



## Information and Communication Technologies in Medical Education

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### **Abstract**

During the COVID-19 epidemic, almost all countries of the world faced the problem of closing schools and universities by switching to 100% online education, which greatly affected education in general. Distance learning, which has only just begun to be in demand, has become the only way to guarantee continuity in learning during the COVID-19 pandemic. This contribution is a brief review of the literature on the limitations and benefits of distance learning using information and communication technologies in medicine, in particular at the higher school level, with a focus on the experience and features of distance learning during the COVID-19 emergency in Uzbekistan.

**Keywords:** *Digital Technology; Distance Learning; Innovations in Learning; Online Laboratory*

### **Introduction**

Everyone knows that over the past decade, the increase in communication technologies and the availability of information have significantly affected the development of education. Various innovations and opportunities in the field of education have emerged due to the development of mobile and communication technologies. For many countries, including Uzbekistan, the introduction of new information and communication technologies in the public education system is a fundamental part of development. As the education sector becomes more competitive, information and communication technology becomes a necessary means of survival, as this new digital world requires teachers to adapt and adopt information and communication technologies, methodologies and worldviews. To achieve global competitiveness of higher education, it is necessary to create a modern and secure digital educational environment that ensures high quality and accessibility of education of all types and levels.

**The Relevance and Significance** of the information and communication technology of the educational process is caused by the global processes of transition to the digital economy and digital society. Any new technological structure opens up new prospects. Education largely determines what these prospects will be. It is necessary to start the information and communication technology of the university with the main educational process. The educational process is a purposeful and organized unified system of actions for the training, education and development of the individual, which includes

the goals, objectives, methods and means of managed education. Education in general is one of the most promising areas of targeted human resources in the country. In particular, the medical education system is facing a serious reform process aimed at expanding the capabilities of traditional learning models based on the creation of a single digital educational space. Information and communication technology of the educational process of a medical university requires the creation of the necessary infrastructure, the formation of an appropriate regulatory and legal, scientific and methodological base that ensures the implementation of priority projects.

As we stated above, one of the important goals of the information and communication technology of a medical university is to create a single information space of an educational institution, the purpose of which is to ensure the information openness of the Institute in accordance with the requirements of the legislation of the country in the field of medical education, to provide modern information technologies with the requirements for the implementation of educational programs and the possibility of remote access of students and research and teaching staff to information and educational resources.

***The Goal of Information and Communication Technologies*** of the educational process in medicine is to maximize the potential didactic opportunities of digital technologies. In the course of the digital transformation of the medical educational process, it is necessary to fully automate the organizational management of the educational process, which involves comprehensive monitoring of constantly changing conditions and increases the degree of structuring of the educational activities of the university. When it comes to Ed Tdch, teachers will never have to worry about resource constraints again. If you take into account the interactive whiteboard's own software with its ability to connect to the Internet, the resources are almost limitless. These can range from media integration to live annotations and gamification, but the only limitations are the creativity and technological literacy of the educator. Teachers can now delegate administrative distractions to their newly acquired Ed Tdch tools. As a result, those who use Ed Tdch devices correctly may find that their day-to-day training is much more effective.

Among the interesting digital innovations should be noted the rapid adaptation of online learning, which is expressed in the form of the development of mixed forms of learning and the active development of online courses. These days, online learning programs and learning materials are used all over the world. The results of many studies show that distance education with proper content and use is acceptable for different levels and disciplines. Based on these results, the above-mentioned programs have become an alternative to traditional teaching methods during the global COVID-19 pandemic and have begun to occupy an important place in the educational system in many countries since 2020, and Uzbekistan is no exception.

In a difficult time for humanity, distance learning has become a viable option for both individual and collaborative learning, offering alternatives to time and place. First, it boasts tools that adapt learning to different educational styles. Improvements in information and communication technology in online learning affect scientific education in medicine. Moreover, the teaching and learning of natural sciences in medicine requires not only laboratory practices to teach complex and abstract concepts, but also the use of rich teaching materials. But on the other hand, other important explanations for the lower perception of the practice of distance learning in science education include negative attitudes towards this type of education, the lack of technical skills of teachers, insufficient technical support, and pedagogical shortcomings, which are considered as shortcomings of online learning. It should be clear that teachers need to be trained in information and communication technologies.

Distance learning methods are at least as effective as face-to-face ones. However, as discussed in previous parts, more work is needed to study their effectiveness in specific disciplines, such as chemistry. Another important aspect of distance education is related to its accessibility. In principle, as stated in the UNESCO declaration, distance learning and online learning must meet several criteria in order to expand, not restrict, access to education. It is reported that "Students in distance learning courses represent a variety of racial and ethnic characteristics, age, native languages and learning styles. In addition, an

increasing number of students with disabilities participate in regular higher education courses. Their disabilities include blindness, poor vision, hearing impairments, mobility impairments, learning disabilities, and health impairments." Probably, the main tasks at a distance are free access to all students and equality of accessibility.

Surprisingly, distance learning in chemistry was introduced several decades ago, and computer simulations and digital software have been widely used in many areas of chemistry since the seventies of the last century. The first critical review of distance learning in chemistry education was published in 1999, showing how chemistry teachers took advantage of computer technology quite soon. For example, online activities involving the creation of virtual workgroups or the sharing of multimedia, such as digital video and molecular three-dimensional animation, were widely represented at both the high school and university levels, combined with face-to-face and in-person training. New technological teaching methods have demonstrated that they are quite effective in medical education in terms of the level of interactivity and student participation in the classroom.

On the other hand, the main limitations of distance learning in chemistry in medical universities seem to be related to the need for special training of teachers and a radical change in educational models. Moreover, it is clear from these studies that distance learning in chemistry in medical universities implies the availability of new and specialized training materials and, more importantly, completely free access to digital tools and the Internet or mobile devices.

On the other hand, the long period of closure of schools and universities, particularly in some countries, such as Uzbekistan, has revealed all the limitations of teaching methods based only on distance education. This is especially evident for those educational activities that involve manual training, such as chemical and instrumental laboratories in medicine. An additional problem is the lack of empathy and the psychological effects of distance learning, which have clearly worsened due to the dramatic competition and the general level of diffuse anxiety associated with the COVID-19 emergency.

Taking into account my personal experience in teaching chemistry at a medical university for more than 20 years, I propose to introduce such a concept as "virtual chemical laboratories" in all higher educational institutions of Uzbekistan. Of course, it has advantages and disadvantages that determine the methodically justified limits of using this software product in the process of teaching chemistry. In particular, in support of the educational chemical experiment, the capabilities of the WEBlab virtual chemical laboratory for supporting the process are described. The main task of WEBlab is to solve experimental problems in chemistry in higher education.

The WEBlab Chemistry Lab aims to simulate the chemical processes required to create virtual analyzed experimental chemistry problems. Features of the virtual chemical laboratory WEBlab is the creation of a virtual laboratory environment. The result of the research is the development of a set of experimental tasks in chemistry for students on the topic "Solutions" in the cloud-oriented virtual chemical laboratory WEBlab.

Conducting research work by students, including in the SSE, develops their skills of independence, allows them to realize their creative potential. To teach students to make their own decisions, self-government can help in their self-determination. Young people at the present stage are trying to self-actualize. This opportunity is also given to them when they voluntarily choose a variety of forms of extracurricular tasks in the discipline they are studying. Thanks to the widespread introduction of computer technologies in the educational process, the boring and "dry" traditional essays have been replaced by the possibility of preparing informative multimedia information and illustrated presentations (including audio), training videos.

All the electronic educational resources used allow us to present the educational material as a system of bright reference notes filled with comprehensive structured information. At the same time, each

student works at a pace and with those loads that are optimal for him, which allows the best assimilation of the educational material.

The problem, probably, of any educational institution is the assimilation and memorization of new special terminology. They mobilize visual memory, focus attention on the correct spelling of new words, so-called reference signals (or "signal cards" with brightly highlighted new terms according to Shatalov). In this regard, at present, the use of multimedia in the educational process greatly facilitates the functions of the teacher, with the help of which terminological dictation can be carried out to consolidate special medical terminology, both orally and in writing.

Crosswords are used as an element of problem-based search training, and they can also be demonstrated using multi-media. They not only help to master some concepts, terms, but also are an effective means of differentiated and individualized learning, control and self-control, as well as foster perseverance and perseverance in achieving the goal. Including multimedia significantly saves time, immediately discuss unclear issues and errors through an unconventional way of conducting a test-programmed knowledge control not in writing, but in oral form (besides-saving paper). In medical schools, active learning methods (MAO) allow students to work out their professional competencies in conditions that are close to real practice. At the same time, one of the main tasks of the MAO is implemented - the formation of professional qualities of a specialist.

Currently, there is a need for such technologies, which would be based on the development of a professional's personality: creative and critical thinking, the ability to analyze, make decisions, cooperate in the workforce, and more. Therefore, under the term "new educational technologies", we can also imagine such as modeling and simulation, including the method of specific situations (CS), which have proven themselves well in the training of future medical professionals. Specific situations exist in various fields of activity. They make it possible to bring the training as close as possible to the real professional activity. Situation (Fr. - position, situation) - a set of circumstances (internal and external), containing conditions, contradictions, in which any activity of an individual, group, organization develops, requiring a specific solution, but not having an instant unambiguous solution to get out of the situation (case study).

For example, "Situation-assessment" is a prototype of a real situation with a ready-made proposed solution, which should be evaluated "right - wrong" and offer an adequate solution. This type of CS can be used through videos "Find mistakes" (with known mistakes), which demonstrate, for example, the determination of the boundaries of the liver by Kurlov, the determination of meningeal symptoms, taking a smear from the throat. Then, having found the errors, the student proceeds to the training, while demonstrating the correct algorithm of professional competence. By the way, the students themselves took part in the preparation of the videos.

The situation-illustration-prototype of a real situation can be included as a fact in the lecture material. As a clinical example, thematic patients are demonstrated in practical classes, followed by their clinical analysis. In the absence of thematic patients, multimedia resources are used to demonstrate visualized situational tasks. For example, let's say a patient with typhoid fever or scarlet fever. Before naming the disease in which this type of rash occurs, the student should reflect: what kind of rash is it, its localization, number, etc. Or a description of symptoms such as Filatov's symptom, "crimson tongue", "gloves" symptoms, etc. During the survey of students, I suggest using the method of commenting, i.e. thinking out loud. Explaining their judgments and actions, the student gradually comes to some result, outcome, or diagnosis. This technique contributes not only to the development of speech, but also to the development of logical thinking and introspection.

The list of questions of such practice-oriented tasks additionally includes others, including questions of differential diagnosis, problematic issues, etc. A situation-problem is a prototype of a real problem that requires an operational solution. With the help of such a situation, you can develop skills to find the optimal solution. We often talk about the optimization of the educational process, the introduction of computer information technologies. But due to objective reasons, not everyone is able to achieve this in

full, as we would like. Some training rooms at clinical bases are not equipped with computers (laptops), or there are no multimedia installations (or TV screens that could be connected to a laptop). And this would greatly facilitate the perception and memorization (consolidation) of educational material, especially when there are no thematic patients, while not detracting from the importance of live communication with the patient. In the practical activities of medical students, it is very important to learn how to find a common language with the patient, to collect anamnesis, to conduct an objective examination. Today, medicine is experiencing a need for medical workers who have a high level of communicative competence, which determines the formation of their professional competence.

### **Conclusion**

In conclusion, it should be noted that most of the latest information and communication technologies offer teachers a lot of potential opportunities and, by opening up new opportunities, the educational institution and teachers can benefit greatly from experimentation and implementation. And the complete replacement of distance learning with traditional education may be justified due to the global emergency caused by the COVID-19 epidemic.

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