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Innovative technologies drive the modernization of higher education

Інноваційні технології - рушійна сила модернізації вищої освіти

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
Abstract


The article shows the need to modernize higher education and its entire system, which consists of improving the efficiency of the educational process in higher education through the implementation and design of innovative modern educational technologies. The main types of innovative approaches in the educational process of a higher school are disclosed. The classification of educational technologies according to the factor of psychological development, orientation on personal structures, according the nature of the content and structure, is considered. Methodological approaches that are important in the modernization of higher education through the introduction of innovative technologies are analyzed. Taking into account modern methodological approaches, it is shown that the content of innovative technologies should be determined using the basic principles discussed in the article. The research work was aimed at proving the need to modernize higher education and its entire system, which consists of improving the efficiency of the educational


Анотація


У статті показано необхідність модернізації вищої освіти та всієї її системи, яка полягає у підвищенні ефективності освітнього процесу у ЗВО шляхом впровадження та проектування інноваційних сучасних освітніх технологій. Розкрито основні типи інноваційних підходів у навчальному процесі вищої школи. Розглянуто класифікацію освітніх технологій за фактором психологічного розвитку, орієнтацією на особистісні структури, за характером змісту та структури. Проаналізовано методичні підходи, важливі в модернізації вищої освіти шляхом впровадження інноваційних технологій. З урахуванням сучасних методичних підходів показано, що зміст інноваційних технологій необхідно визначати з використанням основних принципів, розглянутих у статті. Висвітлено та показано важливість основних блоків інноваційних технологій, що впливають на освіту: (інформаційні технології, дистанційне навчання). Науково-дослідна робота була спрямована на доведення необхідності модернізації вищої освіти та всієї

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process in higher education through the implementation and design of innovative modern educational technologies. In conclusion, the study demonstrates that the modernization of higher education through the implementation of innovative educational technologies can improve the efficiency of the educational process and prepare students for the challenges of today's world.

Keywords: modernization of higher education, efficiency of the educational process, innovative technologies, information technologies, distance learning.

Introduction

The relevance of our article is also determined by the activation of the main product of the information revolution - information technologies, which revolutionize all spheres of human life. The field of education is no exception. Information technologies have introduced such an impulse of innovation into the education system, which can be considered as the main means of its innovative development.

Information revolution - reflects the revolutionary impact of information technologies on all spheres of society. This phenomenon integrates the effects of previous revolutionary inventions in the information field, as it creates a technological basis for overcoming any distances in the transmission of information, which contributes to the unification of intellectual abilities and spiritual forces of the individual.

Education has changed significantly under the influence of new challenges of modernity and has become one of the factors of radical change in social systems. The globalization of education is unfolding in the direction of forming a single "educational space" based on integrating national educational systems.

Challenges that higher educational institutions may face when implementing innovative technologies are a lack of resources, resistance to change, and the need to train teachers.

Modernization of higher education and its entire system consists of improving the efficiency of the educational process in higher education through the implementation and design of innovative modern educational technologies and systems (Dubaseniuk, 2004).

її системи, що полягає у підвищенні ефективності освітнього процесу у ЗВО шляхом впровадження та проектування інноваційних сучасних освітніх технологій. Дослідження демонструє, що модернізація вищої освіти шляхом впровадження інноваційних освітніх технологій може підвищити ефективність навчального процесу та підготувати студентів до викликів сучасного світу.

Ключові слова: модернізація вищої освіти, ефективність освітнього процесу, інноваційні технології, інформаційні технології, дистанційне навчання.

The main resource in the high-quality training of a modern specialist and his modernization are innovative technologies in the field of education. These technologies all over the world affect the quality of people's lives and condition the civilizational development of the individual.

The use of innovative technologies in education, the latest means of life affects and changes the nature of human existence. With the modern reform of education all over the world, in today's conditions, the main tasks in the education sector are the training of competitive, creative, educated individuals with developed competencies for high-quality professional activity and effective life activities (Pérez-delHoyo et al., 2020).

The constant and rapid development of the Internet and telecommunications technologies, their popularity and applicability in all spheres of life requires a rethinking of the place and role of a person in the educational process and affects changes in the educational environment, improving the content of education, which requires: constant modernization of education, mandatory use of innovative technologies in the educational space, rethinking the role of technology in education, the goals of education, changes in teaching methods and methods of teaching material, requires the dissemination of learned best practices, the purpose of which is to improve the quality of education in general (Senchenko et al., 2018). Effectiveness and efficiency are the main criteria for evaluating innovative technology and the entire innovative educational process (Navolokova, 2009).

Entry of Ukraine into the world and European educational space, and the integration processes taking place in it require increasing the competitiveness of specialists. This encourages

higher education institutions to innovate. The renewal of the modern system of higher education and pedagogical science determined the need for research on pedagogical innovation as a special branch of scientific knowledge. Intensive development and modernization of innovative processes in modern conditions fundamentally change the relationship to the possibility of managing such processes, since the existing spontaneity of these processes delays the development of practice.

Literature Review

The problem of innovative development of education and educational innovations is relevant because it causes wide public and scientific resonance. Innovative educational activity involves the development of the creative potential of teachers and concerns not only the creation and dissemination of novelty but also changes in the way of activity, and the thinking style of the participants of the educational process. The main characteristic of the innovative pedagogical activity of a higher educational institution is to increase the effectiveness of the educational process.

The development of innovative technologies as a pedagogical category is connected with the works of such scientists.

V. Brych & O. Borysiak (2017) justify the need for a mobile reorientation of the principles of competitive positioning of enterprises in the environment, which is connected with the affirmation of the global character of social processes in the educational sector. They show the need to introduce innovations in business processes based on quality education. They reveal the transformation of approaches to the role of a person in the enterprise and show the necessity of using innovative technologies for personnel education.

A. Kuchai (2013) analyzed the priority directions in education, revealed the content of a fundamentally new paradigm of education, in particular, emphasized the transition from the formation of a citizen of the country to a citizen of the world, a person whose morals and culture correspond to solving the world's problems, a democratic, open, educated, responsible person. It shows the need for education seekers to implement training with the use of innovative technologies, which ensure an increase in the level of creativity of specialists, promote the desire for self-improvement and self-development of future specialists, the desire for

search, research work, provide psychological support for the innovative pedagogical activity.

N. Navolokova (2009) characterized various innovative technologies in an accessible form, offered practical recommendations for their use, and presented modern approaches to the design of teaching aids. The author's definition of the concept of "pedagogical technology" is given, a classification is proposed and an analysis of known and effective innovative learning technologies is carried out. Practical recommendations on the use of innovative technologies are provided. Information on teaching techniques, methods, and forms is presented.

Hepp et al. (2015) researched the method of using augmented reality technology to improve modern society. The features of the innovative product and prospects for integration are highlighted, and the importance of the implementation of augmented reality technology is shown.

N. Machynska & Yu. Komarova (2015) revealed the content of innovative technologies and showed their features, emphasized their expediency, and proved the necessity of their implementation in higher education. An aspect characterization of innovative technologies in higher education was made: (information technologies, case technologies, etc.), their classification was presented, the stages of innovative technologies in higher education were analyzed, and the specifics and feasibility of their application were determined.

Summarizing the opinions of scientists, we note that the important tasks of the development of innovative education are: first, ensuring the innovative orientation of the education system based on large-scale computerization and activation of scientific, technical, and innovative activities of higher educational institutions, creating innovative structures in their system; reforming the education system taking into account the requirements of European standards and preserving cultural and intellectual national traditions.

Secondly, increasing the effectiveness of the university sector of scientific research and development to strengthen its role in ensuring innovative development of the national economy. Modern high technologies depend on the level of scientific research, efficiency, and effectiveness of their implementation production. Of course, the quality of scientific

and technological developments depends on the qualifications of scientists and engineers, and they, in turn, are the total effect of this education system, especially higher education.

Thirdly, ensuring the expanded reproduction of knowledge based on the integration of higher educational institutions, academic and industry institutions by increasing the level of funding of the public sector of scientific research and development; concentration of resources on priority areas of development of science and technology and innovative activity; stimulating lifelong learning, fostering a culture of innovative thinking.

After analyzing the literary sources, it was found that the scientists presented a classification of innovative technologies, the definitions of the researched problem were grouped: "innovative technologies", "pedagogical technology", "educational technology", "teaching technologies", the role of the introduction of innovative technologies in education was shown, the methodology was investigated using augmented reality technology.

To achieve the innovativeness of the educational process, we set ourselves the task of revealing the main types of innovative approaches in the educational process of a higher school; to single out the main components of the modernization of higher education through the introduction of innovative technologies; to consider the classification of educational technologies according to the factor of psychological development, according to the orientation of personal structures, according to the nature of the content and structure; to reveal innovative teaching methods and technologies. Therefore, the research work is aimed at proving the need to modernize higher education and its entire system, which consists of improving the efficiency of the educational process in higher education through the implementation and design of innovative modern educational technologies.

The purpose of the article: is to show the need to modernize higher education and its entire system, which consists of improving the efficiency of the educational process in higher education through the implementation and design of innovative modern educational technologies.

Methodology

The study is based on the premise that the high-quality training of specialists in higher education institutions requires the modernization of higher

education by introducing innovative technologies, determining the content of training, and organizational structure, taking into account the trends of modern innovative education, the development of innovations in the field of education, promoting the formation of competence in a professional career at under the conditions of modernization changes in universities, European integration educational processes, integrated educational process of training specialists in institutions of higher education for adaptation to the labor market and successful professional activity.

The following methods were used in our study: analysis of philosophical, psychological, pedagogical, and scientific sources on the problem of modernization of higher education through the introduction of innovative technologies; showing the experience of organizing the training of specialists on the path of European integration, the origins, and development of innovative technologies to identify the state of development of the problem of modernization of higher education through the introduction of innovative technologies; a comparative analysis of the development of the problem of modernization of higher education through the introduction of innovative technologies and the introduction of industry innovations into the educational process of training specialists in universities; analysis of scientific publications on the development of the problem of modernization of higher education through the introduction of innovative technologies and practices, to generalize the identified trends of promoting the development of the problem of modernization of higher education through the introduction of innovative technologies in the training of specialists in universities; scientific and pedagogical experience of researchers to compare scientific and methodological support for determining the state of implementation of innovative technologies. Pedagogical observation, conducting problem-based learning through the introduction of innovative technologies.

We conducted an experimental study. The first stage of the experiment involved the formation of the student's information culture, which is an indicator of the modernization of higher education, which is the basis of the following stages.

In the second stage of the experiment, students mastered the system of theoretical knowledge about future professional activity and mastered the methodology of scientific knowledge. At the

same time, we observe the development of students' abilities, the formation of their need for independent activity, and their orientation toward the use of innovative technologies in professional activities.

The third stage of the experiment was aimed at the formation and improvement of the knowledge system, and the development of practical skills in the use of theoretical knowledge accumulated in the previous stages. At this stage, theoretical and practical training of students is integrated.

A control and an experimental group of students were created. In the control group, the process of studying the "Informatics" course took place within the framework of traditional education. In the experimental groups, the influence of the formation of each component of the student's information culture, which is an indicator of the modernization of higher education, was tested.

The analysis of the obtained data made it possible to formulate some regularities in the dynamics of the levels of formation of the information culture of students, which is an indicator of the modernization of higher education, after studying the computer science course: the transition from a low level in the experimental groups increased by a total of 25.6% compared to 14.8% in the control ones (with traditional education); the transition to a high level increased by an average of 7.4% in experimental groups versus 3% in control groups; a slight increase in the average level of formation of the student's information culture, which indicates the modernization of higher education and the ways and possibilities of introducing innovative modern educational technologies, as well as the estimated efficiency ratio of experimental groups compared to control groups.

At all stages of the experimental work, there was an uneven, but fairly steady growth in the level of formation of students' information culture, especially at the second and third stages of the experimental study.

Therefore, the proposed step-by-step technology of forming the information culture of students and the ways and possibilities of their implementation of innovative modern educational technologies is effective.

The obtained results and their analysis make it possible to form certain ideas that the purposeful formation of information culture of students, renewal of ways and possibilities of introducing

innovative modern educational technologies into them, formation of information culture and professional competencies of students contributes to the fact that the modernization of higher education through the introduction of innovative technologies in under the conditions of the information society is moving to a higher, new level of its evolutionary development.

Results and Discussion

The significance of the development of education, innovative processes of the development of the educational space, the state, and the entire society at the current stage of human existence plays an important and determining role in the modernization of higher education through the introduction of innovative technologies, since the main thing in modern production is knowledge and information. In our time, such terms as innovative activity, innovations, innovative products, and innovative products have become important in society.

In the educational process at the higher school, two main types of innovative approaches are distinguished, taking into account the scientific achievements of foreign modern pedagogy (Vitanova, 2016).

The first type of innovative approach includes innovations-modernizations that modernize the educational process and contribute to the achievement of guaranteed results within its traditional reproductive orientation.

The second innovative approach to education includes innovations-transformations that provide an opportunity to ensure the modernization of higher education through the introduction of innovative technologies, qualitative renewal of the educational process, directing the orientation of educational and cognitive search activity, and ensuring its research character (Dubaseniuk, 2004).

Since today requires global modernization of higher education through the introduction of innovative technologies, these are not just any innovations, but those that significantly increase the effectiveness of educational activities, and with this approach, the use of innovative technologies in education is the basis for increasing the efficiency and quality of the education process in higher school (Machynska & Komarova, 2015).

The main components of the modernization of higher education through the introduction of innovative technologies are (Furman, 1995):

- pedagogical neology, which is the theory of creation and application of innovations in the education system;
- methodology of perception, interpretation in the sociology of the new, assessment in education, management, pedagogy, and psychology;
- technology and practical application of innovative educational technologies.

These components form the essence of innovation.

According to the nature of the content and structure: educational and educational, religious and secular, professional and general educational, technocratic and humanitarian, branch, subject, mono-technological, penetrating, and complex technologies (Dubaseniuk, 2004).

V. Kovalchuk considers such innovative teaching methods and technologies to be the most important in higher education (Kovalchuk & Fedotenko, 2018): Information Technology; communication technologies; games; problem-based learning; coaching; case study; experiential learning; contextual learning; individual training; interdisciplinary training; training; independent activity; project activity; anticipatory activity.

After analyzing scientific research, we classify innovative technologies in education by groups.

Digital technologies. The modernization of higher education through the introduction of innovative technologies is aimed at an integrated process of informatics with various subject areas, which leads to the improvement of the educational field, ensures the digitalization of the consciousness of the students of education, and allows them to understand the processes of digitalization in modern society, leads to professional growth.

Personal-oriented technologies. Personal-oriented technologies place the personality of the student at the center of the educational system and contribute to providing the student with conflict-free conditions, the realization of his natural potential, comfortable educational conditions, safe learning conditions, and development. Personal-oriented technologies are not a means of achieving any abstract goal, but the goal of the educational system and contribute to the development of individual educational programs by students according to their needs and capabilities.

Monitoring of intellectual development. When modernizing higher education through the introduction of innovative technologies, the diagnosis of the quality of the educational space, and the analysis of the education of each student is necessary for the construction of graphs of the dynamics of success and is carried out by testing (Lin et al., 2023).

Educational technologies. It is an integral factor in the modernization of higher education through the introduction of innovative technologies in modern learning conditions. Education seekers receive the opportunity of education in the form of their involvement in additional forms of personality development: participation in student self-government, mass cultural events, etc.

Didactic technologies. Through the introduction of innovative technologies during the modernization of higher education, didactic technologies, both already known and new and proven methods, can be implemented. These are games, independent work, protection of completed projects, the "consultant" system, learning with the help of audio-visual technical means, the "small group" system – group, differentiated methods of education, etc. In practical application, there are various combinations of innovative methods (Pérez-delHoyo et al., 2020).

When modernizing higher education through the introduction of innovative technologies, modern methodological approaches are taken into account (synergistic, competence-based, informational, systemic, acmeological, personal-activity, cultural, algorithmic, etc.).

Taking into account modern methodological approaches, the content of innovative technologies should be determined with the help of principles. Let's consider the main principles.

The principle of conformity to nature takes into account the laws of natural personality development and provides during the modernization of higher education through the introduction of innovative technologies: the development of the student's potential, inherited from parents and nature – spiritual, physical, social, mental; psychological-pedagogical individual assistance to students in realizing basic needs for self-actualization, security, self-realization, etc., without which the natural sense of personal dignity and independence cannot be realized.

It is not possible to create conditions for the free use of the emotional, social, physical, and intellectual, opportunities and abilities provided by heredity, which are inherent to a certain individual.

The principle of scientificity requires that the processes of educational cognition exist based on methods, principles, and means of science, and experimental activity is based on them (Moiseyuk, 2007).

The principle of an individual and differentiated approach through the introduction of innovative technologies enables a harmonious combination and mutual complementation of collective and individual forms of education with an individual and personal orientation to education, contributing to the determination of the individual trajectory of personality development (Marusynets et al., 2022). The principle of an individual and differentiated approach is related to the choice of methods of mastering the content of educational programs, and the level and adaptation of education seekers to information and computer technologies in the educational process (Chaika, 2011).

The principle of connection between theory and practice. Theoretical knowledge in the introduction of innovative technologies is the basis of productive learning – an intellectually rich, creative high-tech educational space (Sovhira et al., 2023). The principle of connection between theory and practice requires the study of modern theories of science, prospects for the development of education, combining theoretical material with situations and examples from real life. The acquired knowledge should be integral, reflected in the content of the innovative material, and not fragmented into theories, ideas, or facts (Chaika, 2011). The main role should be played by scientific theories in the design of the educational process, not practice. A scientific theory must be built based on the experience gained by the students, developing it so that it does not become abstract (Khymynets, 2009).

The principles through the introduction of innovative technologies form a system where, along with the analyzed principles, the generally accepted principles of systematicity and consistency are implemented; visibility; unity of education and upbringing; multiculturalism; consciousness, activity, and independence; thoroughness; availability; emotionality, etc. Orientation of education through the introduction of innovative technologies on the systematic implementation of principles ensures the

humanistic orientation of the educational space, and the achievement of educational, educational, and developmental goals (Ortega Navas, 2011).

The purpose of our research work was to prove the need to modernize higher education and its entire system, which consists of improving the efficiency of the educational process in higher education through the implementation and design of innovative modern educational technologies.

The research was conducted by introducing two types of innovative approaches to the educational process. The first type of innovative approach includes modernization innovations that modernize the educational process and contribute to the achievement of guaranteed results within its traditional reproductive orientation.

The second innovative approach to education includes innovations-transformations that provide an opportunity to ensure the modernization of higher education through the introduction of innovative technologies, qualitative renewal of the educational process, directing the orientation of educational and cognitive search activity, and ensuring its research character.

In the course of research and experimental work, we analyzed ways to modernize higher education and its entire system; the main types of innovative approaches in the educational process of the higher school are disclosed; the main components of the modernization of higher education through the introduction of innovative technologies are singled out; the classification of educational technologies by the factor of psychological development, by orientation to personal structures, by the nature of the content and structure is considered; innovative teaching methods and technologies are disclosed; the classification of innovative technologies in education by groups is shown. For this, we used a complex methodology, which includes a set of methods that ensure the reliability of the results of the formative stage of the experiment: observation; survey; testing; computer diagnostics; conversation; solving practical problems; performance of individual tasks; analysis of the results of activities (computer classes, results of solving tasks, essays, and others).

To obtain reasonable and reliable results of the experiment, we had to choose criteria for evaluating the results of the experiment, determine the size of the sample, and prove its representativeness.

We used the ratio method as a criterion for evaluating the results of the experiment. The essence of this method is that when processing and analyzing the results of the experiment, we used a quantitative assessment of the formation of each of the components of the student's information culture, which is an indicator of the modernization of higher education and, in general, this personal culture as a whole by groups. At the same time, the level of formation of the student's information culture, which is an indicator of the modernization of higher education, was determined by the percentage ratio of students who were at each level of formation at the beginning of the experiment and during the experimental work.

Table 1.

Comparative data of students of experimental and control groups before the beginning of the formative stage of the experiment (in % of the total number)

Group	Number of students persons	Progress %	Ability to use innovative modern educational technologies						Formed algorithmic thinking					
			high		average		low		high		average		low	
			persons	%	persons	%	persons	%	persons	%	persons	%	persons	%
Experimental	76	54,3	3	3,9	17	22,4	56	73,7	6	7,9	21	27,6	49	64,5
Control	75	55,1	5	6,7	16	21,3	54	72	4	5,3	19	25,3	52	69,4

Having determined at the ascertaining stage of our research the levels of formation of students' information culture and the ways and possibilities of introducing innovative modern educational technologies, we concluded the need to make some changes to the educational process to improve the training of future specialists.

Thus, the goal of our further work is the improvement of innovative modern educational technologies and the step-by-step formation of the student's information culture, as well as the verification of these technologies in practice. To achieve the innovativeness of the educational process, we revealed the main types of innovative approaches in the educational process of the higher school; the main components of the modernization of higher education through the introduction of innovative technologies are singled out; the classification of educational technologies by the factor of psychological development, by orientation to personal structures, by the nature of the content and structure is considered; innovative teaching

Table 1 presents the results of diagnostic "slices" of the initial state of some indicators of the formed information culture of students, which is an indicator of the modernization of higher education, which was conducted before the start of the formative experiment.

The comparative analysis of the obtained results shows that there are no significant differences in the experimental and control groups according to the selected indicators before the formative experiment. This gives us the right, with a high degree of reliability, to consider the sample of the control group to be identical to the sample of the experimental group at the corresponding stage of the experiment.

methods and technologies are revealed.

The following were chosen as starting positions:

- the technology of step-by-step formation of students' information culture should be acceptable for all specialties;
- formation of the information culture of students should be carried out continuously and subsequently during their professional training.

Thus, students of various specialties and each course of study should be included in research and experimental work, and at the same time, it is necessary to take into account the content of general education and professional disciplines, research, and independent work of students.

The formative stage was conditionally divided into three main stages, for each of which control "slices" were carried out, determining changes in the levels of formation of the information culture of higher education seekers, which is an indicator

of the modernization of higher education. The data of the control sections were compared with the results of the ascertaining experiment, i.e. with the results of the "initial section".

The first stage of the formative experiment coincided with the first year of study at a higher education institution and was decided within the framework of the "Informatics" course, which created the prerequisites for the formation of a student's information culture, which is an indicator of the modernization of higher education, being the basis of the following stages.

At the second stage of the formative experiment, during the study of general education and special disciplines, students mastered the system of theoretical knowledge about future professional activity and mastered the methodology of scientific knowledge. At the same time, we observe the development of students' abilities, the formation of their need for independent activities, and their orientation toward the use of innovative technologies in professional activities.

The third stage of the formative experiment was aimed at the formation and improvement of the knowledge system, and the development of practical skills in the use of theoretical knowledge accumulated in the previous stages. At this stage, the theoretical and practical training of students is integrated. The most important element of this stage is production practice, which affects the success of the formation of professional competencies, since knowledge and skills are practically realized, and even awareness of the peculiarities of professional activity.

The groups were approximately equal in terms of the level of success, the formation of cognitive motivation, and readiness to independently perform educational tasks. In the control group, the process of studying the "Informatics" course took place within the framework of traditional education. In the experimental groups, the influence of the formation of each component of the student's information culture, which is an indicator of the modernization of higher education, was checked.

To eliminate the randomness of the results and track the dynamics of transitions from level to level and the degree of formation of the information culture of students and to identify ways and opportunities for the introduction of innovative modern educational technologies,

during the first stage of the formative experiment, in addition to the initial diagnostic section, we conducted two additional sections based on the results of mastering some innovative computer technologies.

The analysis of the data allowed us to formulate some regularities in the dynamics of the levels of formation of students' information culture, which is an indicator of the modernization of higher education, after studying the computer science course:

- the transition from a low level in the experimental groups increased by a total of 25.6% against 14.8% in the control groups (with traditional training);
- the transition to a high level increased on average by 7.4% in the experimental groups against 3% in the control groups;
- a slight increase in the average level of formation of the student's information culture, which indicates the modernization of higher education and the ways and possibilities of introducing innovative modern educational technologies, as well as the calculated coefficient of effectiveness of experimental groups compared to control groups.

Thus, during the first stage of the formative experiment, we observed an uneven, but rather stable growth in the levels of formation of students' information culture.

Therefore, after the first stage of the formative experiment, only minor changes are observed in the levels of the formed information culture of students and the ways and possibilities of introducing innovative modern educational technologies, therefore, the continuation of purposeful work on its formation is necessary.

The next two sections – one intermediate, and one final section – we conducted at the end of the next stage of research and experimental work. They were characterized by the fact that there was a combination of theoretical and practical training of students. Students go through practice, during which the peculiarities of professional activity are revealed and realized, and the student self-assesses the level of his professional training (Senchenko et al., 2018).

The result of the final stage of the formative experiment is further significant changes in the levels of formation of students' information culture and the ways and possibilities of introducing innovative modern educational

technologies. The results of diagnostics after the final stage of the formative experiment show that the number of students with low and medium levels of formation of information culture continues to decrease, but at the same time, the number of students with a high level is increasing significantly. Thus, this final stage of the formative experiment is necessary and effective, since at its end there remains a small percentage of students with a low level of formation of information culture, and the ways and possibilities of introducing innovative modern educational technologies in the professional training of students have been clarified. The number of students with medium and high levels

of formation of information culture, which is an indicator of the modernization of higher education, is growing significantly.

Thus, during all stages of research and experimental work, we observed a not always uniform, but rather steady growth in the level of formation of the information culture of students, which means the ways and opportunities of introducing innovative modern educational technologies, that is, the indicators of information culture decrease at a low and medium level, and increase at a high level, especially at the second and third stages of experimental research (Fig. 1).

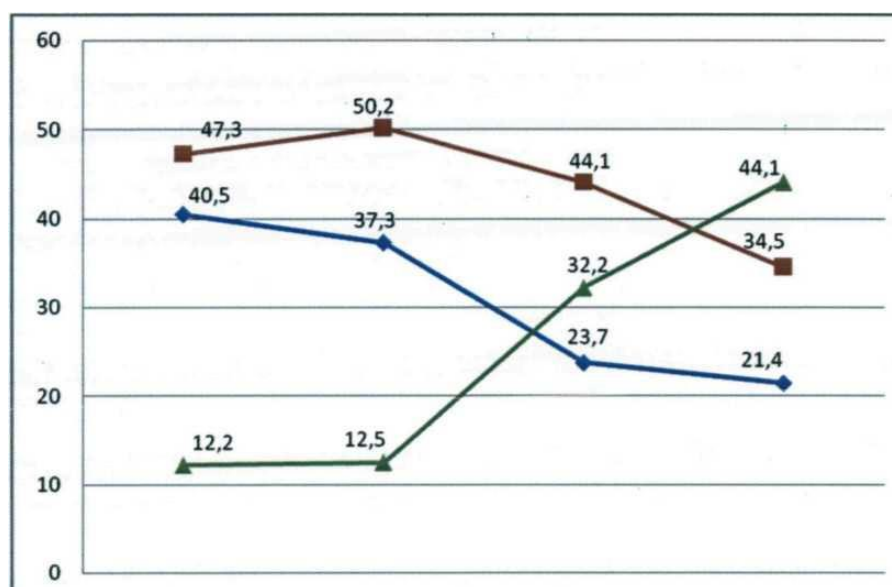


Figure 1. Dynamics of changes in the levels of formation of information culture of students and ways and possibilities of introducing innovative modern educational technologies.

Source: The source was compiled by the author based on the analysis of experimental data

Summing up some conclusions, we state that during all stages of experimental work, we observed an uneven, but rather steady growth in the level of formation of students' information culture, especially in the second and third stages of experimental research.

Therefore, the proposed step-by-step technology of forming the information culture of students and the ways and possibilities of their introduction of innovative modern educational technologies is effective.

At all stages of research and experimental work, special attention was paid to the independent work of students. Tasks for students' independent work were special and were aimed at forming the information culture of students and the ways and

possibilities of their introduction of innovative modern educational technologies.

The obtained results and their analysis allow us to make some ideas about the fact that the purposeful formation of students' information culture, the renewal of ways and opportunities for their introduction of innovative modern educational technologies, the formation of information culture and professional competencies of students is facilitated by the fact that the modernization of higher education through the introduction of innovative technologies in the conditions information society is moving to a higher, new level of its evolutionary development.

So, we can conclude that the step-by-step research-experimental work proposed and tested

by us is effective and can become the basis for its implementation in the educational process of higher education institutions.

Conclusions

The need to modernize higher education and its entire system is shown; the main types of innovative approaches in the educational process of the higher school are disclosed; the main components of the modernization of higher education through the introduction of innovative technologies are singled out; the classification of educational technologies by the factor of psychological development, by orientation to personal structures, by the nature of the content and structure is considered; innovative teaching methods and technologies are disclosed; the classification of innovative technologies in education by groups is shown.

Methodological approaches that are important in the modernization of higher education through the introduction of innovative technologies are analyzed. The importance of the main blocks of innovative technologies that affect education is highlighted and shown. Taking into account modern methodological approaches, it is shown that the content of innovative technologies should be determined using the basic principles discussed in the article.

The obtained results and their analysis allow us to make some ideas about the fact that the purposeful formation of students' information culture, the renewal of ways and opportunities for their introduction of innovative modern educational technologies, the formation of information culture and professional competencies of students is facilitated by the fact that the modernization of higher education through the introduction of innovative technologies in the conditions information society is moving to a higher, new level of its evolutionary development.

Further research will reveal the main types of innovative approaches in the educational process of a higher school.

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