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Teaching students in high school using multimedia technologies

Навчання студентів у вищій школі засобами мультимедійних технологій

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Abstract

The peculiarities of the training of specialists in higher education using multimedia technologies are clarified and their importance and necessity for modern education are shown. Based on the recorded didactic and technical pedagogical capabilities of multimedia, we will identify potential functions that can be differentially implemented in the educational space. Manipulation, deformation, contamination, toning of images, discrete presentation of audiovisual information is considered; fixation of a selected part of visual information for movement, its further examination "under a magnifying glass", demonstration of processes and events in the real-time, multi-window presentation of audiovisual information, which intensify the educational process and strengthen the motivational effect in the educational field. Research and experimental work were carried out, which made it possible to find out the peculiarities of the training of specialists in higher education using multimedia technologies

Анотація

З'ясовано особливості підготовки фахівців у вищій школі засобами мультимедійних технологій та показано їх важливість та необхідність для сучасної освіти. На підставі зафіксованих дидактичних і технічно-педагогічних можливостей мультимедіа виокремлено потенційні функції, які можуть бути диференційовано реалізовані в освітньому просторі. Розглянуто маніпулювання, деформація, контанімація, тонування зображень, дискретне подання аудіовізуальної інформації; фіксація вибраної частини візуальної інформації для переміщення, її подальшого розгляду «під лупою», демонстрація процесів і подій у реальному часі, багатовіконне представлення аудіовізуальної інформації, що інтенсифікують освітній процес й посилюють мотиваційну дію до освітньої галузі. Проведено дослідно-експериментальну роботу, яка дала можливість з'ясувати особливості підготовки фахівців у вищій школі засобами мультимедійних технологій та

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and to prove their importance and necessity for modern education. We have reasonably identified the stages that are important for the educational space for the qualitative application of knowledge and skills in the training of specialists; advantages of the introduction of multimedia technologies; various aspects of the use of computer software multimedia tools in the process of professional training of a specialist are named.

Keywords: training of students, improving the quality of specialist training, multimedia technologies, higher education, higher education institutions.

Introduction

The problem of using multimedia technologies in higher educational institutions occupies an important place in the training of modern specialists with a high level of knowledge, practical skills and professional skills. This is due to the fact that students' acquisition of skills in the use of modern multimedia technologies is an integral component of their studies in higher educational institutions in order to conduct classes on subjects at a high professional level. Improving the quality of training of future technical specialists, ensuring their practical orientation in order to increase the level of competitiveness of Ukrainian graduates on the world labor market requires the improvement of the organizational and educational process in higher educational institutions of a technical profile (Potapchuk, 2018).

As you know, multimedia technologies are constantly improving, becoming more saturated, unified, flexible and productive. They are aimed at various needs of society. The use of multimedia technologies in the educational process ensures both visual and auditory perception of the material, active participation of students in classes, and return to topics that require additional processing.

The main condition that determines the successful functioning of the educational system is the active interaction of the participants of the educational process in the modern information environment, which is characterized by the rapid development of the latest information and telecommunication technologies, information systems, and the appearance of various software products.

So, the result of professional training of future teachers is the readiness to use multimedia

довести їх важливість та необхідність для сучасної освіти. Обґрунтовано виокремлені нами етапи, що важливі для освітнього простору з метою якісного застосування знань і вмінь при підготовці фахівців; переваги впровадження мультимедійних технологій; названо різні аспекти використання комп'ютерних програмних мультимедійних засобів у процесі фахової підготовки спеціаліста.

Ключові слова: підготовка студентів, підвищення якості підготовки спеціалістів, мультимедійні технології, вища освіта, заклади вищої освіти.

educational systems in professional activities, which is determined by the actual problem of pedagogical science and practice (Markus, 2021).

The outlined trends caused a number of changes in the education system, not only in the methodology, structure, technology of the learning process, but also in its strategic orientation. Currently, the development of scientific approaches to the use of the pedagogical potential of multimedia tools for the purpose of developing the student's creative personality, forming his ability to alternative thinking, which contributes to the improvement of the quality of education, is being updated.

As a result, in the article we revealed: the main areas of practical use of multimedia technologies in education; potential functions that can be differentially implemented in the educational space; modern innovative means of processing multimedia audiovisual information, which intensifies the educational process and strengthens the motivational effect in the field of education, especially higher education; stages characteristic of the educational space for the qualitative application of knowledge and skills in the training of specialists; advantages of the introduction of multimedia technologies, which contribute to the improvement of the quality of training of specialists; factors of working with a multimedia program; features of multimedia technologies; the main functions performed by multimedia technologies in the educational process.

Literature review

In the education of Ukraine, theoretical and practical aspects of multimedia learning

technologies are being developed, as evidenced by numerous studies on the informatization of higher education and the introduction of multimedia technologies in the process of professional training of specialists of various profiles. Such scientists as: R. Horbatiuk et al., (2022) substantiated the meaning of the concept of "professionalism", showed different meanings of the concept, and derived the actual concept. The technology of forming professionalism is substantiated; directions and ways of formation of professionalism in future specialists using multimedia technologies were investigated. The technology of forming professionalism with the use of multimedia technologies was developed and implemented in stages for students of higher education.

The problem of the introduction of ICT into the educational process of educational institutions is highlighted in scientific works: L. Shevchenko (2016) in the process of technological preparation analyzed the peculiarities of using multimedia tools. I. Markus (2021), the process of formation of professional competence of future specialists was considered using multimedia technologies.

A description of the practical experience of using multimedia tools can be found in the works Marta-Lazo, Gabelas-Barroso, Nogales-Bocio & Badillo-Mendoza (2022). They emphasize that the last decade, several activities have been carried out that have aimed to implement, in various undergraduate and graduate courses, learning from a holistic perspective using a multimedia dimension. Castro-Alonso, Wong, Adesope & Paas (2021) conducted a meta-analysis to test hypotheses from diverse theories predicting the effects of these agents' characteristics. We tested predictions of cognitive load theory, cognitive theory of multimedia learning, computers are social actors, social agency theory, uncanny valley, and the action observation network. They conclude that multimedia pedagogical agents help learning through multimedia, and that students may be able to learn similarly from different types of agents.

The problem of new multimedia resources versus traditional notes was considered by Halpern, Piña & Ortega-Gunckel (2020). With the increasing adoption of information and communication technologies among youngsters, it has become common for high school students to incorporate the use of multiple devices and digital platforms in their study habits. Although these digital resources support and motivate them to learn,

these are also a source of continuous distraction. This research analyzes the impact of studying with handwritten notes, WhatsApp, YouTube and searching the Internet in academic performance, through a mixed method. M. Fan (2021) considered the meaning of the concept of "multimedia" and clarified the content of multimedia technologies in higher education. Types of multimedia courses are shown in the training of music specialists: multimedia lectures, video lectures, and analog educational publications. It has been proven that the introduction of multimedia technologies into the educational process contributes to the innovative training of music specialists and their quality improvement.

The analysis of scientific literature and dissertation studies showed that in the works reviewed above, the following issues are poorly researched: 1) improving the qualifications of pedagogical workers for the use of multimedia technologies in professional activities; 2) aspects of the introduction of multimedia technologies in higher education; 3) the use of multimedia technologies by pedagogical workers to form the social competence of students; 4) increasing the level of competence of pedagogical workers in the use of multimedia technologies in the formation of social competence.

We believe that these issues are relevant and require specially organized scientific research.

Despite the large number of scientific studies using multimedia technologies in the field of education, the question is not exhaustive. The relevance of this study is due to the fact that multimedia technologies make it possible to actively use computers, programs and a wide variety of modern technologies in the learning process.

Goal: to find out the specifics of training specialists in higher education using multimedia technologies and to show their importance and necessity for modern education.

Methodology

The research methodology is scientific methods were used: theoretical (analysis of sociological, philosophical, historical, psychological, and pedagogical, literature), to substantiate the initial provisions of our research; empirical (analysis of activity results, observations) to clarify innovative approaches for training future specialists and identify the level of the educational process in higher education;

interpretative and analytical method, based on which scientific sources were studied using analysis, synthesis, generalization, and systematization; the method of comparative and historical analysis, which made it possible to identify trends in the development of education at different historical stages; concrete scientific methods (generalization and analysis of foreign modern approaches to the organization of professional training of specialists): comparative-semantic-terminological; historical analysis; search; statistical.

The research was carried out taking into account the results of comparative, pedagogical, and pedeutological studies, based on anticipatory and interdisciplinary approaches aimed at understanding the problems of the specialist and a holistic vision of the problem of education. Therefore, we substantiated the conceptual foundations of the research at the methodological and theoretical levels.

The methodological level is based on the following approaches: the synergistic approach ensures the development of personality and contributes to the enrichment of the educational process with dialogue methods and means of educational and pedagogical interaction; the anticipatory approach promotes the orientation of future specialists to innovative professional activity, ensures the fundamentalization of the training of future specialists; the system approach ensures the interconnection and interdependence of all components of education, as a result of which human education is a system; the cultural approach directs the educational process to take into account the historical traditions of its people, and its culture; the partnership approach contributes to increasing the effectiveness of educational activities, providing practical professional training, and enriching the content of education and the methodology of pedagogical practice; the technological approach provides an opportunity for high-quality practical training of specialists in universities and makes it possible to ensure the effectiveness of theoretical training of specialists.

We conducted an experimental work, in which we used various aspects of computer program multimedia tools in the process of professional training of the future specialist and were organized in the following forms of work during our experimental research, we considered multimedia means to be a set of different learning technologies, software, and hardware, graphic images, music and video, texts, and equipment,

in the process of using the skills and abilities of the students of education are improved, and new knowledge is acquired.

The category of tasks that needed to be solved using multimedia technologies had good results before the experiment, but after the experiment, they rose to a higher level. Tasks whose solutions required knowledge of multimedia technologies were solved before the experiment in the CG by 4.5% of students, and in the EG by 4.1%. After the experiment, the percentage of people able to use multimedia technologies in the CG increased by 15.4%, and in the EG by 60.3%. As for the category where it is necessary to make decisions using professional multimedia programs, there was a zero result before the experiment, since the students had no idea about the use of multimedia technology programs before the experiment since they had not been studied at all. After teaching the developed materials, the percentage of those able to solve professional problems using professional programs in the CG increased by 5.9%, and in the EG by 32%, which indicates good results.

The goal and result of training future specialists to use multimedia technologies is their readiness for this type of activity. In this regard, at the formative stage, the next step of the experiment was to carry out statistical "measurements" (zero cuts) of the levels of the studied type of readiness among students in the control and experimental groups to become competitive in professional activities with the ability to use multimedia technologies.

Results and discussion

In the system of higher education, multimedia teaching aids cannot replace the teacher or partially fulfill the role of a teacher. Still, their use in the educational process of a higher school will contribute to the improvement of the activity of the teacher, increase the quality of training of future specialists, and the efficiency of the entire educational process (Potapchuk, 2018).

Institutions of higher education face the task of training a professional with flexible thinking, a well-rounded personality, capable of successfully performing a variety of professional tasks, and ready to independently acquire new knowledge throughout his life. With such an approach, multimedia learning tools are indispensable in the higher education system, which increases the effectiveness of the educational process, contributes to the improvement of the activity of the teacher

himself, and increases the quality of training of future specialists. The use of multimedia technologies in the modern educational space during the training of specialists stimulates the thinking of students of higher education and the development of imagination, contributes to the intensification of the educational process, allows to increase the volume and quality of educational material, to make independent decisions in problematic situations, to form research and analytical skills, etc. (Fan, 2021).

Let's consider the main two areas of practical use of multimedia technologies in education:

- creation of autonomous educational complexes and multimedia programs, which are distributed using electronic media with preliminary installation on local network servers, and workstations for use in the educational process;
- using the possibilities of telecommunications or other innovative technologies to create a multimedia environment, combining several multimedia projects with a scalable and flexible structure Manrique, (2020).

Based on the recorded didactic and technical-pedagogical capabilities of multimedia, we will single out potential functions that can be differentially implemented in the educational space:

- informational function;
- developmental function;
- explanatory function;
- systematization function;
- heuristic function;
- motivational function.

Through the use of modern innovative means of audiovisual information processing, multimedia intensifies the educational process and strengthens the motivational effect in the field of education, especially higher education:

- "manipulation" (movement, overlay) within the field of three screens (next, middle, previous) with visual information;
- deformation of visual information (compression or stretching of the image, decrease or increase of the linear parameter);
- contamination (mixing) of various audiovisual information; implementation of educational animation effects;
- toning of images;

- discrete presentation of audiovisual information;
- fixation of the selected part of visual information for movement, its further consideration "under a magnifying glass";
- demonstration of processes and events in real-time;
- multi-window presentation of audiovisual information on one screen (for example, text in one "window", video in the other) with the ability to activate any part of the screen.

Today requires from specialists practical skills and theoretical knowledge in the field of mastery of progressive means and methods of modern science and, application of the latest pedagogical technologies. The use of multimedia technologies in the educational process helps to acquire practical skills and theoretical innovative knowledge in the field of one's professional training.

Let's consider the stages that are characteristic of the educational space for the qualitative application of knowledge and skills in the training of specialists:

- planning, in the training and own work of education seekers, the way to use multimedia technologies;
- organization of the method of introduction of tools and resources to the education process;
- monitoring the impact on increasing the effectiveness of education and training of multimedia technology education seekers (de Almeida et al., 2023).

We will show the advantages of the introduction of multimedia technologies, which contribute to the improvement of the quality of training of specialists:

- 1) to form practical skills and abilities in communicative and informational interaction;
- 2) based on the inherent personality, individual abilities, and psychological features to develop the acquired experience;
- 3) make optimal decisions, develop research skills, and increase your level of multimedia literacy;
- 4) optimally use your study time, apply and develop innovative methods for professional activity;
- 5) to develop the ability to use multimedia technologies in future professional activities; and to increase the amount of

educational material for creative assimilation and use.

So, we can see that the introduction of multimedia technologies contributes to the improvement of the quality of training of specialists (Fan, 2021).

The use of multimedia computer software in the process of professional training of the future specialist contributes to the in-depth study of the content of specialized subjects, effective solving of the main tasks, optimization of self-development and self-education of future specialists based on the individual way of perceiving information, the level of training, taking into account personal characteristics. Students of higher education master the ability to make objective conclusions, intellectual knowledge, comparison of information, and the ability to synthesize, analyze, and effectively use the results of information analysis in their own professionally directed activities. For such a high-quality completion of the educational process, its special organization, search, and implementation of innovative methods, methods, teaching tools, substantiation of a complex of pedagogical conditions that correspond to the

level of development of the information society, educational innovation trends are necessary (Seiko et al., 2021).

Having clarified the peculiarities of the training of specialists in higher education using multimedia technologies and proving their importance and necessity for modern education, substantiating the stages characteristic of the educational space with the aim of qualitative application of knowledge and skills in the training of specialists; advantages of the introduction of multimedia technologies, which contribute to the improvement of the quality of training of specialists, we conducted an experimental study.

To study the skills of using multimedia technologies in solving professional problems, students were offered educational and professional tasks. They represent tasks of a professional nature, but the ways to solve these problems can be very different, in this case, the use of multimedia technologies, from execution on paper to solving them using professional programs. The percentage of students who correctly solved educational and professional tasks is presented in Table 1.

Table 1.
Use of multimedia technologies by students to solve professional problems

Problems that need to be solved using...	Before the experiment		After the experiment	
	CG	EG	CG	EG
creation of autonomous educational complexes and multimedia programs, which are distributed using electronic media with preliminary installation on local network servers, on workstations for the purpose of use in the educational process	82%	79%	91,5%	98%
"manipulation" (movement, overlay) within the field of three screens (next, middle, previous) with visual information;	4,5%	4,1%	21,4%	60,3%
deformation of visual information (compression or stretching of the image, decrease or increase of the linear parameter)	2,3%	3,5%	22,5%	45,1%
using the possibilities of telecommunications or other innovative technologies in order to create a multimedia environment	0%	0%	5,9%	32%
combining several multimedia projects with a scalable and flexible structure				
contamination (mixing) of various audiovisual information;				
implementation of educational animation effects;				
toning images;				
discrete presentation of audiovisual information;	45%	46,4%	57,1%	79,9%
fixation of the selected part of visual information for movement, its further consideration "under a magnifying glass";				
demonstration of processes and real-time events, etc.				

In the experimental work, we used various aspects of computer program multimedia tools in the process of professional training of the future specialist and were organized in the following forms of work:

- in face-to-face distance learning: in which some modules, blocks, and topics are offered for distance study, or (if necessary) the student, interacting with the teacher and other students by e-mail in blogs, on forums, can study part of the course remotely;

- in face-to-face education: in the preparation of telecommunications projects, in individual classes, for participation in contests, remote Olympiads, for the performance of individual tasks;
- in distance learning using case technologies.

A complex of tasks, professionally-oriented exercises aimed at the gradual formation of skills as part of the professional training of students, which are aimed at the gradual formation of the skills of higher education seekers in the high-quality use of computer multimedia software tools not only in the system of professional training but also during the whole life:

Stage 1, the tasks provide for the possibility of systematization of skills and knowledge acquired in the process of bachelor training of specialists, and to be aimed at the acquirers of the educational space of knowledge about the types and types of software computer multimedia tools;

Stage 2, the possibility of selecting technologies for effective work with software computer multimedia tools;

Stage 3, the ability to use software computer multimedia tools in one's own professionally oriented activities.

We proceed from the fact that multimedia technology is a technology that allows using a computer to process, integrate, and reproduce different environments, different types of signals, methods, and means of data exchange at the same time; it is based on hypermedia (working with combinations of video, sound, graphics, animation) and the hypertext system (working with combinations of text materials); with its help, real processes are simulated and modeled; visibility in the presentation of information improves; sounding and enlivening of objects, verbal accompaniment of visual information is carried out; a virtual educational environment is created; interactivity of software tools is ensured.

The means of multimedia technologies are based on:

- use of multimedia technologies (real video fragments, virtual objects, animated graphics, audio fragments, etc.);
- interactions – means of asynchronous interaction, online mode (electronic educational materials, webinars), synchronous interaction (video conferences) (Buinytska, 2012).

One of the essential advantages is the development of multimedia by the author's means and the creation of presentations based on them – the simplest type of multimedia technology.

Students used the following stages of creating a multimedia presentation:

- formulation of the thematic direction of the presentation;
- a selection of materials on a certain defined topic (pictures, text, video, animation, sound);
- distribution of topic materials on the expected number of slides, which is planned in the presentation;
- selection of slide design and selection for creating a program presentation;
- placing the necessary information on the slides, determining the markup for each made slide;
- adding background music, animations, video, and audio materials;
- viewing the presentation and its correction, saving the presentation.

Multimedia tools in the educational process help reproduce specialized educational material, but at the same time do not provide an opportunity for direct interaction with the object being demonstrated (Liu, 2023).

A technical and effective teaching tool that helps to qualitatively solve modern educational tasks is a set of technical tools, which consists of a computer, a multimedia projector, and a SMART Board (a flexible tool that combines the capabilities of a computer with an ordinary marker board). SMART Board, combined with a multimedia projector, becomes a touch-sensitive large screen where you can control the computer by touching the surface of this innovative screen. Without deviating from the explanation of the material, it is possible to demonstrate the necessary information, open any computer program, and make the necessary selections and notes at the same time, which emphasizes the attention of the acquirers of the educational space. The SMART Board includes a set of files, and SMART Notebook software with the content of practical and lecture classes (Jordán Naranjo et al., 2022).

So, during our experimental research, we considered multimedia means to be a set of different learning technologies, software, and hardware, graphic images, music and video, texts, and equipment, in the process of using the

skills and abilities of the students of education are improved, and new knowledge is acquired.

Observation of the practical activities of future specialists was carried out during industrial practice. An integral part of the professional training of future specialists is the practical mastery of all elements of professional activity using multimedia technologies. Therefore, observation of the practical activities of students ensured the study of the characteristics of professional skills, personal qualities, creative attitude to professional activities, and theoretical training.

Based on the results of the final diagnostics, it was revealed that there is a positive trend in the use of multimedia technologies to solve professional problems.

The category of tasks that needed to be solved using multimedia technologies had good results before the experiment, but after the experiment, they rose to a higher level. Tasks whose solutions required knowledge of multimedia technologies

were solved before the experiment in the CG by 4.5% of students, and in the EG by 4.1%. After the experiment, the percentage of people able to use multimedia technologies in the CG increased by 15.4%, and in the EG by 60.3%. As for the category where it is necessary to make decisions using professional multimedia programs, there was a zero result before the experiment, since the students had no idea about the use of multimedia technology programs before the experiment since they had not been studied at all. After teaching the developed materials, the percentage of those able to solve professional problems using professional programs in the CG increased by 5.9%, and in the EG by 32%, which indicates good results.

Based on the observation and results of a formal experiment to determine the activity component of readiness, that is, readiness to solve professional problems using multimedia technologies, the experiment data were processed and students were divided by readiness levels.

Table 2.
Table of student readiness levels before and after the experiment

Levels of readiness of students to implement multimedia technologies in professional activities	Before the experiment		After the experiment	
	CG	EG	CG	EG
High	14%	17%	22%	65%
Average	29%	31%	45%	24%
Low	57%	52%	33%	11%

The table shows that the percentage of students with a high level of readiness for competitiveness in professional activities in both groups before the experiment was approximately the same, but after that, there was a significant difference, in the CG – 22%, and in the EG 65%, which undoubtedly indicates the formation in students' readiness to solve professional problems using multimedia technologies. The average level also has changes, so the percentage of students before the experiment in the CG was 29%, and in the EG – 31%, but after completing the course in the CG with an average level it increased, and in the EG it decreased. As for the low level, the results are approximately the same; the percentage of students with a low level decreased to 33% in the CG, and 11% in the EG.

It can be concluded that the readiness of students to become competitive in professional activities with the ability to use multimedia technologies can be considered fully formed since the experimental study revealed the presence of an

established structure of professional action using multimedia technologies (the presence of the ability to solve problem situations that arise in process of professional activity using multimedia technologies, the ability to organize work using the capabilities of multimedia technologies).

The goal and result of training future specialists to use multimedia technologies is their readiness for this type of activity. In this regard, at the formative stage, the next step of the experiment was to carry out statistical “measurements” (zero cuts) of the levels of the studied type of readiness among students in the control and experimental groups to become competitive in professional activities with the ability to use multimedia technologies.

The research was carried out in the following areas:

- determining the level of interest in multimedia technologies in the process of professional education at a university;
- study of the level of knowledge formation on the problem of higher professional education under study;
- identifying the level of mastery of professional skills in using multimedia technologies in the studied aspect of university education.

In the process of our research, the conditions that ensure the development of the professional interests of education seekers and the activation of their educational activities in the process of learning technologies have been singled out:

- use of innovative methods of the educational process;
- creation of a special educational environment for cognitive interest and the formation of the need of education seekers to use ICT;
- solving professionally oriented problems using multimedia tools.

Systematic use of multimedia provides:

- establishment of interdisciplinary connections during the educational process;
- increasing the quality and professional level of the use of visibility;
- logical construction of educational material, which has a positive effect on the level of knowledge of education seekers;
- organization of project activities for education seekers with the creation of educational programs under the guidance of teachers;
- change of attitude towards the computer;
- increasing the motivation of education.

Educators begin to perceive multimedia tools for work in any professional field as a universal tool. It should be noted that at different stages of the lesson, the professional method of using multimedia tools can differ significantly. The task is to find such innovative methodical tools and techniques that will help generalize, systematize, deepen, and supplement knowledge, and not just reproduce the acquired. What is valuable in the use of multimedia educational tools is that they bring an "interesting innovative novelty" to the lesson, that by the form and content of their application, they make it possible to understand the material in a new way in a short period, to reproduce a significant amount of material, to clarify unclearly formed concepts, to

evoke new images in the students of education, to deepen the acquired knowledge (Shevchenko, 2016).

We agree with the opinion of O. Pinchuk (2010), that the use of multimedia technologies during the summarization and repetition of educational material can be calculated for comparison, independent work, and solving cognitive tasks, where students should better clarify the essence and importance of events, processes, and phenomena, make certain generalizations and conclusions. In this case, according to its didactic purpose, the applied information acts as a valuable material for the independent work of education seekers. The didactic role of multimedia technologies at the stage of explaining new material, in the process of generalization and repetition differs from their use. The difference is that the material is no longer used as a source of knowledge and repetition, at the same time, the material can cover several topics, and the purpose of the material is an additional or main illustration or a means of systematization and reproduction of already acquired knowledge. The method of working with a multimedia program depends on the following factors:

- is it known to the students of education;
- whether the students are getting acquainted with such a means of education for the first time.

When students of education use multimedia programs, it helps in the reproduction of the educational material and its systematization, generalization, and deepening (Polishchuk et al., 2022).

In the case of previous non-use of multimedia tools, their didactic purpose changes: they present known material in a new light, and not only reproduce it, and supplement it with new facts, but help to systematize and generalize knowledge. In classes at institutions of higher education, not only the multimedia educational program can be used in its entirety, but also individual fragments of education, if students need to simulate a phenomenon or a complex process that students have not mastered enough. At the same time, during the repetition of the material, to systematize the topics studied in other disciplines and summarize the significant material, separate multimedia programs can be successfully used. By the purpose and content of material repetition, multimedia tools can be used: during individual classes as a guide to independent work, visualization or as a means of

repetition, illustration for repetition, generalization, and systematization of knowledge; while explaining with elements of the current iteration. Accordingly, methodological techniques, the place of multimedia information, and its application are changing. Therefore, the use of multimedia technologies is carried out in different ways, depending on the level of ownership of various programs and the availability of certified programs, according to the needs of a specific type of activity (Shevchenko, 2016).

An experimental test that made it possible to find out the peculiarities of training specialists in higher education using multimedia technologies and to prove their importance and necessity for modern education, to substantiate the stages that are characteristic of the educational space with the aim of qualitative application of knowledge and skills in training specialists; name the advantages of the introduction of multimedia technologies, which contribute to the improvement of the quality of the training of specialists and highlight the characteristic features of modern multimedia technologies. These are the features of multimedia technologies:

- provide opportunities for independent activity to education seekers;
- ensure joint creative activity of the teacher and students of education;
- make it possible to change the role of teachers and students of education to participants in productive activities, from authoritarian carriers of information;
- create a favorable environment for the professional competencies of future specialists, and the formation of the own intelligence of the students of education.

Modern multimedia technologies of the educational space are based on the principles of optimization, which are aimed at improving the quality of education and the entire process of the educational space.

Future competitive specialists, as subjects of the educational process, based on the acquired competencies, should possess the latest information technologies that contribute to the solution of professional problems at the methodologically appropriate level (Liu, 2022). Modernity demands from future professionals such personality traits as the ability to adapt to rapid changes in the world, activity, creativity, and independence, the formation of which requires the use of modern multimedia

technologies in the educational process based on the implementation of the competence approach (Nastas & Vember, 2021).

The study made it possible to find out the main functions performed by multimedia technologies in the educational process:

- reproduction of educational information that reflects the essence of objects, phenomena, and processes being studied;
- ensuring visibility of multiple uses in the educational process and educational information materials;
- modeling of physical, geometric, and mathematical schemes that provide an opportunity to investigate and demonstrate the processes under study and dynamic systems;
- ensuring self-education of education seekers;
- ensuring control and self-control of education seekers, and their perception of educational information;
- indirect management of cognitive activity of education seekers;
- the use of audio materials is an effective and necessary means of education;
- involvement of education seekers through listening and direct communication;
- application of educational visual materials consisting of models, objects, tables, diagrams, animations, graphs referring to slides, illustrative instructions, and animation;
- use of video tools to motivate future specialists to develop professional competence.

So, in the process of forming the professional competencies of future specialists, multimedia technologies are used to achieve specific goals: explanation generalization, and abstraction, which are the main criteria of the educational process and provide an opportunity to prepare a competitive specialist (Potapchuk, 2018).

Conclusions

The peculiarities of the training of specialists in higher education using multimedia technologies are clarified and their importance and necessity for modern education are shown. The main areas of practical use of multimedia technologies in education are considered.

Based on the recorded didactic and technical pedagogical capabilities of multimedia, we will identify potential functions that can be

differentially implemented in the educational space.

Manipulation, deformation, contamination, toning of images, discrete presentation of audiovisual information are considered; fixation of a selected part of visual information for movement, its further consideration "under a magnifying glass", demonstration of processes and events in the real-time, multi-window presentation of audiovisual information, which through the use of modern innovative means of processing audiovisual information, multimedia intensifies the educational process and strengthens the motivational effect in the educational field, namely higher education.

Research and experimental work were carried out, which made it possible to find out the peculiarities of the training of specialists in higher education using multimedia technologies and to prove their importance and necessity for modern education. During our experimental research, we considered multimedia means to be a set of different learning technologies, software, and hardware, graphic images, music and video, texts, and equipment, in the process of using the skills and abilities of the students of education are improved, and new knowledge is acquired.

The goal and result of training future specialists to use multimedia technologies is their readiness for this type of activity. In this regard, at the formative stage, the next step of the experiment was to carry out statistical "measurements" (zero cuts) of the levels of the studied type of readiness among students in the control and experimental groups to become competitive in professional activities with the ability to use multimedia technologies.

The means of multimedia technologies are singled out based on: the use of multimedia technologies, and interaction; the stages of creating a multimedia presentation are considered; the conditions that ensure the development of professional interests of higher education seekers, the activation of their educational activities in the process of studying technologies and the characteristic features of modern multimedia technologies are named.

Various aspects of the use of multimedia tools in the process of professional training of a future specialist in distance learning require further research.

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