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OPTIMIZATION OF THE EDUCATIONAL PROCESS OF MEDICAL HIGHER EDUCATION INSTITUTIONS THROUGH THE INFORMATION AND EDUCATIONAL ENVIRONMENT

Murzina O.A. iD, Raznatovska O.M. iD, Pototska O.I. iD ✉, Nahorna N.O. iD Optimization of the educational process of medical higher education institutions through the information and educational environment.
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ABSTRACT. Background. Improving the effectiveness of training of future highly qualified personnel requires the improvement of existing and search for new forms and methods for organizing the educational process. Such approach requires the use of complexes of technical and didactic means that ensure the interconnection between classroom and non-classroom forms of the educational process. **Objective.** To analyze the existing conditions for the implementation of information and educational environment. **Methods.** Analysis of theoretical sources on the problem of the use of the information and educational environment in higher medical education, studying and generalization of leading experience in teaching student courses using information and communication technologies. The analysis of the results of the efficiency of implementation of the educational and informational environment has been carried out on the departments of phthisiology and pulmonology, histology, cytology and embryology, medical physics, biophysics and higher mathematics and analytical chemistry. **Results.** The article presents certain results of the work of lecturers concerning the development and use of the informational and educational environment in the context of continuing learning of present-day information-oriented society. Creating information and educational environment that supplies interaction between lecturers and students in classroom through interactive forms of communication on the basis of edX platform promotes the optimization of the learning process. The basic principles of providing innovative approaches, methods, technologies of the uniform informational and educational environment of higher education medical institutions are substantiated. The necessity of disclosing the experience of higher education institutions regarding the creation of the informational and educational environment as part of the optimization of the student's educational process is emphasized. The experience of using new learning form confirmed the simplicity and interactivity of interaction of the student and the lecturer, gives the wide opportunities for learning process arrangement, enables the student to model learning process individually, as well as new forms of learning process supervision. **Conclusion.** In our opinion, online courses based on edX platform facilitate the optimization of the learning process in higher education institutions. The prospect of further work is the continuation of the development and implementation of the online course for students on edX platform in the learning process.
Key words: informational and educational environment; optimization of the educational process; professional education; innovation-educational technology.

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Background

In the rapidly changing conditions of the present directly related to the intensification of information exchange, the function of scientific and methodological provision of the system for improving professional training lies with the system of higher education.

Improving the effectiveness of training of fu-

ture highly qualified personnel requires the improvement of existing and search for new forms and methods for organizing the educational process. Such approach requires the use of complexes of technical and didactic means that ensure the interconnection between classroom and non-classroom forms of the educational process. Professional training includes a key element aimed at mastering professional skills by future professionals, performing professional functions, mastering the types of professional activity in the context of personally oriented paradigm of education, aimed at preparing students for professional identity, professional self-realization and professional self-actualization throughout life. Therefore, the provision of humanistic-oriented professional qualification requires the reworked educational process grounding, development and introduction of the relevant innovative approaches, methods and technologies into the educational process of higher education institutions.

Today's higher education of European countries and the United States actively implements the latest pedagogical technologies, among which are distance learning, e-learning, mobile learning, m-learning, blended learning, the use of interactive techniques, training by practical course technology, etc. [1]. Such approach is ensured through a high level of computer literacy of students and technical support of higher education institutions. As students have to work independently, the need for effective use of information and communication technologies is increasing, which requires higher education institutions to optimize the educational process of education institutions, in particular, medical higher education institutions through the information and educational environment.

At present, the modern free online learning systems offer effective solutions and tools integrated into a secure and protected platform for a single informational and educational environment to be deployed by the education institutions. Through such tools, the higher education institutions can not only move to a new level of using information and communication technologies (the lecturer can create and manage access to the website of any course unit in such a way that students can access only if authorized), reduce the costs of organizing and managing the educational process, but also can increase the efficiency of the educational process by means of online communication with the lecturer.

The development of informatization of the education system is based on the achievements of scientific and technological progress and psycho-pedagogical science, implementation of access to quality education in educational systems, principles of open education, comprehensive application of modern information and communication technologies in education, and deepening of cooperation between education institutions, scientific institutions and business entities in the sphere of information

and communication technologies for providing quality education, forming effective economic mechanisms for engagement and promotion of joint activities [2].

This problem is more essential in medical higher education institutions where vocational education requires the specific approaches to long-term specialist training (continuous education), addiction to the place of study, memorization of large volumes of information, timely formation of clinical thinking and its constant development, optimization of the processes of processing medical information , use of situational tasks, etc.

Thus, increase of the efficiency of higher medical education creating the best conditions for studying and choosing the most promising methods and means is still important. The search for ways to ensure high-quality professional education and to improve the educational process through the optimization of education is of great importance in this direction. Optimization is the process of providing the best state to anything, that is, the process of making optimal and best decisions [8]. The scientifically based choice of technologies and methods determines the optimization of the learning process and contributes to the improvement of its content. The problem of optimization is related to the search for a new in the training. Solution of this problem is related to some difficulties that are associated with the lack of knowledge of the teachers with the optimization itself, as well as the inability to choose the best means of study. These difficulties make it necessary to study the optimization of the educational process through informational and educational environment.

The concept of the development and implementation of the innovative information and communication technologies in the education system is approved by the Resolution of the Cabinet of Ministers of Ukraine "Strategy for the Development of the Information Society in Ukraine" No. 386-r dated May 15, 2013 [3], the implementation of which is scheduled for 2020. Training of highly skilled specialists in the conditions of development of innovative information and communication technologies is possible in the conditions of equipping educational institutions with electronic means of training and telecommunication means of access to information and educational resources specified in the Laws of Ukraine "On Education" [4], "On Higher Education" [5], "On the Main Principles of the Development of Information Society in Ukraine for 2007-2015" [6], the Concept for the implementation of media education in Ukraine [7] and other regulatory documents.

Therefore, the use of information and communication technologies is one of the main directions of the development of informatization of higher education. Modern scholars and lecturers consider some aspects of the use of information resources: pedagogical design of virtual educational systems (A. Andriiv, A. Akhaian, N. Morze, etc.), general and

technical questions of application of network technologies in education (V. Bykov, A. Vagramenko, Yu. Zhuk, I. Robert, K. Kolin, etc.), didactic problems of the use of Internet technologies in education and the experience of organizing distance teaching activities with the use of Internet technologies (V. Kukharenko, V. Oliynyk, Yu. Pervin, O. Polat, A. Khutorskyi, V. Shevchenko and others), individual work during study (M. Asanaliiev, O. Yevdokimov, Ye. Polat, V. Andrushchenko, K. Babenko, R. Hurevich, N. Zaiachkovski, V. Kremen, A. Ivasyshyn, I. Lerner, P. Pidkasystyi, S. Samihin, M. Smetanskyi and others).

Theoretical problems of optimization of education were covered by M. Anokhin, Y. Babansky, A. Berg, V. Bespalko, P. Gusak, M. Danilov, L. Zankov, V. Kagan, V. Lozova, M. Makhmutov, A. Nisimchuk, I. Ogorodnikov, I. Podlasy, O. Pekhota, S. Sysoev, A. Khutorsky and others.

The number of studies in this area has increased in terms of the use of free online learning systems, in particular, information and communication technologies for different forms of learning. The matter of using such technologies in the educational process is the research subject of such scientists as L. Artemov, V. Bykov, L. Bilan, V. Bilous, O. Bondarenko, Ya. Bulakhova, V. Zabolotnyi, H. Kozlakov, O. Mischenko, O. Pinchuk, L. Petukhova, O. Spivakovskyi, O. Shestopalov and others.

But insufficient attention is drawn to optimization of the educational process of higher education institutions through the information and educational environment, namely in medical education.

Objective.

To consider the analysis of the existing conditions of realization of the information-educational environment integrated with communication of teachers and students by means of interactive means of communication on the basis of the edX platform; to find out the didactic possibilities of using free online education systems and to exchange experience of online educational work with the use of Internet technologies.

The article considers the analysis of existing conditions for implementing the information and educational environment to be integrated with communication of lecturers and students through interactive means of communication based on edX platform; clarification of didactic possibilities of using free online education systems and sharing the experience of online educational work using Internet-technologies.

Materials and Methods

The research has been conducted on the basis of the Zaporizhzhia State Medical University (ZSMU) within the framework of research work "Methodological, pedagogical and technological support of professional training in the medical higher education institution on the basis of intellectual computer systems". Over 2 last years, almost all lecturers of the higher education institution started to use the edX platform. During the research, the following methods were used: analysis of theoretical sources on the problem of the use of the information and educational environment in higher medical education, studying and generalization of leading experience in teaching student courses using information and communication technologies. The analysis of the results of the efficiency of implementation of the educational and informational environment has been carried out on the departments of phthisiology and pulmonology histology, cytology and embryology, medical physics, biophysics and higher mathematics and analytical chemistry.

Results and discussion

Today, the optimization of the educational process is aimed at the formation of a highly skilled and competitive specialist in the conditions of European integration and globalization, which is based on fundamentalism, professionalism, creativity and communication through the use of advanced training technologies.

The prospective way of organizing the educational process based on the widespread use of information and communication technologies in the higher education institution is the combination of traditional and distance learning. The process where traditional technologies are to be combined with innovative technologies of electronic, distance and mobile learning is called "blended learning". Blended learning as an instrument for modernizing modern education in practice appears to be the creation of new pedagogical techniques based on the integration of traditional approaches to the organization of the educational process with transfer of knowledge and technology of e-learning [9].

Sabina Moebz and Stefan Weibelzal determine that learning combining distance and traditional communication in the integrated learning activities is blended [10]. The researcher Betty Collins describes a "hybrid of traditional classroom and online learning, where learning takes place both in and outside the audience, with the online component becoming a natural extension of traditional classroom learning" as blended learning [11].

Scientists V. Kukharenko, A. Striuk, and Yu. Trius characterize the blended learning as the purposeful process of acquiring knowledge, skills and abilities in terms of integration of the classroom and individual educational activities of the parties to the educational process on the basis of the use and complementarity of technologies of traditional, electronic, distance and mobile learning in line with student self-assessment of time, place, routes and pace of learning environment [12].

M. Nikitina combines classroom, distance and individual learning which includes the interaction between subjects of learning and interactive sources of information reflecting all components inherent in the educational process (goals, content, methods,

organizational forms, means of learning), operating in the constant interaction with each other, creating the unity [13].

Yu. Trius argues that the use of traditional, innovative pedagogical technologies and information and communication technologies on the principles of mutual complementarity improves quality of education [14].

In the opinion of the Ukrainian scientist V. Bykov, due to information and communication technologies it became possible to implement new educational courses into the educational practice. It is constantly necessary to search, approbate and test conceptually new pedagogical technologies which are mainly based on information and communication technologies. It is also recommended to implement the prospective methods and means of information and communication technologies in the educational practice [15].

To optimize the educational process, higher education institutions actively implement innovative technologies, the most popular of which are distance learning, learning with the use of interactive techniques, training by practical course technology, etc.

One of these technologies is the information and educational environment allowing you to create and apply electronic notes, encyclopedias, tests, glossaries, questionnaires, virtual labs, etc.

Also, in order to form the professional qualities of future medical professionals, in addition to traditional teaching methods, those modern interactive methods and learning technologies (Figure 1) that unite students and give them the opportunity to work in a group, namely, "case study", "business games", "video training", "aquarium" and others may be used. They have a professional direction and provide not only training in unprepared oral speech, but also impact on intellectual and professional development, learn to notice the various nuances of professional interaction, think through the professional aspect, reasonably express and defend their point of view, create conditions for the formation and development of professional skills. Such exercises are oriented on the needs and interests of students, give fullscope of the efficient development of professional behaviour of medical professions.
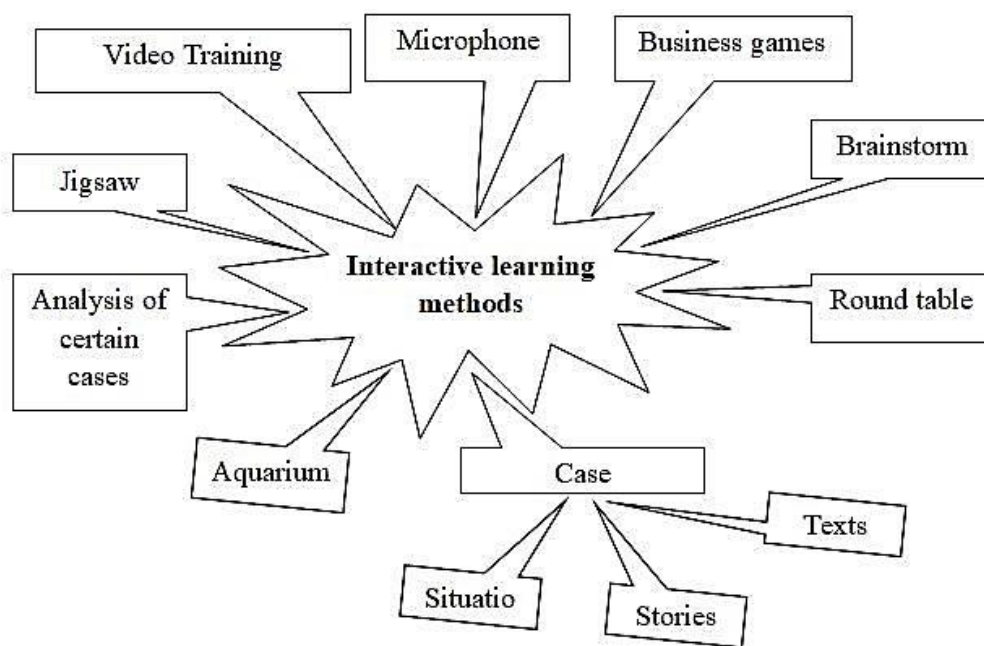

Figure.1. Intercative learing methods.

English scholars M. Shever, F. Edei and K. Yeits developed the method of situational analysis ("case study") [16]. The importance of implementing cases is provided by their orientation towards the formation for future specialists of such important qualities as analytical abilities, critical thinking, creativity, flexibility in solving problems. The essence of such method is the use of specific cases (situations, stories where texts are "cases") for simultaneous analysis, discussion and decision making for a certain section of discipline. The value lies in the

fact that it simultaneously reflects not only a practical problem, but also actualizes a certain complex of knowledge, combines various activities that ensure the implementation of educational and educative goals

In learning with case-study, students have the opportunity to test the theory in practice, enhance their ability to demonstrate and improve analytical skills, learn to work in a team, find the most rational solution to the problem. Using the case-study method for student learning can increase the cognitive

interest in academic disciplines, promote the development of research, communication and creative skills. The distinguishing feature of the case-study method is the creation of a problem situation based on facts from a real life. The distinct advantages of "case study" are the educational potential in terms of the formation of personal value orientation on career and formation of the individuality capable of self-enhancement, improvement and realization of personal potential.

In the opinion of L. Petukhova and O. Spivakovskyi, the use of information and communication technologies has shown their advantages over traditional learning methods in the context of the implementation of a person-oriented approach, since they contribute more to the implementation of the principles of individualization and differentiation of the educational process, expansion of its content, increasing of the intensification and effectiveness of the educational process, in general [17].

The information and educational environment enables future doctors and lecturers to implement the educational process in convenient circumstances and time; the lecturer briefly explains the educational material and draws attention to the difficult moments in the classroom, other students have independent learning skills.

Also, one of the options for using such methods and technologies is the distance learning form which is called the educational system of the twenty-first century. Its importance is that the results of social progress, previously concentrated in the field of technology, are focused on the information sphere as of today. The development stage is characterized as telecommunication. This is a medium of communication, information and knowledge. This learning form allows for the creation of a massive system of continuous professional education, general exchange of information, regardless of the temporal and spatial framework. On the back of gadget concept, telecommunication technologies in distance learning will be implemented into the educational practice as an effective basis for training and continuous support of high qualification skill level.

Thus, the use of education and professional information and educational environment enables to implement the distance learning technology that includes computer information sources, electronic libraries, video and audio libraries, classic textbooks and tutorials. When implementing the distance learning in the higher education institutions, there is a range of questions concerning the equipage of the education institution with modern computer hardware and software: placement of discipline materials at web-sites; online registration; completing the course unit, including online work with material and online communication with the lecturer; control and verification of knowledge; testing in the educational process; certification after graduation. Thus, the problem of choosing a platform, the basis for virtual educational environment, shall be essential and such choice depends upon a range of factors: which requirements are to be put to the environment, which functional features shall be present; which users shall be the subject of the environment and, it is important, which means you have for purchase and maintenance of the required platform.

There are two types of platform of educational program learning: based on the commercial software; based on the Open Source (OS) of solutions.

Free distance learning systems are favorable for state institutions. One of the options of using such methods and technologies – edX package representing a web-site content management system specially designed for the creation of quality online courses by lecturers. edX is a free online learning system. This system of free online learning combines up to 1 bln. Users that are the participants of over 1000 Internet-courses. edX is an automated system developed on computer and Internet technologies for the learning management system. edX is a web-application placed on the server and may be accessed through browser. As a rule, the server is placed in the university or at the faculty, but it also can be placed in any other place. Such learning management system enables the lecturer to create a web-site and manage access to it so that all trainees can review it. In addition to access control, it gives a wide range of tools making the course more effective.

For the first time among all medical universities of Ukraine, lecturers of all faculties of Zaporizhzhia State Medical University made online courses on modern LMS platform edX and presented the real choice of academic courses for students. Under supervision of the department of medical and pharmaceutical informatics based on communication and Internet technologies, there has been difficult way of managing the design of online courses and main ideas of e-learning. This project has been implemented on the back of continuous work on information support in the educational process. The unified educational environment of university has been created with the assistance of the university presidentship.

Methodological design of e-learning includes: concept of e-learning, technology of learning on the course (learning process model), structure of educational and methodological package of distance course.

At the departments of phthisiology and pulmonology and analytical chemistry of Zaporizhzhia State Medical Universityin in accordance with the unified educational space of the university on the eDX platform and under the supervision of the Department of Medical and Pharmaceutical Informatics, the online courses of the choice and independent work of the students have been developed and implemented in the educational process. On-line courses of choice provide the implementation of the prin-

ciple of through teaching. With insufficient number of practical hours for teaching disciplines, on-line courses on independent work of students are very relevant. Undoubtedly, both types of on-line courses contribute to the thematic student education.

The results of such learning are the formation of a personality of intended doctor and pharmacist with the required package of key competences, being able to solve any professional tasks. The learning process under such model is focused on the development of the self-control skills. Such learning facil-itates the increasing learning effectiveness as there is not only classroom work of the student, but also permanent and regular individual work using modern programs and technical tools leading to the continuous educational process. Such learning enhances analytical skills and develops critical thinking. The implementation of innovative technologies, methods, tools and means in the educational process enables to use the potential of educational content (Figure 2).
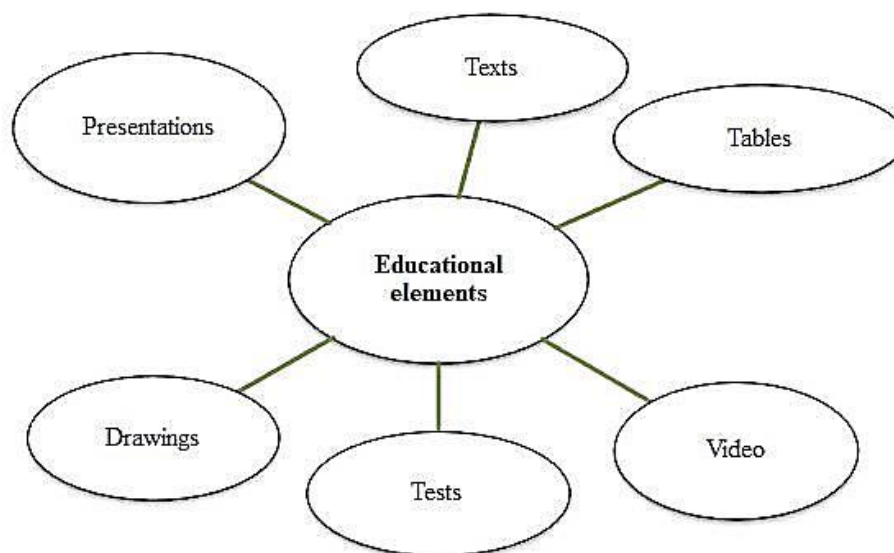

Figure 2. Educational elements of online courses.

Optimization of the classroom and individual educational interconnection of the participants to the pedagogical process through the creation of the information and educational environment and its filling with interactive, context means in the learning process of future doctor and pharmacist enables to improve the educational process, to create such activity tool to facilitate the accumulation of relevant knowledge and experience, as well as to support intellectual efforts of students, to stimulate cognitive activity. Thus, it will increase the motivation of students for learning; cultivate cognitive, productive, conscious grounds that will impact on all scopes of activities of future doctor and pharmacist.

Such learning organization enables students to gain new knowledge through electronic resources at all reasonable time and practice new skills in communication with the lecturer and fellow students in classroom. It forms responsible attitude of students institutions to the learning process, choosing the pace of material adoption. In the course of such learning, there is the process of individual cognitive activity of future doctors and it enables to balance basic and related knowledge due to individual learning of theory and doing additional exercises.

Conclusion

Thus, creating information and educational environment that supplies interaction between lecturers and students in classroom through interactive forms of communication on the basis of edX platform promotes the optimization of the learning process that makes the learning process more effecient and adds the interaction of lecturers and students with interactive forms of communication and also facilitates the improvement of higher education level in Ukraine.

The experience of using new learning form confirmed the simplicity and interactivity of interaction of the student and the lecturer, gives the wide opportunities for learning process arrangement, enables the student to model learning process individually, as well as new forms of learning process supervision. In the opinion of students, such form of learning gives the freedom of choice, communication and time scheduling. In our opinion, online courses based on edX platform facilitate the optimization of the learning process in higher education institutions.

Prospects for further investigations

The prospect of further work is the continuation of the development and implementation of the online course for students on edX platform in the learning

process.

Information about conflicts of interest

Potential or obvious conflicts of interest, related to this manuscript, at the time of publication does not exist and is not expected.

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Мурзіна О.А., Разнатовська О.М., Потоцька О.І., Нагорна Н.О. Оптимізація навчального процесу вищих навчальних медичних закладів через інформаційно-освітнє середовище.

РЕФЕРАТ. Актуальність. Підвищення ефективності професійної підготовки майбутніх висококваліфікованих кадрів потребує удосконалення існуючих та пошуку нових форм і методів організації навчального процесу. Такий підхід потребує використання комплексів технічних і дидактичних засобів, які забезпечують взаємозв'язок аудиторної та позааудиторної форм занять. **Мета.** Проаналізувати існуючі умови реалізації інформаційно-освітнього середовища. **Методи.** Аналіз теоретичних джерел з проблеми використання інформаційно-освітнього середовища у вищій медичній освіті, вивчення та узагальнення

передового досвіду викладання студентських курсів з використанням інформаційно-комунікаційних технологій. Аналіз результатів ефективності впровадження освітньо-інформаційного середовища проведено на кафедрах фтизіатрії та пульмонології, гістології, цитології та ембріології, медичної фізики, біофізики та вищої математики та аналітичної хімії. **Результати.** У статті представлені певні результати роботи викладачів стосовно розробки та використання інформаційно-освітнього середовища в контексті неперервної освіти сучасного інформаційного суспільства. Інформаційно-освітнє середовище, що забезпечує взаємодію викладачів та студентів у класі через інтерактивні форми спілкування на платформі edX, сприяє оптимізації навчального процесу. Обґрунтовано основні засади забезпечення інноваційних підходів, методів, технологій єдиного інформаційно-освітнього середовища вищого навчального медичного закладу. Підкреслена необхідність розкриття досвіду вищих навчальних закладів щодо створення інформаційно-освітнього середовища, як складової оптимізації навчального процесу студентів. Досвід використання нової форми навчання підтвердив простоту та інтерактивність взаємодії студента і викладача, дає широкі можливості для організації навчальної діяльності, дозволяючи студенту самостійно моделювати свій процес навчання, а також нові форми контролю навчальної діяльності. **Підсумок.** На нашу думку, online курси на платформі edX сприятимуть оптимізації навчального процесу вишу. Перспективою подальшої роботи ми вбачаємо в розробці та впровадженню в навчальний процес online курсів для самостійної роботи студентів на платформі edX.

Ключові слова: інформаційно-освітнє середовище; оптимізація навчального процесу; професійне навчання; інноваційно-освітня технологія.

Мурзина Е.А., Разнатовская Е.Н., Потоцкая Е.И., Нагорная Н.А. Оптимизация учебного процесса высших учебных медицинских заведений через информационно-образовательную среду.

РЕФЕРАТ. Актуальность. Повышение эффективности профессиональной подготовки будущих высококвалифицированных кадров требует совершенствования существующих и поиска новых форм и методов организации учебного процесса. Такой подход требует использования комплексов технических и дидактических средств, обеспечивающих взаимосвязь аудиторной и внеаудиторной форм занятий. **Цель.** Проанализировать существующие условия для реализации информационно-образовательной среды. **Методы.** Анализ теоретических источников по проблеме использования информационно-образовательной среды в высшем медицинском образовании, изучение и обобщение передового опыта преподавания студенческих курсов с использованием информационно-коммуникационных технологий. Анализ результатов эффективности внедрения образовательной и информационной среды проведен по кафедрам фтизиатрии и пульмонологии, гистологии, цитологии и эмбриологии, медицинской физики, биофизики и высшей математики и аналитической химии. **Результаты.** В статье представлены некоторые результаты работы преподавателей по разработке и использованию информационно-образовательной среды в контексте непрерывного образования современного информационного общества. Информационно-образовательная среда, обеспечивающая взаимодействие преподавателей и студентов в классе через интерактивные формы общения на платформе edX, способствует оптимизации учебного процесса. Обоснованы основные принципы обеспечения инновационных подходов, методов, технологий единого информационно-образовательной среды высшего учебного медицинского учреждения. Подчеркнута необходимость раскрытия опыта высших учебных заведений по созданию информационно-образовательной среды, как составляющей оптимизации учебного процесса студентов. Опыт использования новой формы обучения подтвердил простоту и интерактивность взаимодействия студента и преподавателя, дает широкие возможности для организации учебной деятельности, позволяя студенту самостоятельно моделировать свой процесс обучения, а также новые формы контроля учебной деятельности. **Заключение.** По нашему мнению, online курсы на платформе edX способствуют оптимизации учебного процесса вуза. Перспективой дальнейшей работы мы видим в разработке и внедрению в учебный процесс online курсов для самостоятельной работы студентов на платформе edX.

Ключевые слова: информационно-образовательная среда; оптимизация учебного процесса; профессиональное обучение; инновационно-образовательная технология.