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## CONCEPTUAL PRINCIPLES OF IMPROVING SPECIALISTS' PROFESSIONAL TRAINING IN THE INFORMATION AND EDUCATIONAL ENVIRONMENT AT HIGHER SCHOOL

**Abstract.** The new paradigm of education orients the pedagogical community to the variability of educational systems and institutions, the flexibility and dynamism of the professional training process, its adaptation to social needs, the demands of the population and employers, and the wide introduction of modern pedagogical technologies into the educational process. This requires organizational and structural modernization of administrative, educational, research and other components of higher education institutions aimed at improving the quality of education, forming the creative personality of a modern specialist. An important task is the integration of Ukrainian higher education institutions into the European and global scientific and educational space using the resources of the modern information and educational environment. The conceptual principles of improving the specialists' professional training, aimed at organizing the educational process in the information and educational environment of higher schools with the aim of increasing specialists' professional competence with the help of a modernized training system, are defined, scientifically substantiated and described in detail. Their functional purpose is clarified – the creation of a theoretical and methodological basis for the design, modeling and implementation of the optimal process of specialists' professional education through the formation and

implementation of an effective information and educational environment in the regulatory and legal field of higher education in accordance with the requirements of regulatory and legal acts relating to the quality of higher education. The expediency of using the potential of IES to strengthen the educational, cognitive and professional, developmental activity of learners and scientific and pedagogical staff of higher schools is proven. A number of tasks for the effective implementation of professional training in the information and educational environment of higher education institutions are outlined. Measures for the creation and implementation of IES in a higher education institution are suggested.

**Keywords:** professional training, institutions of higher education, information and educational environment, information and communication technologies, informatization of higher education.

## INTRODUCTION

Formulation of the problem. The new paradigm of education, adopted in Ukraine, orients the pedagogical community to the variability of educational systems and institutions, the flexibility and dynamism of the professional training process, its adaptation to social needs, the demands of the population and employers, the wide introduction of modern pedagogical technologies into the educational process, which change the nature of the search, acquisition and dissemination of knowledge. An important task is the integration of Ukrainian higher schools into the European and global scientific and educational space by implementing the resources of the modern information and educational environment (IES). In the 21st century in the conditions of open borders and competition of educational services, a trend has arisen and the demand for the implementation and development of a computer-technological learning platform is gaining popularity, which leads to the formation of the so-called Education 4.0 [1, p. 169]. This requires organizational and structural modernization of the administrative, educational, research and other components of the activities of higher schools, aimed at improving the quality of education, forming the creative personality of a modern specialist, taking into account the considerations of stakeholders, preserving national educational traditions, as well as realizing the autonomy of institutions, developing the mobility of scientific and pedagogical staff and students [2, p. 9].

We note that the introduction of information and communication technologies (ICT) into the educational process makes sense if it gives a chance to create additional opportunities and organizational and technical resources. This means an access to a much wider volume of educational information; visualization of the studied material; support of active and interactive learning methods; the modular principle of building the content of education; application of appropriate tool software.

It should be noted that during the COVID-19 pandemic, as well as the aggravation of the geopolitical situation, the emergence of real threats of a military nature, which have turned into a multi-year armed conflict in the East of Ukraine, the requirements for the flexibility and efficiency of educational institutions and teaching staff readiness are increasing. Despite the lack of technological and computer-pedagogical skills necessary for the use of digital tools of distance education, in the conditions of strict quarantine measures, teachers of various countries implemented an effective combination of synchronous and asynchronous education [3]. Unfortunately, a significant number of participants in the educational process faced problems related to the lack of effective ICT solutions for online learning, psychological and technological unpreparedness for a remote form of interaction, insufficient administrative coordination between teachers and students during the emergency introduction of the institutional electronic way of learning [4, p. 20]. In these circumstances, there is a consistent and radical change in traditional views on professional training technologies. An opportunity to modernize education opens up, innovation is recognized, awareness of the advantages of open, informal education with the use of ICT increases [5, p. 268]. Higher school teams have taken a number of steps to create an information and educational environment, the elements of which, first of all, the information system of “virtual learning environment” can perform the tasks necessary for the implementation of a distance form of education.

**Analysis of recent research and publications.** Features of an information and educational environment construction at educational institutions were investigated by V. Bykov, R. Hurevych, A. Hurzhiy, Yu. Zhuk, M. Kademiya, M. Koziar, V. Kremen, V. Lapinskyi, O. Lytvynova, N. Morze, Ye. Pollat, S. Semerikov, Yu. Tryus, M. Shyshkina, as well as S. Britain, Ch. Weber, J. Karaliotas, J. Clayton, M. Mariano, J. Moore, P. Newhouse, N. Sclater, C. Tella, J. Henner, S. Schafert, etc. According to their vision, the informatization of the educational process is the creation of an information and educational environment favorable for the use of the latest ICT in combination with other types of educational equipment and traditional means of education. This approach is now rightly considered as a basis for proactively solving the current and strategic tasks of higher education, an effective means of intensifying professional training [6, p. 94-95].

According to V. Bykov, promising directions for the development of the educational sector and the integration of the domestic system of professional training into the European and global educational spaces are the implementation of the achievements of psychological and pedagogical science, educational practice and scientific and technical progress, following international trends in the creation of open educational and scientific information systems, the use of computer-oriented learning tools, cloud oriented education informatization systems, network technologies and databases, and artificial intelligence technologies [7, p. 4]. In this context, informatization of education and training contributes to the:

- intensification and rationalization of achieving the multifaceted goal of the education system;
- improvement of the quality of assimilation of a set of knowledge, abilities and skills by graduates, forming their readiness to apply it for their intended purpose, in accordance with the level of training and the profile of professional activity;
- creation of appropriate conditions for increasing the level of information literacy (competence) of specialists in order to solve educational, industrial and utilitarian tasks;
- adaptation of the participants of the educational process to the use of ICT in educational and further professional activities;
- assurance of the self-realization of each individual and the education of new generations capable of working productively and learning throughout their lives [6, p. 94-95].

**The purpose of the article** is to define, scientifically substantiate and describe in detail the conceptual basis for improving the specialists' professional training aimed at organizing the educational process in the information and educational environment of higher schools with the aim of increasing their professional competence with the help of a modernized system of training at higher education institutions of Ukraine. The functional purpose of the conceptual basis is to create theoretical and methodological foundations of designing, modeling and implementation of the optimal process of specialists' professional education by creating and implementing an effective IES in the normative and legal field of higher education in accordance with the requirements of normative and legal acts concerning the quality of higher education.

## THEORETICAL BASICS OF RESEARCH

The leading idea is to improve the educational process in departmental higher education institutions of the State Emergency Service of Ukraine through a thorough reconstruction of the content, methods and technologies of professional training, bringing them closer to real professional duties with the help of IES – a complete set of hardware and software tools, electronic educational and methodological complexes, organizational and pedagogical conditions for the use of ICT, which contribute to the establishment of educational interaction between students, scientific and pedagogical workers and various electronic educational resources, increasing the cognitive activity and quality of future specialists' training by didactically expedient satisfaction of their needs in information services and educational content, as well as optimization of information, organizational and scientific-methodological support of the educational process and management of the institution, coordination of the operation mode of all divisions and services. All this requires the modernization of specialists' professional training system, updating the ways of continuous formation and

development of their professional competences in accordance with the large-scale transformations in the socio-economic sphere of our country, the rapid spread of ICT and the convergence of modern technological innovations in the rescue service and other areas of civil protection, as well as the growing needs of society and individual requests.

Studies conducted in Ukraine and abroad show the growth of attempts at mass informatization of education at higher schools, which creates an urgent need for targeted research work in this direction [8–12]. In particular: insufficiently developed and diverse studies of the educational process regarding the expediency and productivity of using the latest methods and pedagogical technologies; it is urgently necessary to create a fundamentally new model of the entire process of professional training based on ICT, as well as the development of specific means and resources. It is already clear that in order to obtain the necessary result, i.e. competitive specialists with high qualifications, it is necessary to create new methods and technologies for studying professionally oriented theoretical and practical disciplines.

It is difficult to imagine modern higher education without the latest computer and telecommunication equipment and ICT that enables to fulfill the orders of the twenty-first century society for the training of competent specialists who are able to effectively use ICT and innovations based on it for professional purposes and in everyday life. LMS systems (Moodle) distributed at higher schools provide a concentration of learning materials and courses and often also cover course management, registration, course planning, discussion forums, blog sites, and assessments. Key LMS features include password-controlled access to learner-selected courses. LMS tracks what materials a learner has access to and how much time a learner spends on them. It also has learning analytics to collect data available to the LMS in terms of learner actions. LMS registration accounting systems contain basic user information such as: registration details, course selection, course outline, qualification objective, study time and tracking information. LMSs are also used as repositories for learning data, resources, and materials. This may be provided by the course developer; commercial materials or, conversely, freely available open educational resources may be provided. Materials can be presented in various formats from simple text to interactive multimedia.

Among the main types of communication tools common in LMS, three can be distinguished, namely: e-mails, forums / webinars and chats. Tools can also be used to include learners in publishing materials, or serve as download mechanisms through blogs or wikis, links to other web resources. Most LMSs integrate with major administration/management systems that are IMS standards.

Along with the generally recognized didactic opportunities and advantages, the practice of higher school informatization in Ukraine revealed a number of problems, which are associated with difficulties in the implementation of an information and educational environment at higher education institutions with specific learning conditions. Let us note the most common problems.

*Financing difficulties.* As a rule, the use of an educational platform requires continuous maintenance. If a school has a modest budget, it is worth considering the use of platforms based on free software, as well as the application of interoperability standards to connect to other web resources and tools.

*Rejection by teachers.* Educational institutions need to reach a compromise on the issue of integration of the educational platform by teachers (relying on an active group of teachers) into the educational process in order to meet the needs of learners.

*Digital literacy.* Teachers often lack the skills to deliver material using the learning platform. It is extremely important to develop digital skills among pedagogical staff in order to develop students' abilities to apply ICT in practice while working with an educational platform.

*Informational security.* The transfer of private data should be minimized, and if such transfer is necessary, it should be carried out in accordance with national legislation and rules of a higher school.

Therefore, the ways to solve the problem of the effectiveness of the latest technologies application in professional education have not been fully determined yet, even in the countries with the most developed educational systems. The key questions that arise in this connection concern:

- building a holistic strategy of the educational process using ICT;
- restructuring of the content of educational disciplines for their informatization;
- determination of the share of educational material that should be mastered with the help of ICT tools in each training profile;
- creation and implementation of automated means of control and assessment of learner's educational achievements;
- design (selection) of ICT productive for the implementation of specific educational tasks, and multi-aspect monitoring of their expediency [13, p. 169].

## RESEARCH RESULTS

In view of the fact that the information environment makes it possible to solve the complex task of integrating information processes inherent in the main activities of the educational institution, we consider it appropriate to apply the concept of the *information and educational environment of a higher education institution* in relation to the pedagogically and technologically organized system of information interaction of all participants and all components of professional training process at a higher school [4]. According to its characteristics, the educational environment can be: specific or universal; innovative or traditional; competitive or cooperative, humanistic or technocratic; open or closed.

That is, every higher school now faces the task of designing, implementing, and developing IES for specialists' training. This requires the development of requirements for electronic educational resources, the definition of didactic and methodical principles of computer-oriented learning and the design of effective methods and technologies of learning on this basis [6, p. 95].

Obviously, the improvement of specialists' professional training in IES, i.e. by means of electronic learning and computer-oriented educational technologies, requires taking into account synergistic, systemic, innovative, informatics, personal-activity, competence, resource, environmental and other methodological approaches that reflect objective regularities of scientific knowledge. It also requires considering the idea of continuous education, the transition to a multi-level system of professional training. Synergistic provisions of the philosophy of open professional education regarding non-linear dynamic systems, which differ in self-organization and self-development, are methodologically important for substantiating the conceptual platform of educational process modernization in higher education by means of IES.

According to the innovative approach, it is expedient to use the potential of IES to strengthen the educational and cognitive and professional development activity of learners and scientific and pedagogical staff of higher schools. This requires the design, implementation and development of the IES computer-technological platform: electronic educational and methodical complexes and network services, filling them with electronic educational resources and Smart-technologies; application of cloud computing technologies in the educational process, wide use of mobile Internet devices; application of virtual reality technology for the formation of students' professional and practical abilities and skills; in the future – the introduction of intellectual learning systems that will perform the functions of a personal teacher, the use of artificial intelligence methods, expert systems, neural networks, genetic algorithms, multi-agent systems, etc. into the professional training of specialists. [14, p. 35-36].

For the effective implementation of professional training in the information and educational environment of a higher school, it is necessary to solve a number of tasks [15, p. 326–328], namely:

- to develop the methodological foundations of the “informational and educational environment” concept in higher education;
- to outline the institutional space of the higher education system in the period of informatization and transformation of Ukrainian society;

- to clarify the normative bases of information support for specialists' professional activity, their training at higher schools, and to work out the mechanisms for providing information resources in the institution;
- to determine the essence and components of the information and educational environment of higher schools, as well as to identify the peculiarities of their functioning and to build a model of future specialists' professional training in the information and educational environment of higher schools;
- to reveal the specifics of the implementation of specialists' training system in the information and educational environment of higher schools at the macro-, meso-, and micro-levels and to substantiate the necessary and sufficient organizational and pedagogical conditions for the formation of specialists' professional competence in the information and education environment, etc.

The following measures are proposed for the creation and implementation of IES in a higher school.

*Integrated access to educational resources.* A major trend in education today is that the most important potential benefits of using technology are convenience and productivity, i.e. time savings. Therefore, providing educational platforms with integrated access to various resources that are ideally suited for the educational process is especially important for those seeking education.

*Development of learning based on interaction.* Online forums have become the main space in which teachers post educational resources and conduct seminars. The pedagogical success of open learning platforms is evident in the development of interactivity – much greater than what can be achieved within the classroom.

*Convergence of digital publications and educational content.* Books and printed materials will not be completely removed from use, but it will be possible to significantly optimize production to reduce costs for students by replacing paper textbooks with digital counterparts that will be hosted in a cloud computing environment.

The architecture of the information and educational environment of a higher school is built on a software and hardware platform that enables the connection and use of the entire set of electronic resources and services of the institution, effective organization of the educational process, covers teachers, learners, the administration of the institution, serves as an integrated center for all the subjects of professional training. IES ensures the implementation of the entire complex of organizational, management, legal, educational and other relations of the participants in the educational process through an information model oriented to the needs of students (student-centered) and provides for the fulfillment of state orders and stakeholder requirements, the distribution of powers between all the parties of the education system, enshrined in legislation.

During the creation and commissioning of the IES, it is envisaged to establish information interaction with external information systems of state authorities and local self-government bodies, educational institutions, scientific and educational institutions, and the expert community, which together form an integrated information interaction. Data communication between IES modules and users is organized with the help of the personal data identifier of learners, scientific, pedagogical and administrative workers.

The creation of IES is based on the maximum use of leading results and possibilities of informatization, application of applied and infrastructural solutions, implemented and tested systems and elements of e-learning, distance educational technologies, learning management systems (LMS) and automated control systems (ACS) in the field of education. The effective design, construction and development of IES requires the development and approval of technical regulations that determine the requirements for software and information components of the system, necessary hardware, interaction formats, technical parameters of content and rules for assessing the quality of its content, requirements for data bases (repositories), physical characteristics of the system components, their interfaces, as well as organizational and technical wishes to all participants in the creation, adjustment and support of the operation of the IES.

## CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

As practice shows, the application of IES increases the efficiency of managing various aspects of education, teaching and research due to the implementation of a joint automated system of institution management. Second, ICT can be used to disseminate teaching and learning materials to all participants of the educational process through VLE / LMS learning platforms. In addition, many institutions now have learning object repositories or open educational resources. Similarly, most institutions have open access research repositories and repositories. Third, ICT is used in terms of human resource development reporting research, both for internal promotions and in terms of national scientific assessments. Resources are usually available to help educators use technology effectively in course development. Fourth, they provide all the participants of the educational process with access to sources of information from around the world. Increasingly, educators and learners are augmenting institutional systems and resources with tools and resources freely available in the Internet. Eg., the use of cloud computing technology is expanding. Fifth, scientists want examples of good practice and mechanisms for sharing ideas on education. ICT systems can contribute to this with various communication tools, network media. ICT systems can provide teachers and students with space for cooperation in the implementation of joint projects. These systems can also be used to support the interaction of research projects. Sixth, they can manage classes in the mode of remote attendance, mobile and distance learning. They also cover communications infrastructure services such as network services and telephony, data center operations, computing and web support services.

In general, this will make it possible to determine the goals, objectives, main directions of operation, architecture and results of the implementation of the IES, a set of information and educational solutions based on general rules and approaches that will contribute to the successful implementation of the goals of the institution, the fulfillment of state educational standards, the requirements of the Ministry of Education and Science of Ukraine regarding the level of graduates' training, updating the forms, means, methods and technologies of professional training, improving the teaching of the entire complex of disciplines, improving the quality of education results in general.

Such measures will ensure the proper preparation of higher school graduates – young workers for proper professional activity, in particular, the formation of a set of competencies necessary for specialists of various profiles and fields. At the same time, the criteria for specialists' professional competence formation are professional activity, emotional, psychological and physical endurance, readiness for innovative and creative activities.

Further directions of research related to the implementation and development of IES in higher education include a set of scientific and pedagogical activities aimed at creating and testing innovative methods and technologies for using computer-oriented tools in higher education. Since the creation and maintenance of IES is a complex, multifaceted, knowledge-intensive and labor-intensive work, the full-scale implementation of which cannot be ensured by the forces of a separate educational institution, the key task in this area at the national level is the creation of a national educational portal that will help educators in solving all didactic and technological problems of creation, functioning and development of IES at institutions of various levels and profiles, and will also centrally manage the design and development of a unified information and educational space of our state.

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