern society is characterized by operation of informatization space, the main feature of which is the conversion of information into one of the major production resources. Therefore, training future professionals, their information culture and professional commitment to the use of information technologies requires special attention and constitutes the guarantee of ICT implementation in all spheres of the society. In this context, the sphere of healthcare is no exception.

In fact, future doctors should now be able to work with modern diagnostic equipment, use the latest educational resources at the undergraduate and postgraduate stages of education, and use software and office applications that facilitate everyday work. In addition, future doctor should be prepared to systematically process the significant flow of information, integrate knowledge in new disciplines. Not only the programs and curricula, but also educational methods and forms must meet these requirements.

As a consequence, the entire system of medical education is being reoriented to the final result – training of open-minded doctors who possess diverse skills, are able to integrate their work into the activities of all employees of the health sector and other professional areas, can independently make professional decisions based on mastering certain range of functions and tasks.

The use of ICT in the learning process has been already extensively discussed in the fundamental research papers by O. Znachenko, N. Bibik, S. Sysoieva and many others.

The challenge for higher medical education is to provide a substantial and up-to-date level of medical education, in terms of both under- and postgraduate training, to ensure access to information sources of world medical science and practice. To a certain extent, the approach to medical education must change, it is needed to increase not only students' awareness, but also develop their ability to solve tasks and problems that arise in the treatment of patients, addressing ethical issues of law and other aspects of medical practice.

Training process in higher medical education is a combination of academic, professional, scientific and practical activities under conditions of continuous learning. Modern educational processes cannot take place without involvement of a wide range of information resources, development of skills in processing and presentation of different information in electronic form.

For effective use of information and communication technologies (hereinafter – ICT) in the educational process it is necessary to provide the functioning of a single system, which includes personnel subsystem and hardware components (servers, PCs, local network, projection equipment), information subsystem (software, training and methodic materials, websites instructors), electronic library [4, p. 40].

In case of availability of the above-mentioned components, ICT can act as both an object of education and its means. ICT act as an object of education in the study of medical informatics, bioinformatics, and medical statistics. Mastering these subjects is not possible without computers and specific software. For other disciplines, the use of ICT has several manifestations, including:

- to monitor students' training;
- for visual representation of educational material (multimedia lectures, tutorial videos, etc.);
- to solve computational problems, processing the data of biomedical and experimental research;
- for designing and visual representation of physical, chemical and biological processes occurring in the studied organs and systems, functioning of the samples under consideration.

Multimedia lectures have become an available method of presenting complex educational material in sciences of natural cycle due to the possibility of introducing a large number of graphic images that require some knowledge in anatomy, biology, chemistry, physics [7, p. 36]. It serves not only as a revising factor, but also as a motivating factor for students, confirming the presence of clear teaching interdisciplinary integration. Almost 80% of information is perceived by sight, and only 20% – by mental efforts and memory.

As a matter of fact, visual information of illustrations allows to significantly reduce verbal description, promotes better mastering of the material. In addition, the use of multimedia presentations can significantly increase the informational content of lectures, provide revision of the most difficult moments (trivial redundancy), implement accessibility and perception of information by the parallel presentation of information in different modalities: visual and auditory, review the material of previous lectures, and create comfortable working environment for the teacher [5, p. 56]. Taking into account that nowadays multimedia software and educational products are widely developed and used at various stages of employment, there is an opportunity to use them during classes, electives, extra classes, as well as for students' independent and extracurricular work.

Special software can reproduce complex or lengthy chemical, physical, biological processes, and specialized computer health programs (RadiAnt DICOM Viewer, Makhaon ICD 10) help to prepare students for work with medical equipment. Programs used in higher education are divided into:

- tutorial programs (direct the training process in view of existing knowledge and individual skills of students and promote the assimilation of new information);
- diagnostic programs (tests) (intended for the diagnosis, testing, assessment of knowledge, skills and abilities);
- training programs (designed to consolidate and revise the prior educational material);
- databases (information storage in a variety of disciplines using search requests in different areas of expertise to find the required information);
- simulation programs (representing some aspect of reality by means of parameters to examine its basic structural or functional characteristics);
- modelling programs (reflecting the basic elements and types of functions, simulating a reality);
- programs of “micro” type (similar to simulation-modelling ones. They do not reflect reality but create the virtual learning environment);
- software tools (provide specific operations, i.e., processing text, tabulation, editing graphics).

The degree of mastering the material during the lecture sessions depends on many factors, but the most effective one is the use of complex audio-visual means by which the human brain learns information better. Therefore, it is relevant to use not only graphics, but also dynamic, sound, and video means. It is justified to use educational videos and videos in authentic language. They allow to organize the audience in a phase of biological reduction (25-30 minutes after the beginning of the lecture and last minutes of it) by means of reasonable combination of audio and video effects.

It is also appropriate to use electronic textbooks, which include a large number of illustrations (tables, figures, charts, diagrams) and a hyperlink to each part of the material. This reduces training time by almost three times, and the level of memorization increases by 35-40% due to simultaneous use of images, sound, text and other features. With electronic textbooks, based on specially designed computer programs, all types of control can be implemented. This facilitates the teacher’s work and enhances the efficiency and timeliness of control.

The use of information technologies in the educational process affects the nature of teaching and learning, promotes independent work of students with various electronic means for educational purposes. The most effective is the use of information technology for mastering skills and abilities needed for training.

It is necessary to bear in mind that use of information technologies causes not only reduction, but also the simultaneous complication of teacher’s activity. For example, when mastering theoretical lecture material not only classroom format is used, but also a system of educational support (counselling, formative assessment, computer-based testing, and work with teaching materials) has been created. The

structure and form of such training activities as monitoring, consulting and independent work has also been complicated.

It should also be noted that information and communication technologies in education significantly influence the formation and development of human mental structures, including thinking.

One can distinguish characteristic differences and perspectives that are inherent in information and communication technologies:

- interactivity (available models of physical phenomena for immediate correction of input data and model parameters);
- adaptability, i.e., the ability to change (within certain limits) the pace of learning methods in presentation of educational material;
- possibility of hypertext structuring of educational material (text and graphics including animation tools);
- broad differentiation of learning, i.e., disclosure of creativity, cognitive abilities of each individual's learning process [2, p. 265].

Informatization of educational process significantly contributes to the solution of problems of its humanization, because there are opportunities for strong communication, taking into account individual aptitudes and abilities, opening the creative potential of teachers and students, differentiation according to students' distinguishing characteristics, exemption from having to perform routine technical operations, providing opportunities for solving cognitive and creative problems.

Introduction of information technology into the learning process is accompanied by the increase in independent work that needs constant teacher's support. An important role belongs to consultations, which become complicated in terms of didactic purposes; they are preserved as separate forms of educational process and simultaneously are elements of other forms of learning activities (lectures, practice, seminars, and laboratory workshops).

It is necessary to observe that effective use of information technology means in the learning process depends on successful solving of methodological problems related to the information content and methods of using the automated learning systems. Therefore, automated training system should be considered as program-methodical complexes (a set of software and hardware means, methods (procedures) implemented through their use, and designed to solve specific problems of the educational process).

For the effective educational use of modern ICT, the teacher must possess a range of specific skills [8]:

- apply modern information and communication technologies in the preparation, analysis, and adjustment of the educational process, teaching management, educational and cognitive activity of students;
- adopt the most rational methods and teaching means to consider the individual characteristics of students, their inclinations and abilities;
- effectively combine traditional teaching educational system with new information and communication technologies [2, p. 126].

Hence, the tasks directly set in front of the system of higher medical education and teachers are as follows:

- formation of interest to mastering ICT in students of medical universities;
- formation of knowledge and skills necessary for effective use of ICT, for their successful application by students in their future careers;
- organization of educational process with the use of ICT, considering interdisciplinary communication and integration of educational material.

Moreover, introduction of ICT in the learning process, in our view, should be accompanied by improved technical equipment of educational process, ensuring the transfer of educational information and exchange; providing mass transfer and exchange of educational information to influence both the individual student and the group [3, p. 246].

The use of ICT provides an opportunity to implement such educational goals as personal development, preparing students for life in the information society, the development of thinking, aesthetic education, development of communication skills, abilities to choose the best solutions, formation of information culture, and ability to process information [1].

Thus, introduction of ICT in higher medical education promotes the professional competence of future doctors and constitutes the objective of training process. ICT allow to model and simulate complex biological processes of the human body, represent a large number of graphic images simultaneously. Multimedia means form the complex multi-level connections in the human brain and thereby activate the creativity of students and develop their cognitive activity. However, ICT should not be used by teachers thoughtlessly, since no technology can be considered as universal: each of them gives different results in different situations, and this aspect must be considered when choosing them.

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