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Professional training of specialists in the information and educational environment of the university

Formación profesional de especialistas en el entorno informativo y educativo de la universidad

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Abstract

The article defines the goals of society's informatization and the content of the university's information and educational environment, reveals the purpose of the university's information and educational environment, and examines the spectrum of characteristics of information technologies that are components of the

university's information and educational environment. To implement an information and educational environment at the university that fosters high-quality professional training of specialists and enhances the level of educational services, the higher education institution itself must possess several key properties, as outlined in the article. Using questionnaires and interviews at the ascertaining stage of the study, the position of students and teachers on the organization of the information and educational environment of the university for high-quality professional training of specialists was clarified. It was found that students and teachers are not ready to use the opportunities of the information and educational environment of the university in their activities. After completing the research and experimental work, statistically significant and positive changes were achieved in the levels of readiness of teachers and students to interact in the information and educational environment of the university, with the advantages of high and sufficient levels in the motivational, cognitive, and activity components.

Keywords: information and educational environment of the university, professional training of specialists, informatization of society, readiness of teachers and students to interact, information technologies.

Resumen

El artículo define los objetivos de la informatización de la sociedad y el contenido del entorno informativo y educativo de la universidad; Se revela la finalidad del ambiente informativo y educativo de la universidad; Se considera el espectro de características de las tecnologías de la información que forman parte del entorno informativo y educativo de la universidad. Para implementar el entorno informativo y educativo de la universidad para la formación profesional de alta calidad de especialistas y aumentar el nivel de los servicios educativos, la propia institución de educación superior debe tener una serie de propiedades, que se revelan en el artículo. A través de cuestionarios y entrevistas en la etapa de investigación, se aclaró la posición de los estudiantes y profesores con respecto a la organización del entorno informativo y educativo de la universidad con el objetivo de una formación profesional de alta calidad de los especialistas. Se encontró que los estudiantes y profesores no están preparados para aprovechar las oportunidades que ofrece el entorno informativo y educativo de la universidad en sus actividades. Tras la finalización del trabajo de investigación y experimental, se lograron cambios estadísticamente significativos y positivos en los niveles de preparación de docentes y estudiantes para la interacción en el entorno informativo y educativo de la universidad, las ventajas de niveles altos y suficientes en los componentes motivacionales, cognitivos y de actividad.

Palabras clave: entorno informativo y educativo de la universidad, formación profesional de especialistas, informatización de la sociedad, preparación de docentes y estudiantes para la interacción, tecnologías de la información.

Introduction

In the context of the global development of the information society and the intensification of the world market for new technologies, a fundamental change in the educational paradigm is taking place, focused on the development of the individual, his life and professional self-realization, and the training of competitive specialists in the process of professional training.

Now is the time to rethink the priorities of higher pedagogical education in Ukraine, form new conceptual and methodological foundations of educational activity, and make a paradigm shift in understanding its goals, objectives, content, and organizational and implementation methods.

It should be noted that the former education system has been quite successful in preparing highly qualified personnel for the country for many decades. However, the requirements of the time and the rapid development of ICT, the rapid growth of standards for the level of mastery of them, the openness of educational systems, and the popularity and demand for electronic educational resources in general and

in the conditions of forced distance of interaction in particular, require changes in approaches to the organization of the educational process in vocational education institutions (Carvajal-Morales et al., 2024). The widespread use of new computer-oriented technologies, particularly distance learning, data personalization, virtual classrooms, cloud and Internet technologies, is prompted by conceptual changes in the system of training specialists.

The problem of professional training of new generation pedagogical workers, in particular the training of specialists in the information and educational environment of the university, is caused by a set of factors, including the updating of the content of education; a significant expansion of the professional functions of future specialists as a subject of innovative activity; the need for constant search for new innovative forms, methods of teaching and education, taking into account the realities and needs of practice; the ability to build conceptual foundations of pedagogical innovations; the need to involve students in search activities and experimentation, occupy leading positions.

The need to solve the above problem, its relevance, and expediency are due to several contradictions in the information education system, in particular between:

- The growing requirements of society, the high-tech labor market, state standards for the training of IT specialists, and a high level of professional competence, and an insufficient level of their practical readiness to perform professional activities, due to the modern needs of the IT industry.
- The potential capabilities of the domestic educational and information environment, the integrated nature of the professional activities of specialists in innovative conditions, and traditional methods of training future specialists in the information and educational environment of the university.
- The need for targeted formation of information competence in future specialists, the lack of an educational model for their formation in higher education institutions, and the insufficient development of methodological support for the educational process.

The relevance of the research, the theoretical and practical significance of the chosen scientific problem, and the feasibility of its development, as well as the need to eliminate the identified contradictions, determined the choice of the topic of the article.

Literature Review

A large number of studies are devoted to the study of trends in the development of higher education in the context of a changing educational paradigm; to the definition and development of theoretical and methodological principles of continuous professional education, to the study of the personality of a future competent specialist and the issues of professional training of an IT professional. Scientists are united by a common view of the problem: the success of the professional activity of a future specialist of a technical higher education institution is determined not only by knowledge and skills, but also by personal and professional qualities that meet the growing requirements of scientific and technological progress in the 21st century.

The basis of the research problem was the ideas formulated in the works of domestic and foreign scientists. The issues of the development of informatization of education and the introduction of ICT into the educational process are highlighted in the works of Arregui-Valdivieso et al. (2024). Scientists have studied the information and educational environment of the university, it is a holistic set of means, complexes and organizational and pedagogical conditions for the use of information technologies for high-quality professional training of specialists and increasing the level of educational services that contribute to increasing cognitive activity and the implementation of interactive interaction between students, the use of various electronic educational resources in higher education and, as a result, the quality of training of future specialists through didactically appropriate satisfaction of their needs in information services, optimization of scientific and methodological, organizational, information support of the educational process and management of a higher education institution.

The issues of organizing the information and educational environment of the university, considering the scientific and methodological foundations of designing information educational environments of educational institutions, with the aim of high-quality professional training of specialists and improving the level of educational services, are devoted to the work of modern scientists and practitioners.

The main stages of developing and designing an information system in the information and educational environment of the university to improve the level of educational services are considered by Cordero et al. (2024) prototypes of the main pages of the system have been developed and a diagram of the components of the web system, the process of designing the architecture, the web system interface, the website operation scheme, state diagrams of the main processes, and a sequence diagram of the information system are presented; technologies in the process of developing an information system for professional training of specialists used in the practical activities of higher education are presented, the database structure is given. A feature of the university's information and educational environment presented by the authors is the development of a parser for automated filling of the educational resources database for higher education applicants to improve the level of educational services provided.

The issues of managing the education system and its innovative potential through the introduction of modern information technologies, as well as modeling and designing the information-educational and information-communication educational environment, are considered by Hernández-Rodríguez & Guillén-Yparrea (2024). The essence of the concepts of “information educational environment”, “information technologies”, and “informatization of education” as a holistic dynamic system is revealed. In the conditions of ensuring the quality of education, the prospects for development and advantages of informatization of education are determined; based on a unified unification into an educational information single environment, the process of informatization of education in institutions of professional pre-higher education is investigated, the importance of implementing informatization of the professional training system of future specialists is proven. The research by Rodríguez-Linares et al. (2024) is devoted to the revision of established approaches to professional training, as required by the formation of an information society. An important requirement given the dynamics of modern technological processes is the information and educational environment of the university, the use of information and communication technologies in all spheres of professional activity, and skills of working in informatization, to increase the level of provision of educational services.

Various aspects of the problem of developing professionally important qualities, studying information technologies, and their formation in the process of professional training of future specialists at the stage of their formation in higher education institutions are highlighted in the works of researchers Gaviria et al. (2024). The researchers to improve the level of educational services, create a high-quality information and educational environment of the university, the use of cloud services, skills in working with shared documents, Google, and mind maps, web technologies, and other online resources becomes essential in higher education.

In turn, scientists from Latin American countries consider the problem of training specialists in the information and educational environment of the university and draw attention to the importance of innovative technologies in educational institutions.

Scientists’ attention is focused on the need to use innovative technologies throughout the educational process, which will allow the formation of a high information culture among the world's youth. The formation of innovative technologies in students requires, first of all, a high level of information culture of a specialist and their methodological literacy in professional training.

The aim of the article by López Belmonte et al. (2020). They have focused on meeting the educational scope of the digital competence of teachers of cooperative education. Authors Sánchez-Macías et al. (2023) in their work aimed to measure and describe the level of digital competencies from a pedagogical teacher’s approach, validate the theoretical relationship between its dimensions, and identify behavioral

patterns among the teachers. Researchers Fernández-Otoya et al. (2024) emphasize that digital transformation has become permanent and has forced governments to reassess the validity of their educational models; therefore, when it comes to digital and information literacy, training teachers to improve new digital skills becomes extremely important.

Scientists emphasize that the introduction of ICT into the educational process and its digitalization allow for the implementation of a new format of education. The information environment created by ICT is considered by modern scientists as a component of the educational environment and acts as a complex, multifaceted formation. At the same time, the analysis of scientific sources on the topic of the study showed the absence of works devoted to the comprehensive study of the problems of organizing the information environment, in particular its organizational, legal and other mechanisms, as well as the involvement of pedagogical workers of vocational education institutions in the processes of ensuring the quality of training of specialists using the capabilities of information technologies.

Purpose of the research. Organization of the information and educational environment of the university with the aim of high-quality professional training of specialists.

Methodology

Within the framework of the presented general understanding of the methodology and its highlighted structural components, revealing the essence of the methodology of activity in the pedagogical sphere, we will indicate that the important components of the system of methodological knowledge are: a set of principles of pedagogical activity; a set of methods of pedagogical activity, which gives rise to the emergence of teaching methods, research methods, diagnostic methods, methods of managing a certain process, methods of using information technologies and their means.

The implementation of the stated goal was carried out by applying research methods: theoretical: systematic, comparative analysis, classification, generalization, extrapolation of research data and theoretical data, modeling – to determine the essence of the research concepts and justification of pedagogical conditions; the method of generalization and comparison of data –to identify the features and specifics of the organization of advisory and information activities in higher education; empirical: observations, interviews, questionnaires, pedagogical experiment – to verify the effectiveness of the developed conditions; methods of quantitative, qualitative and statistical analysis of research results – to determine the degree of reliability of the obtained data and verify statistical hypotheses.

The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the goal and objectives of the study were determined, the experimental plan was developed, methods of measurement and processing of results were identified, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, the experiment was conducted.

At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The purpose of the experimental work was to verify the effectiveness of the organization of the university's information and educational environment for high-quality professional training of specialists.

The reliability and validity of the obtained results, the objectivity of their assessment were ensured by the methodological justification of the initial positions and the qualimetric mechanism for assessing the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

Validation of the study

The reliability and validity of the results were ensured through: methodological justification of the initial positions; a qualimetric quality assessment mechanism that assessed the components of the educational environment; the complexity of research methods: both theoretical (analysis, modeling) and empirical (observation, questionnaire, interview, pedagogical experiment) were used; the use of statistical analysis: MS Excel and SPSS were used to process quantitative data.

Statistical confirmation of hypotheses:

- Hypothesis H0: The dynamics in the experimental group are not more significant than in the control group.
- Hypothesis H1: The dynamics in the experimental group are significantly better.
- The test was carried out using the Pearson χ^2 criterion, with significance levels $\rho = 0.05, 0.01, 0.001$.

Method of constructing the analyzed variables.

Quantitative variables were constructed according to the following components:

1. Motivational component – attitude towards using the information environment, level of interest.
2. Cognitive component – level of knowledge and understanding of ICT.
3. Activity component – ability to effectively use ICT in learning and teaching.

Readiness levels were assessed as: high, sufficient; low, critical.

Respondents: 107 students and 48 teachers. The sample was formed according to the criteria of content, representativeness, and equivalence. The selection method was random sampling using the selection step calculation technique.

The construction of the analyzed variables was based on three key components (motivational, cognitive, and activity), which were assessed through surveys and interviews. The reliability of the results was confirmed statistically, using χ^2-analysis and SPSS/Excel programs.

QUANTITATIVE ANALYSIS OF THE RESEARCH showed that 155 respondents participated in the experiment (students – 107 people, teachers – 48 people). Sample formation: random selection taking into account representativeness and equivalence.

Assessed readiness components: motivational, cognitive, and activity. Levels were measured in % for each group:

High, sufficient, low, critical.

At the ascertaining stage – initial data: level of awareness: high: 37% of teachers and students, medium/low – the rest.

ICT proficiency:

Teachers: high – 15%, medium – 59%
Students: high – 9%, medium – 50%
At the same stage, the level of satisfaction with the environment was determined: high – 12%, low – 32%, critical – 35%.

Readiness to use the information environment: More than 60% of respondents did not demonstrate readiness to use it effectively.

At the formative stage, there was an improvement in the experimental group:

Motivational component: teachers – 72%, students – 62%
Cognitive component: teachers – 62%, students – 59%
Overall dynamics of readiness levels: +34% – motivational component, +24% – cognitive component, +37% – activity component.

Increase in readiness level (EG): +14% — with a high level, +19% — with a sufficient level, -33% — with a low/critical level.

Results of statistical analysis: Tools: MS Excel, SPSS; Criterion: Pearson's χ^2; Significance levels: $\rho = 0.05 \rightarrow \chi^2 = 7.81$, $\rho = 0.01 \rightarrow \chi^2 = 11.3$, $\rho = 0.001 \rightarrow \chi^2 = 16.27$.
Result: H1 confirmed – changes in EG are statistically significant.

The data indicate a statistically significant increase in the level of readiness of students and teachers of the experimental group to use the information and educational environment. The formative stage gave effective results due to the implemented pedagogical conditions and digital technologies. The main changes occurred in the motivational and activity components.

The experiment was conducted in Rivne State University of Humanities and the Central Ukrainian National Technical University. The conduct of the experiment is permitted by the scientific councils of the universities in order not to violate ethical considerations in institutions of higher education.

Through questionnaires and interviews at the ascertaining stage of the research, the position of students and teachers was clarified regarding the organization of the university's information and educational environment for high-quality professional training of specialists.

The capabilities of the "Statistics" package were used to perform calculations. The empirical values obtained by the Pearson χ_{em}^2 criterion were compared with the tabular critical values χ_{cr}^2, which correspond to the levels of statistical significance adopted in the studies, depending on the number of factors being compared.

So, comparing the results of the formative stage of the experiment and the ascertaining stage of the experiment, we determined that the pedagogical conditions developed by us are effective for organizing the information and educational environment of the university with the aim of high-quality professional training of specialists and increasing the level of educational services.

Results and Discussion

The goals of the informatization of society and the content of the information and educational environment of the university.

The modern restructuring of the industrial society into an information society and socio-economic modern processes appears in education as a system of determinants of progressive significant changes. In the educational sphere, informatization is an innovative component of transformational changes, which is a system of methods, software, and hardware processes integrated for storing, accumulating, processing, using, and distributing information in the interests of consumers. The goals of informatization of society are: the use of modern information technologies in the educational process; improving the quality of education by providing access to knowledge for each member of society; development within the framework of individualization of education of creative and intellectual abilities; ensuring advanced learning of students (Hidalgo Cajo et al., 2024).

The information and educational environment of the university is “a holistic set of hardware and software, electronic educational and methodological complexes and organizational and pedagogical conditions for the use of ICT, which contribute to the implementation of interactive interaction between students, scientific and pedagogical workers and various electronic educational resources, increasing cognitive activity and the quality of training of future specialists by didactically appropriate satisfaction of their needs in information services and educational content, as well as optimizing the information, organizational and scientific and methodological support of the educational process and institution management, coordinating the functioning of all departments and services of the higher education institution” (Villegas-Ch et al., 2023). The organization of the university's information and educational environment for high-quality professional training of specialists and increasing the level of educational services is an important element of organizing the process of professional training of students, closely related to production activities, design of the educational process (Silva et al., 2024). The development of the content of the university's information and educational environment to increase the level of educational services involves the following procedure: identification of professional skills and abilities; analysis of professional functions that ensure the performance of professional functions; transformation into educational subjects of a set of knowledge, skills and abilities; determination of the system of knowledge necessary for the successful mastery of the student's skills; preparation of practical work aimed at mastering the professional skills of the individual.

The modern information and educational environment of the university is defined as a software and technical complex and as a pedagogical system. Therefore, in the process of developing the information and educational environment, psychological and pedagogical problems and information and software, and technical problems should be solved. Further development of the organization of the information and educational environment of the university, informatization of higher education requires a comprehensive solution to the tasks that are entirely related to the creation of such an educational information space of the university, which exists based on the unification of university and regional information and transport networks, educational programs, information systems (Correa Cruz et al., 2017). The methodology for using information environment services and information resources using the telecommunication access network in education is important today. The purpose of creating an information and educational environment of the university for high-quality professional training of specialists and increasing the level of provision of educational services is the implementation and organization of educational programs in a single global information educational space through the use of distance learning technology, which allows making education accessible, improving its quality, solving complex problems of structuring and systematizing educational information.

Let us define the goals of the information and educational environment of the university:

- Formation of professional knowledge of each future specialist, their skills, and abilities.
- Development of personality and realization of the creative potential of students.
- Formation of information culture in future specialists.
- Formation of professional self-awareness.
- Formation of a modern professional and scientific worldview.

During the organization of the information and educational environment of the university, a complex of psychological and pedagogical, educational and methodological, technical, organizational, programmatic, technological, regulatory, socio-economic, and ergonomic problems aimed at the formation of a creative personality and closely related to each other are solved. It is important to create appropriate pedagogical conditions for the successful functioning of the information and educational environment of the university. Such necessary conditions are:

- A high level of information culture among higher education students and teachers.
- The introduction of pedagogical information and communication technologies based on subject relationships for each subject.

- Reflection activities of higher education students capable of self-assessment of their personality (Rojas-Bahamon & Arbeláez-Campillo, 2024).

The components of such an information and educational environment of the university from the standpoint of a systemic approach for high-quality professional training of specialists are the following microenvironments:

Internet classes, electronic textbooks, manuals, computer-oriented educational and methodological complexes, academic disciplines, library, and own projects (Valdez et al., 2022).

Informatization of education, creation of information, and the educational environment of the university cause several changes in the procedural component. Integration of information technologies into the educational process of higher education by creating an information and educational environment is considered favorable for differentiation, individualization, and intensification of education, as a consequence of improvement and optimization of higher education. The information and educational environment encompasses technical, informational, educational and methodological subsystems that ensure the educational process of higher education, and also promotes the interaction of its participants, is a means of developing a higher education applicant, and represents a new level of the pedagogical system, ensuring the effective operation of financial and economic, regulatory and legal, marketing, material and technical, and management subsystems (Vargas-Hernández et al., 2024).

Therefore, the purpose of creating an information and educational environment in educational institutions should be considered "the formation of a successful intellectually and creatively developed personality with a high level of information culture, and the main tasks are to meet the individual educational needs of students due to an increase in the level of professional training; dynamic combination of all communication means due to universal forms of storage, processing and transmission of information; development of the material, technical and educational and methodological bases of the educational institution; improvement of the system of its information and methodological support in the management of the institution".

The spectrum of characteristics of information technologies that are components of the university's information and educational environment.

Let's consider the spectrum of characteristics of information technologies that are components of the university's information and educational environment:

- ***Implementation***: productivity and availability of appropriate procedures – educational (use of information technologies in classes and extracurricular activities), administrative and organizational and educational (automated scheduling, preparation of reports, keeping student records, electronic journal, use of administrative databases, etc.), methodological (publication and preparation of methodological developments, conducting open classes, organizing exchange of experience between teachers, videotaping individual classes, etc.), development (innovative activity, a system of support and motivation for the informatization process, provision with information technology tools).
- ***Accessibility***: quality and number of available student workplaces (computers with peripheral devices), availability of sources, availability of software, computer network, software tools.
- ***Competence***: the ability and willingness of all participants in the educational process to work in appropriate organizational conditions, to work effectively in the university's information environment (students – project activity, focus on operating information technologies in the educational process; teachers – use of information technologies for class management, information literacy; leadership – management of the educational process, support for initiatives, active position, problem solving, etc. (Zapana et al., 2024).

In order to provide high-quality professional training of specialists and improve the level of educational services, the modern information and educational environment of the university combines a wide range of network technologies and educational software, including forums, e-mail, collective use software, video

conferences, chats, video and audio recordings, educational tools based on the use of web technologies and creates the prerequisites for: the introduction of information pedagogical technologies based on subject relationships; reflective activity of students capable of self-assessment; combining the efforts of university teaching staff and innovative technologies in the development of curricula, programs, scientific and methodological support, advanced pedagogical experience; substantiation of the educational process from a scientific point of view; increasing the information culture of employees; activating the educational process; developing students' abilities, revealing their creative potential, and increasing their level of information culture.

In the process of conducting classes in higher education, teachers need to use cloud services, in particular, to create shared documents (presentations, forms, blogs, etc.), knowledge maps (MindMeister, SpiderScribe.net, Mindomo Basic, Bubble.us), didactic resources (Classtools.net, Learningapps, Zondle, Prezi, Studystack), etc. An integral feature of the structure of the cloud infrastructure of the ICT environment is a unified data storage architecture. “Network information and analytical tools of cloud computing in the environment of a higher education institution cover both publicly available scientific and educational information networks and web-oriented systems of the corporate sector, in particular – open journal systems, electronic libraries, scientific and metric systems, and databases, etc.”

To implement the information and educational environment of the university for high-quality professional training of specialists and increase the level of provision of educational services, the higher education institution itself must have several properties (Veytia Bucheli et al., 2024):

- ***Adaptability*** – dynamic adjustment to the requests of education seekers, the needs of the institution, adaptation to the features of the content of the components, taking into account the specifics of training.
- ***Innovation*** – application of the latest approaches, developments to improve the activities of higher education, and improve the quality of educational services.
- ***Multitasking*** – implementation of information and reference bases, parallel support of user requests, all necessary processes, and various educational resources, etc.
- ***Flexibility*** – anticipatory modification.
- ***Variability*** – depending on the given goal – construction of individual educational trajectories of students, the possibility of selecting means and content, and technologies.
- ***Multicomponent*** – regulates and covers program, educational, methodological support, information, and reference resources, control systems, etc.
- ***Openness*** – information accessibility and transparency of resources by the principles of open education, use of open resources of the information space.
- ***Accessibility*** – access to environmental resources from any point on the local network.
- ***Humanism and democracy*** – implementation of a personally oriented approach;
- ***Hierarchy*** – subordination, subordination of blocks, elements, modules of the system as a whole, and each of its structural components.
- ***Integration*** – connection of all components to solve problems.
- ***Interactivity*** – support of responsible and active creative interaction with ICT tools.
- ***Multimedia*** – use of educational information in various forms.
- ***Controllability*** – controlled access to methods and technologies of educational activity.
- ***Intelligence*** – use of software tools for the implementation of educational tasks, decision-making.
- ***Informativeness*** – wide access to information content from all disciplines.
- ***Multi-subjectivity*** – meeting the needs of all subjects of the educational process.
- ***Complexity*** – ensuring the work of all structural divisions of the university.
- ***Mobility*** – facilitating access to information and educational resources using devices, mobile gadgets (Murillo Rosado et al., 2024).
- ***Scalability*** – the ability to increase functions, increase the number of services, expand databases, and increase knowledge.

- ***Universality*** – based on unified technological processes for designing information resources for the iOS.
- ***Personalization*** – designing methods and technologies of the educational process.
- ***Productivity*** – implementation of the most appropriate educational technologies.
- ***Distribution*** – the information component is located on servers (Quezada-Sarmiento et al., 2022).
- ***Functionality*** – the set of available resources ensures the activities of the university.
- ***Practical orientation*** – focus on solving professional tasks and problems in the industry.
- ***Systemicity*** – combining all available resources and applications into a complex system at the software and hardware levels.
- ***Technologicality*** – modular architecture with the ability to expand functionality, open software interface, virtualization of platforms, resources, and services.
- ***Structure*** – internal interconnection and interdependence of all components.
- ***Integrity*** – internal unity of all traditional and innovative elements of the educational environment, etc.

Experimental research.

The purpose of the research and experimental work was to verify the effectiveness of the organization of the university's information and educational environment for high-quality professional training of specialists. The purpose of the ascertaining experiment is to analyze the problem of studying the state and organization of the university's information and educational environment for professional high-quality training of specialists.

107 students and 48 university teachers participated in the research stage.

We identified the main necessary indicators of readiness for the organization of the university's information and educational environment for high-quality professional training of specialists:

- Awareness of the need to use the university's information and educational environment in their own student and pedagogical practice for high-quality professional training of specialists.
- Awareness of students and teachers about the latest technologies within the organization of the university's information and educational environment, their capabilities, and ways of using them for high-quality professional training of specialists and the purpose of professional personal development.
- Readiness to overcome difficulties for high-quality professional training of specialists associated with the use of the organization of the university's information and educational environment.

Through questionnaires and interviews at the ascertaining stage of the study, the position of students and teachers on the organization of the university's information and educational environment for high-quality professional training of specialists was clarified.

The survey conducted at the ascertaining stage of the study revealed difficulties in understanding the essence of the university's information and educational environment by teachers and the majority of students. In particular:

- 39% of students sometimes use the opportunities of the university's information and educational environment.
- 59% of teachers sometimes use the opportunities of the university's information and educational environment.

Such a percentage of low results is influenced by the following factors that were clarified in our study (Fig. 1):

- Insufficient awareness of students and teachers regarding their opportunities to use the university's information and educational environment (only 37% of teachers and 37% of students have a high level of awareness).
- Low level of ICT proficiency among students and teachers (teachers have a high level of ICT proficiency – 15%; average level – 59%, and students have a high level of ICT proficiency – 9%, and 50% have an average level of ICT proficiency).
- See significant shortcomings in the field of education, in particular, in information consulting (teachers – 43%, and students – 24%).
- Low satisfaction with the level of organization of the university's information and educational environment for high-quality professional training of specialists (teachers are only 31%, and students are 23%).

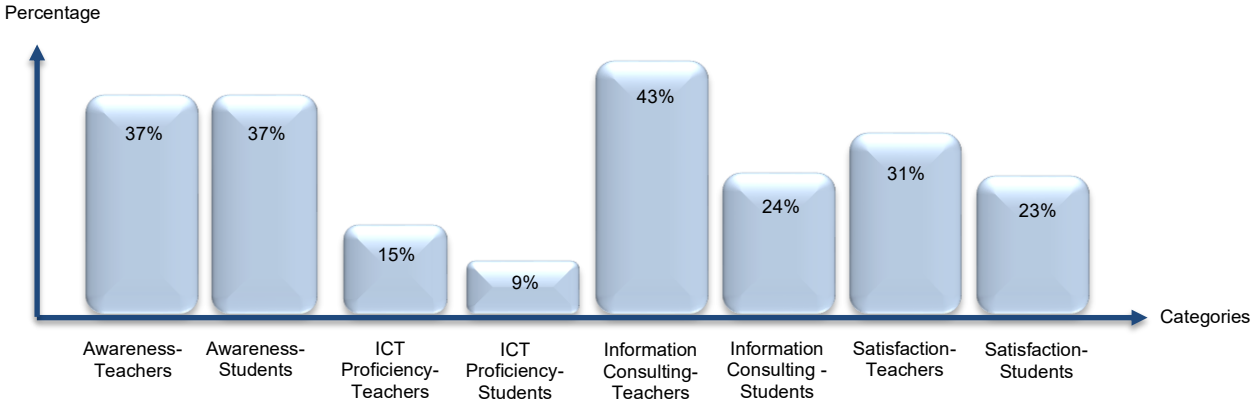

Fig. 1. Awareness and Proficiency Levels in University Environment.

Specific analysis tools: standardized self-assessment forms, assessment criteria developed by the authors by the pedagogical methodology, evaluation of components in points transformed into % for graphs

The vast majority of respondents surveyed are consumers of consulting services: *students*, 75%, and *teachers*, 46%.

Teachers, as a type of consulting, use the following for high-quality professional training of specialists the most: − training, 32%, as well as information, 28%, and comprehensive consulting, 28%.

Students use the most information, 34%, training and education, 30%, and comprehensive consulting, 26%.

A significant number of students and teachers do not properly use ICT in educational activities, because they are either not ready for full use, or are not sufficiently informed about the capabilities of the university's information and educational environment.

Qualitative analysis of the data from the ascertaining experiment shows that, on average, more than 60%, and this is the vast majority of students and teachers, did not demonstrate readiness to use the university's information and educational environment: they lack the proper level of skills, knowledge, abilities, and motivation.

During the ascertaining experiment, it was revealed that 32% of respondents showed a low level of satisfaction with the university's information and educational environment, and 35% of respondents showed a critical level of satisfaction with the university's information and educational environment, and only 12%

of respondents showed a high level of satisfaction with the capabilities of the university's information and educational environment.

The responses of students and teachers turned out to be valuable regarding the use of digital technologies in the educational process and ICT.

It should be noted that among students, the most used technologies are cloud technologies, multimedia, the Internet, and Web technologies.

In their pedagogical activities, teachers prefer cloud technologies, SMART technologies, multimedia, and Internet technologies.

The least used among respondents are: electronic document management, educational hubs, and hypertext technologies.

Having conducted an ascertaining experiment, we concluded that students and teachers are not ready to use the capabilities of the university's information and educational environment in their activities.

Therefore, we have identified the stages of organizing the university's information and educational environment for high-quality professional training of specialists:

1. ***Organizational stage*** – an analysis of experience and determination of the goal of the university's information and educational environment for high-quality professional training of specialists is carried out, which includes the level of student readiness, analysis of conditions and necessary resources, needs assessment, analysis of the technical support of the institution and its capabilities.
2. ***Activity stage*** – implementation of design and creation of the university's information and educational environment by the goals – selection of the content component, development of a model, technologies, strategy, software and material and technical support for the implementation of the environment, implementation of measures to create the university's information and educational environment.
3. ***Control stage*** – use of the finished product in the educational process – testing of the university's information and educational environment by the identification of weaknesses and strengths of its use.

Combining the results of the ascertaining experiment made it possible to formulate a set of necessary pedagogical conditions under which the components of the organization of the university's information and educational environment provide productive teaching, function in the best possible relationship for high-quality professional training of specialists and create an atmosphere of fruitful cooperation, contribute to the effective management of the higher education process, and also contribute to the quality provision of educational services.

We believe that the optimal organization of the university's information and educational environment is facilitated by the provision of the pedagogical conditions we have determined, which contribute to the removal of difficulties in the scientific area under study. The pedagogical conditions for organizing the university's information and educational environment for high-quality professional training of specialists include:

- Readiness of both students and teachers for advisory activities using modern ICT.
- Implementation of multidisciplinary and multi-channel online consulting, which implements the functions of the university's information and educational environment for high-quality professional training of specialists.
- Through ICT tools, creative and developmental subject-subject interaction, which initiates methodological reflection of students and teachers in advisory activities.

Analysis of the results of the formative experiment.

The entire period of the research and experimental work included the following stages: ascertaining, formative, and final.

The formative experiment was conducted during the 2023-2024 academic year. In the EG and CG formed during the research and experimental work, positive dynamics were observed in the levels of organization of the university's information and educational environment according to the criteria of readiness of subjects for interaction in the university's information and educational environment for high-quality professional training of specialists (motivational, activity and cognitive components), the level of satisfaction with the functioning of the university's information and educational environment.

Two statistical hypotheses were formulated by us in the study:

H0: The dynamics of the levels of organization of the information and educational environment in the experimental groups is not more significant than in the control groups.
H1: The dynamics of the levels of organization and information, and the educational environment of the university in the experimental groups, are more significant than in the control groups.

The capabilities of the Statistics package were used to perform the calculations. The empirical values obtained by the Pearson χ_{em}^2 criterion were compared with the tabular critical values χ_{cr}^2, which correspond to the levels of statistical significance adopted in the studies, depending on the number of factors being compared.

To assess the dynamics of the organization of the university's information and educational environment for high-quality professional training of specialists with a probability of error ρ of 0.05; 0.01; 0.001 units at all levels, χ_{cr}^2 is – 7.81; 11.3; 16.27.

Note that the hypothesis H1 was accepted in the case if $\chi_{em}^2 \geq \chi_{cr}^2$, and the hypothesis H0 is accepted – $\chi_{em}^2 < \chi_{cr}^2$.

Total sample: Students – 107, Teachers – 48, Total: 155 people. Groups: Experimental (EG), Control (CG).

The distribution was carried out randomly. The sample was checked for homogeneity. Statistical processing methods: packages: SPSS, MS Excel, statistics: Pearson χ^2, confidence level: 0.05, 0.01, 0.001

The study of the indicators of readiness of students and teachers for the organization of the university's information and educational environment for high-quality professional training of specialists for all components will be presented in the article.

Quantitative data analysis shows that the vast majority (on average, 60%) of students and teachers of the experimental group demonstrated, according to the results of the experiment, the advantage of high and sufficient levels of readiness to use the organization of the university's information and educational environment.

The greatest development, according to the results of the experiment, was achieved by (Fig. 2):

- ***Motivational component*** of readiness to organize the university's information and educational environment − 72% of EG teachers and 62% of EG students.
- ***Cognitive component*** of readiness to organize the university's information and educational environment − 62% of EG teachers, 59% of EG students.

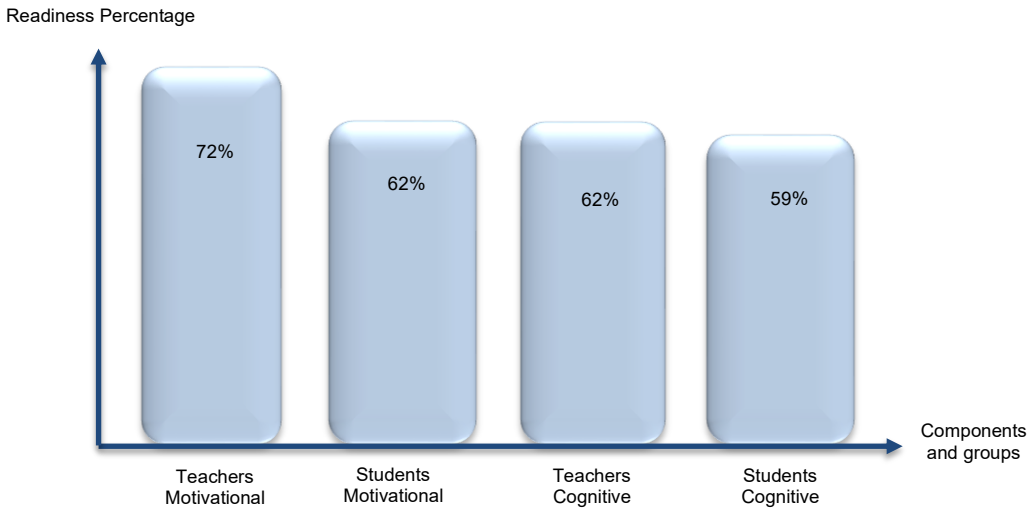

Fig. 2. Readiness to Organize University's Information Environment (EG).

Data collection methods: Questionnaires (questionnaires) – with a focus on self-assessment, awareness, skills; Interviews – to identify a deep understanding of ICT and barriers; Pedagogical experiment – based on control and experimental groups.

Readiness was assessed using the following criteria: awareness of the need for an ICT environment, knowledge and skills to use educational technologies, readiness to overcome difficulties associated with digitalization, and satisfaction with the functioning of the environment.

Changes are also observed in the control group, which are due to the activities of forced remote interaction and the methodological services of universities.

Comparing the data obtained by the criterion of students' readiness to interact in the university's information and educational environment with the indicators of the levels of organization of the university's information and educational environment, we, based on the results of the experiment, clarified the dynamics in its levels.

Thus, according to the results of the experiment, there were changes in the criterion of readiness among teachers and students of the control group, but their statistical significance is low.

Among the respondents of the experimental group, this dynamics is more pronounced (Fig. 3):

- 14% more teachers and students showed a high level of readiness for organizing the university's information and educational environment.
- 19% more teachers and students with a sufficient level indicator, due to a 33% decrease in teachers and students who showed an unsatisfactory and critical level at the beginning of the experiment. 1% was the probability of error.

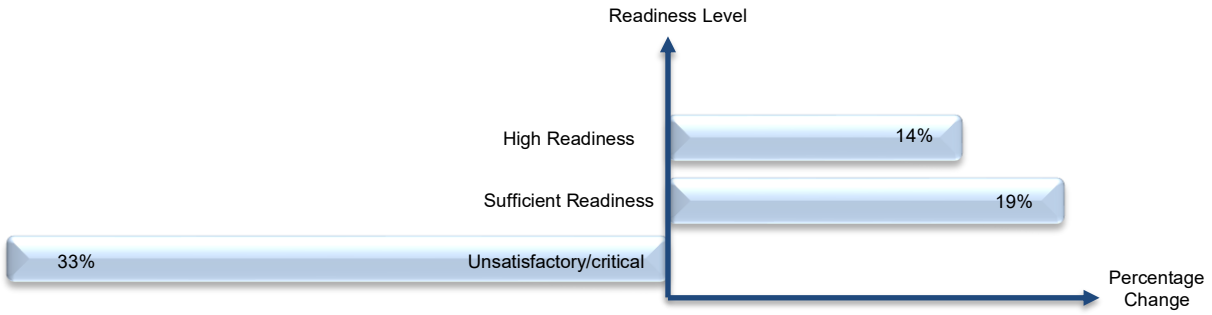

Fig. 3. Improvement in Readiness Levels (EG).

The graphs clearly show the transition from low and critical levels to high and sufficient in the experimental group. There is a decrease in the proportion of respondents with a critical level (-33%), and an increase with sufficient/high (+19%, +14%).

Within the framework of the experimental work, teachers and students had the opportunity to build their own educational trajectory, identify the level of activity and readiness for the use of ICT tools in education, and the opportunity to use a variety of tools of the university's information and educational environment to receive high-quality advisory support.

Qualitative, statistical, and quantitative analyses after the completion of the experimental work showed the tendency of respondents to positive changes in the levels of organization of the information and educational environment of the university, formed into an experimental group.

After the completion of the experimental work, statistically significant and positive changes were achieved in the levels of readiness of teachers and students to interact in the information and educational environment of the university, the advantages of high and sufficient levels in the motivational component (+34%), cognitive component (+24%) and activity component (+37%) (Fig. 4).

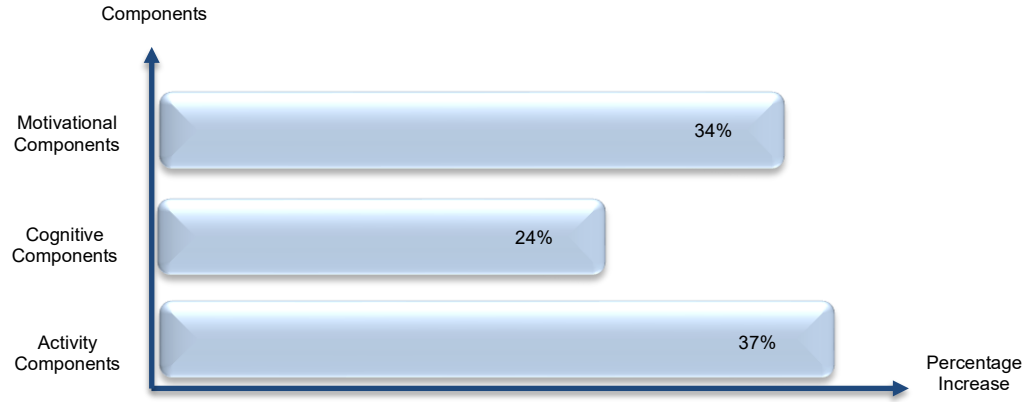

Fig. 4. Improvement in Readiness Levels by Components.

The main categories of variables that are reflected in the graphs are:

1. Motivational component – interest, desire to use ICT, positive attitude.
2. Cognitive component – level of knowledge, ICT competence.
3. Activity component – ability to use ICT in practice, application in real conditions.

Evaluation levels (in each component): high, sufficient, low, critical.

The graphs in the article reflect statistically reliable dynamics of increasing readiness for interaction with the information and educational environment, are based on a representative sample using reliable statistical methods, classify readiness according to three key components, and use meaningful, validated data collection and analysis tools.

So, comparing the results of the formative stage of the experiment and the ascertaining stage of the experiment, we determined that the pedagogical conditions developed by us are effective for organizing the information and educational environment of the university for high-quality professional training of specialists and increasing the level of provision of educational services.

As a result of the experiment to confirm the method of research on the organization of the information and educational environment of the university for the purpose of high-quality professional training of specialists, we developed and implemented in the work of educational institutions a comprehensive methodology for organizing the information and advisory environment and its didactic support, namely: means of direct and indirect pedagogical management of the process of phased involvement of teaching staff and students in information activities using ICT and tools in the form of methodological seminars, focus groups, training sessions, workshops, web conferences, blogs, sites and thematic groups in social networks; concepts for organizing an innovative environment, the structure of the institution's website and electronic document flow and information exchange in the field of providing information services; a package of methodological materials, including electronic forms, infographics, a system of case tasks; methods for monitoring the effectiveness of organizing the information environment, focused on the analysis of activity products, in particular: publications, projects, portfolios, thematic sites, thematic blogs, webquests.

Conclusions

The conducted research confirms that the effective organization of the university's information and educational environment is a systemic factor in improving the quality of professional training of future specialists. In the context of the digital transformation of education, the information environment is not only a technical and technological element of the educational process, but also acts as a comprehensive pedagogical system that integrates infrastructure, didactic, managerial, and communicative components.
Based on the conducted pedagogical experiment and statistical analysis, a positive dynamic of the development of students' and teachers' readiness to interact with the information and educational environment was revealed in three key components: motivational, cognitive, and activity. In particular, as a result of the targeted implementation of pedagogical conditions and the integration of ICT into the educational process, the respondents of the experimental group recorded an increase in high and sufficient levels of readiness: +34% in the motivational, +24% in the cognitive, and +37% in the activity components.

The results obtained confirm the research hypothesis about the statistically significant effectiveness of a holistic model of organizing the information and educational environment, which is based on: systematic use of digital educational resources (cloud services, multimedia platforms, knowledge visualization tools); creating conditions for pedagogical reflection and methodological support of participants in the educational process; developing individual educational trajectories through information personalization of learning.

At the same time, the results of the ascertaining stage of the study revealed a low initial readiness to use ICT among a significant part of teachers and students, which indicates the need for systematic digital pedagogical support, modernization of infrastructure, and increasing the digital competence of participants in the educational process.

Thus, the theoretical understanding of the problem and the practical results of the study allow us to formulate the conclusion that the information and educational environment should be designed as a dynamic, adaptive system aimed not only at the transmission of knowledge, but also at the formation of information culture, reflective and active position of future specialists.

The organization of such an environment requires: an interdisciplinary approach to the development of pedagogical strategies; technological flexibility and inclusiveness of the educational space; and institutional support for the innovative activities of teachers and students.

Limitations of the study.

The implementation of the pedagogical experiment was carried out in three stages during 2023-2024: preparatory, main, and final.

At the preparatory stage (2023), the goal and objectives of the study were determined, the experimental plan was developed, the methods of measurement and processing of results were determined, the control and experimental groups were selected, and their homogeneity was checked.

At the main stage (2023), the experiment was conducted.

At the final stage (2024), the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

Research relies heavily on the accuracy and reliability of data. The following digital data collection tools were useful in the study: MS Excel and SPSS (Statistical Package for Social Science) programs.

The total sample size in the article is 107 students, and 48 university teachers participated in the research stage.

The research was implemented by applying methods and various forms: multimedia technologies (projector, multimedia board, video and audio equipment), software that combine animation, graphic, text, video and sound data and information, their simultaneous use in the information space; mobile devices, personal computer, web-based resources that are freely available and free of charge (YouTube, author's website, specialized sites, social networks, cloud technologies, social network technologies), etc.

The limitations of this research allowed to have the following impact on the results: improving the qualitative characteristics of the material, optimally specifying goals and objectives, and increasing the effectiveness of the results.

Future research directions.

Further research can be aimed at studying the effectiveness of blended and adaptive forms of learning, the use of artificial intelligence to personalize educational trajectories, as well as the study of social and communicative aspects of interaction in the digital educational environment.

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