

# Providing the Practical Component of the Future Specialist with Multimedia Technologies in the Educational Process of Higher Education

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## Summary

The purpose of education is to create an effective system using multimedia technologies that ensures the formation of highly qualified employees, implement educational policy as a priority function of the state. The practical component is identified as a single form of training of specialists, which combines knowledge and activities using multimedia technologies and affects the effectiveness of their professional training. The directions in which modern research of new approaches to the organization of practical training of future specialists by means of multimedia technologies is carried out are noted. The main principles of managing students' activities in practice, using modern information and communication technologies, are highlighted. Approaches and principles to describing the content of students' activities during practical training aimed at forming the experience of professional work of future specialists in the educational process of higher educational institutions are described. It is proved that the function of multimedia teaching tools and multimedia technologies is that they use a source of new content information, take on separate functions of both the teacher and the student, and have features of various types of visual representation. In the history of the education system, there are three models for organizing the practice of future specialists, which is revealed in the article.

## Keywords:

*practical component, future specialist, multimedia technologies, educational process, Graduate School, teacher, student.*

## 1. Introduction

The formation of an information technology society, fundamental changes in the socio-economic and spiritual development of Ukraine require the training of a new generation of specialists. The implementation of this strategic task is also due to deep changes in the system and structure of education and the need to integrate national education into the European educational space. This requires defining conceptual long-term strategies for further improvement and development of Education.

The purpose of education development is to create such a system with the use of multimedia technologies, which on the basis of national treasures of world significance and established European traditions ensures the formation of highly qualified workers who are able to carry out professional activities on a democratic and humanistic basis, implement educational policy as a priority function of the state, aimed at the development and self-realization of the individual, meeting his educational, spiritual and cultural needs, as well as the need for specialists to be competitive in the labor market [17].

Professional development of an expert can be described as the process of forming the experience of his activity. The most intensive changes occur at the stage of professional training in higher education institutions, in the process of including future specialists in practical activities using

multimedia technologies. Studying the place and role of practical training of future specialists in historical retrospect and in the context of modernization allows us to identify the features of organizing practical training of future specialists, which contributes to the formation of their professional experience.

Practice as a single form of training of specialists, combining knowledge and activities with the use of technology, affects the effectiveness of their professional training. It is possible to increase the effectiveness of practice through the search and application of new, optimal organizational forms of practice in modern conditions, which are at the same time effective forms of development of didactic thinking, imagination and intuition, the ability to quickly navigate in real educational systems, the ability to anticipate and effectively act in various difficult situations that arise in the process of training and education using multimedia technologies [16].

**The purpose of the study:** to find out the need to provide the practical component of the future specialist with multimedia technologies in the educational process of Graduate School.

## 2. Analysis of recent research and publications

V. Kremen distinguishes between two directions of education – socio-cultural and pedagogical [11].

I. Zyzyun proves that the possibility of building an active position of a future specialist arises based on theoretical understanding of oneself, one's activities, and one's interaction with pedagogical reality. This leads to the interpretation of the personality of the future specialist as a self-developing, self-regulating system, the purposeful activity of which in the pedagogical sphere rises to the level of conscious value selectivity of activity [21].

T. E. Kristopchuk defines education using multimedia technologies as a multifunctional, interdisciplinary, multi-faceted process that covers three areas of essence and methods of training: axiological-cognitive, emotional and practical; in four planes: regional, state, European and global; in three time dimensions: past, present and future [12].

P. Horol, R. Gurevych, L. Konoshevskiy, V. Podoliak speak about the need to introduce modern information and communication technologies in the educational process [7].

I. S. Kernitsky, O. I. Zachek, V. V. Senik, T. V. show the need to apply multimedia complexes in education [9].

V. F. Zabolotny defines the need for an educational multimedia presentation, which is the presentation of educational material in a digital format, in which the content of educational information is presented in an interactive multimedia form, united by a specific topic and a single design [20].

Kotiash, I., Shevchuk, I., Borysonok, M., Matviienko, I., Popov, M., Terekhov, V., Kuchai O. light up that the use of multimedia technologies in the educational process of higher education institutions allows to move from a passive to an active way of implementing educational activities, in which the student becomes the main participant in the learning process. Multimedia technologies must meet the goals and objectives of the course and be an integral part of the learning process. [10].

Shunkov, V., Shevtsova, O., Koval, V., Grygorenko, T., Yefymenko, L., Smolianko, Y., Kuchai, O. study the effectiveness of the use of network and multimedia technologies in the training of future teachers depends on the level of conceptual development of pedagogical tools used in the organization of educational and cognitive activities of students; from the degree of adaptability of the educational and information environment of training a modern specialist to his professional environment; from the level of readiness of students to perform professionally-oriented tasks with the help of network and multimedia technologies. [18].

Kuchai, O., Skyba, K., Demchenko, A., Savchenko, N., Necheporuk, Y., & Rezvan, O. inspect the role of multimedia education in the progress of the information society. The information range is accomplished both as a separate sector of the economy and as a factor in the modernization of education [14].

Biletska, O., Kuchai, T., Kravtsova, T., Bidyuk, N., Tretko, V., & Kuchai, O. characterize the essence of the activity approach in the aspect of learning foreign languages. An analysis of foreign scholars' recommendations on the implementation of the principle of activity approach to learning was made. The essence of teaching in higher educational institutions, that is to help the teacher to acquire speech competencies for learning foreign languages. The essence of the activity approach principle, which consists of integral training with the active student, is found out. The teacher acts only as a guiding partner, providing advice on the way to achieve the goal. The disadvantages of the activity approach to teaching a foreign language are highlighted: time constraints, insufficient level of students' basic knowledge and their unwillingness to study entirely student-oriented, during which the student is given full independence in choosing a way to effectively achieve the goal [3].

## 3. Research methods

To achieve this goal, theoretical research methods were used – analysis of pedagogical, psychological, methodological literature, synthesis, comparison and generalization, induction and deduction, analogy, which allowed us to characterize the state of working out the problem raised; systematization and generalization of

theoretical and methodological foundations to clarify the state of providing the practical component of the future specialist with multimedia technologies in the educational process of Higher School.

#### 4. Results and discussion

As V. Kremen notes, it is important to distinguish between two areas of education – socio-cultural and pedagogical. Education as a social institution and as a pedagogical system, which is a technology of educational activity (teaching methods, content, forms and means of organizing the educational process), are different concepts. There is no doubt that pedagogy, like any technology, needs constant improvement. The main word here belongs to teachers-innovators, theorists and practitioners of pedagogical science [11].

I. Zyazyun believes that the meaning of any profession and the basic component of pedagogical quality is human orientation, this requires changing the existing strategy of training and orientation in working with the student to the strategy of his unconditional ability to raise himself to the level of creative activity in the "person – person» System. At the same time, the focus is on the development of the future specialist's ability to awaken the human essence, combined with the attitude to constant professional and personal self-improvement, professional self-education. The possibility of building an active position arises based on a theoretical understanding of yourself, your activities, and your interaction with pedagogical reality [21].

Education using multimedia technologies is a multifunctional, interdisciplinary, multi-faceted process that takes place in three directions, in particular, it covers three areas of essence and methods of training: axiological-cognitive, emotional and practical; in four planes: regional, state, European and global; in three time dimensions: past, present and future [12].

Radical changes in the life of society have led to both a reorientation of the target orientation of education in higher education institutions, as well as optimization of specific forms, means and methods of teaching, and the search for new ways to improve the effectiveness of training specialists by means of multimedia technologies. Integration into the international educational space, the processes of democratization and humanization of public life have obliged higher education institutions to make significant changes to the structure of Education.

Modern research on new approaches to organizing practical training of future specialists by means of multimedia technologies is carried out in several directions. Their main feature is the desire to take into account national and international traditions, apply new approaches in modern education, and use multimedia technologies to bring the future specialist closer to real business conditions.

One of the leading trends in the development of professional education is the strengthening of students' interaction with professional realities by means of multimedia technologies. Future specialists begin to gain professional experience first at workshops in simulated conditions that imitate the real educational process, close to real activities, and then carry out practical activities in the real educational process, at the workplace. This trend is associated with an increase in the time planned for independent practical activities of future specialists. Traditionally used forms of practical training – seminars and practical activities themselves – are supplemented with active learning technologies, ensuring the inclusion of future specialists in practical work, continuously solving professional tasks, which corresponds to the properties of the process of forming professional experience by means of multimedia technologies. [6].

Education, on the one hand, depends on the processes taking place in it, should quickly respond to the state of scientific and technological progress, trends in the development of the country's economic sphere, on the other hand, it affects all processes and aspects of life, as it trains specialists, develops personality, and forms certain life views. Special attention should be paid to the current state of education, prospects for innovation, information technologies and their implementation in Ukraine.

Socio-economic changes that are taking place in Ukraine set new tasks for education to revive the intellectual potential of the people develop domestic science to the world level. One of the directions of implementing this goal is the promotion of Education based on new concepts, the introduction of modern information and communication technologies in the educational process [7].

Let's highlight the basic principles of managing students' activities in practice, using modern information and communication technologies:

- the principle of individual approach-individualization of practice, which provides for the performance of work depending on the nature and scope of assistance to students who have different levels of development of components of professional experience;

- the principle of combining pedagogical leadership with the development of independence and initiative of students – differentiation in the content of the practice of the variable part, encouraging independent search and implementation of other methods, analysis of additional literature, mutual assistance and mutual analysis of students' activities;

- the principle of feedback-familiarizing students with the results of expert assessment, the opinion of practice leader, its progress and results.

Therefore, in order to intensify and support the formation of professional experience in the course of practice, it is necessary to establish subject-subject interaction between students and teachers-methodologists.

Based on the study of approaches to clarifying the content of students' practical activities, it was found out that practice as part of the educational process should meet all the requirements, provide for the involvement of modern teaching methods (project training, group work, reflection training, the use of multimedia technologies, etc.), serve as a means of acquiring and improving professional and personal experience by future specialists [6].

The article describes approaches to describing the content of students' activities during practice, aimed at forming the experience of professional work of future specialists in the educational process of higher educational institutions, give grounds to differentiate several principles of constructing the content of practice, taking into account the need to use multimedia teaching technologies:

- the principle of conscious perspective, which determines the student's attitude to the perception and awareness of a complex, personally significant goal of mastering the experience of performing professional tasks, outlines a step-by-step program of actions with an indication of the expected result;

- the principle of relying on experience, which implements the idea of using multimedia technologies by future specialists as one of the sources of training, as well as motivates the relationship between cognitive processes and the logic of becoming a professional's personality in the structure of a specific activity;

- the principle of individual counseling, which predicts assistance to future specialists both in the content of tasks performed and in choosing the best ways and methods to achieve their goals, taking into account the individual characteristics of each student;

- the principle of variability, which provides for the selection of the content of the student's activity in practice in accordance with the needs and capabilities of the future specialist;

- the principle of consistency and continuity of practice – building pedagogical practice as one of the blocks of a unified system of practical training of the entire period of professional training in a higher education institution using multimedia technologies. [13]

The use of multimedia creates a multi-sensory learning environment, taking into account the multi-sensory features of learning. The involvement of all the senses increases the level of assimilation of the material compared to traditional methods [5].

Multimedia systems are now successfully used in the field of education and professional training. A special place is occupied by computer-based educational multimedia systems that allow you to deepen your knowledge, reduce the duration of training, and increase the number of students per teacher [4].

Multimedia software tools have relatively greater capabilities in displaying information than traditional ones, which distinguishes them from each other. Multimedia

presentations directly affect the motivation of the educational process, the speed of perception of the material, fatigue and, consequently, the effectiveness of the educational process as a whole. The use of multimedia presentations in the educational process contributes to the successful solution of methodological problems, activates students' independent cognitive activity, and opens up new opportunities for their creative development. At the same time, the use of presentations must necessarily be harmoniously combined with the traditional methodology of teaching the discipline. Practice shows that multimedia presentations are effective at all stages of the educational process, but in classes that differ in structure and didactic purpose, the method of their application should be appropriate.

Therefore, the statements about the effectiveness of the use of multimedia software tools in the educational process and the requirements of society for graduates of higher educational institutions motivate the need to organize the educational process during practice using computer-oriented teaching methods [4].

Multimedia presentations help to present the material during practice as a system of vivid reference images filled with comprehensive structured information in algorithmic order. The purpose of such presentation of educational information is primarily to form students' imaginative thinking system. It is advisable to show presentations at any stage of studying the topic (section, module) and at any time of the lesson (during the explanation of new material, consolidation, repetition, control). The presentation performs various functions: a teacher, a working tool, an object of training that cooperates with the team, etc. [4].

To demonstrate multimedia presentations, it is necessary to use multimedia complexes: a computer (laptop), which is the main means of processing, storing and displaying information; a multimedia projector ("digital projector", "video presenter", "Power Point Projector"); an interactive multimedia camera; a wall or portable screen; a multimedia acoustic system [9]. Multimedia projectors are a rapidly developing sector of the computer market that allows you to project images from a computer onto large screens with a diagonal of more than 10 m. They are characterized by high resolution and intense luminous flux, which makes it possible to use them for presentations in large, unshaded rooms. Among the advantages, it is worth mentioning their portability and mobility. Almost all multimedia projectors are equipped with variable focal length lenses, so you can set the image dimensions without moving the projector. Modern multimedia projectors have the function of rear display of material from left to right and from bottom to top, which helps to place them on the back of the screen or attach them to the ceiling. In this position, the projector does not require much space and does not interfere with viewing. Individual multimedia projectors have a built-in audio system and provide high-quality audio

accompaniment for presentations in small and large audiences [8].

An educational multimedia presentation is a present of educational material in digital format, in which the content of educational information is presented in an interactive multimedia form, united by a specific topic and a single design. Presentation-type multimedia tools used by teachers are becoming increasingly popular in educational practice. The main goal of multimedia as a learning tool is to create a more progressive environment for displaying and visualizing content and the main didactic advantage of multimedia is new opportunities for presenting educational material.

Research attention should also be paid to a lecture with multimedia support – a form of training that combines the verbal presentation of the material by the lecturer and a multimedia presentation projected using computer technology on the screen. Lectures with multimedia support include a slide demonstration. The slide contains key phrases, definitions, and the most important lecture material. A slide show is usually accompanied by a verbal accompaniment from the lecturer or an audio recording of the lecture text. By showing the slide, the lecturer can explain any difficult-to-understand elements of the material, definitions, concepts displayed on the screen [20].

To improve the learning process, a tool such as a multimedia whiteboard is used. It is a universal technical tool for visual communication and learning, combining the characteristics of a regular whiteboard and the latest computer technologies. It is used not only to display what is happening on the computer, but also to establish the relationship between the teacher and the computer. Under certain conditions, this can be a “teacher – student – computer interaction”.

A multimedia whiteboard usually includes four components: a computer; a multimedia projector; software; and a special touch panel, which, in fact, is the whiteboard. The multimedia projector and touch panel are connected to the computer. The image from the computer monitor is transmitted via the projector to the panel. Touch to the touchpad occurs thanks to special markers or by touching with your fingers and is transmitted to the computer via cable or via infrared communication. The applied pulses are read and interpreted by special software installed on the computer.

Multimedia whiteboards can be direct or reverse projection. Under the condition of direct projection, the projector is placed in front of the surface of the touch panel, and the teacher or student who is at the blackboard can partially cover some images. To prevent this from happening, the projector is hung from the ceiling as close to the board as possible, the lens is tilted down, and some distortion in the image is compensated using a digital correction system. If the board is reverse projecting, then the projector is placed behind the screen, working on the

lumen. Such boards are more expensive, their installation in the classroom requires attracting additional space, but this reduces the negative impact of the projector on the participants of the training [19].

An interactive or multimedia whiteboard makes it possible to use a whole range of modern equipment (projector, computer, scanner, printer, etc.) as efficiently as possible during classes. Such a technical device helps students memorize educational material faster and better, consolidate their knowledge, and actively participate in the maximum number of students. A multimedia whiteboard is a versatile tool that combines the simplicity of a regular marker board with the capabilities of a computer. In combination with a multimedia projector, it becomes a large interactive screen, with one touch on the surface of which you can open any computer program. [9].

Working with a multimedia whiteboard, the teacher has the opportunity to maintain constant contact with the audience, since he is not distracted by working with the computer and is constantly facing the students. If you have an additional device – a wireless electronic tablet – the teacher does not depend on the blackboard at all, moves freely with the audience, which contributes to closer interaction with each student, monitoring and correcting learning activities. At any time, the teacher can pass the wireless tablet to the student, who writes the answer without getting up from his seat. This encourages activity of students and helps to involve them in the learning process, enhances interaction with the teacher and optimizes local control of learning activities [19].

Now computer technology is widely used in all spheres of human activity. The introduction of Information Technologies is due to the rapid development of science, a qualitative increase in human capabilities and an ever-growing amount of information. Informatization has not ignored the education system, especially in terms of using not only computers and laptops, but also tablets, which are quite widely used in education.

Each student learns at a different pace, which potentially makes it difficult to present material that all students will accept. There are a huge number of types of educational programs (applications) for the mobile operating systems "iOS" and "Android", which allow students to work at their own pace, making learning for everyone relatively effective.

In nature, there is no specific universal method of teaching that is suitable for all types of pupils or students. Some people perceive the material better using a visual series (video), others using audio, and some – by reading or playing. At the same time, tablet computers as a multi-purpose learning tool are fully suitable for all types of students [1].

Analyzing the advantages of a tablet computer, we note that such devices offer not only a large amount of entertainment with a certain number of games, available internet services, but also a platform for more exciting

learning. Students can experience a way to learn in a completely new dimension that develops memory, making users more receptive to information. Studies have convincingly shown that visual-spatial methods best enhance concentration and attention [2].

The introduction of such devices as a tablet computer into the educational process relieves the teacher, increases students' interest in learning, optimizes the establishment of intersubjective connections, and makes it possible to visually present the material thanks to multimedia. Tablets are increasingly used in the educational process all over the world. "iPads" and other similar devices can undoubtedly help students improve their knowledge of various subjects.

Tablet computers can make uninteresting things attractive to students of all ages. Their most important advantage is that the tablet provides a playful form of learning at each lesson, and therefore activates the student's activity. This motivates you to study in an educational institution and to master high-quality knowledge.

Due to the widespread use of tablets in education, many companies have announced or already launched the production of special tablet computers designed for education. For example, Intel announced the launch of such a tablet. Despite this, now Apple manufactures most of the tablets that are already used in education.

The use of tablet PCs in academic and extra-curricular activities can be useful for both teachers and students. The most accessible multimedia tools are electronic textbooks created in many academic disciplines. The term electronic textbook means a new type of textbook whose pages are displayed on the display screen [15].

Many teachers are beginning to see multimedia as one of the tools for learning about the world, and the tool is so powerful that along with it, new forms and methods of teaching, a new ideology of thinking appear in the education system.

Training has always been associated with the use of technical means that expand opportunities in teaching a particular subject. With the enrichment of the volume of human knowledge, the need for the use of various technical means of receiving and storing information, as well as research tools, has increased.

Modern scientific research and the experience of the best teachers convincingly prove that the use of multimedia improves the educational process, improves the quality of knowledge, skills and abilities of students. The active use of modern information technologies in teaching becomes a necessity, which is due to the peculiarities of the new stage of the scientific and technological revolution [7].

Information and communication technologies that are used in training have many positive aspects. Multimedia tools open up access for students to non-traditional sources of information, provide completely new opportunities for realizing their creative potential, and help them implement fundamentally new forms and methods of teaching.

The modern understanding of practice is formed in the context of a new educational paradigm in connection with the informatization of the educational space. Obtaining professional experience of future teachers at the stage of training in a higher education institution is a purposeful, regulated process that takes into account the features of the content of education and its technology with simulated professional tasks and real professional situations, taking into account multimedia technologies. The recorded features of the organization of practical training of future specialists from the experience of a foreign School of the XXI Century allow us to identify the most significant properties and functions of practice.

In the history of the education system, there are three models for organizing the practice of future specialists, which is shown in Table.1.

Table 1: Models for organizing the practice of future specialists

	Ordinary model	Consistent model	Mixed model
Characteristics	It provides for the organization of practice throughout the entire period of study, alternating it with theoretical classes.	Predicts first mastering the theoretical foundations of the activity, then workshops and trainings (modeling real situations), only at the final stage of training – practice for a long period.	Combines the characteristics of two other models of practical training.
Countries	Ukraine, Denmark, Netherlands, Estonia, Poland, Slovakia, Germany, etc.	Spain, Iceland, Bulgaria, France, Austria, Italy, Luxembourg.	Portugal, Great Britain, Sweden, Finland, Norway, Iceland, etc.

According to the table above, Ukraine and Poland adhere to an ordinary model of organizing the practice of future specialists. Consequently, these states have the same characteristic of practices [13]

When applying a consistent model, the organization of practical training of future specialists involves a gradual combination of theoretical and practical phases in the training process: the first phase is theoretical training, covering practice in the form of trainings and micro – training, the second phase is a practical course lasting from 15 to 18 months, which is an internship at the intern's workplace. To organize the training of specialists, it is mandatory to use multimedia technologies.

During the first phase of training, practical skills and abilities are formed by stimulating the activity of students. Such methods as student interdisciplinary seminars, micro-exercises, trainings, project activities are widely used, and multimedia technologies are used.

A special role in training is played by the second phase – an internship, which consists of three interrelated stages: the introductory stage, theoretical seminars and advanced training. During the final internship "at the workplace", the intern appears as a specialist who should work in the same way as qualified colleagues. The mode of both categories of specialists is practically no different.

Portugal, Great Britain, Sweden, Finland, Norway, Iceland, etc. follow a mixed model that combines the characteristics of the other two practical training models.

## Conclusions

The creation of new socio-economic conditions and changes in the labor market encourage scientists to search for new models for training competitive specialists who can meet public needs at a high professional level. The improvement of professional and pedagogical training of a specialist at the present stage, in turn, is due to the intensive development of science, European integration processes, and fluency in multimedia technologies, which motivate the feasibility of new principles for training specialists. The implementation of the provisions of the Bologna declaration in higher education institutions provides for significant changes in the organization of the educational process of students. The study and analysis of the state of the organization of practices encourages us to identify ways to improve the process of training specialists in the context of current trends in the further development of the higher education system.

## References

- [1] 10 Big advantages of using iPads (or tablet computers in general) as technology in school classrooms or university auditoriums URL: <http://wi-life.ru/stati/wi-fi/marketingovye-stati-2/wi-fi-in-education-part-1>
- [2] Advantages of tablet computers in education and learning URL: <http://www.itved.ru/planshety/preimushhestva-planshetnyx-kompyuterov-v-obrazovanii-i-uchyobe.html>].
- [3] Biletska, O., Kuchai, T., Kravtsova, T., Bidyuk, N., Tretko, V., & Kuchai, O. (2021). The Use of the Activity Approach in Teaching Foreign Languages in Higher Education Institutions. *Revista Românească pentru Educație Multidimensională*, 13(2), 243-267.
- [4] Burke, K. A., Greenbowe, T. J., and Windschitl, M. A. (1998). Developing and using conceptual animations for chemistry instruction. *Journal of Chemical Education*. 75. 1658-1661.
- [5] Chang, K. E., Sung, Y. T. and Chen, S. F. (2001). Learning through computer-based concept mapping with scaffolding aids. *Journal of Computer Assisted Learning*. 17. 21-33.
- [6] Elliot J. (1993). Professional education and the idea of a practical educational science. *Reconstructing teacher education: teacher development*. Ed. by John Elliot. The Falmer Press. London. 265.
- [7] Horol, P. K. (1999). Computer technology and technical means of education / Ed. Prof. PC Gurevich Vinnytsia: VDPU named after Mykhailo Kotsyubynskyi. 324.
- [8] Kedrovich G. (2000). Assessment of didactic suitability of selected multimedia programs. *Pedagogy and psychology of professional education*. 2. 83-88.
- [9] Kernyskyi I.S. (2013). Modern information technologies and their use in scientific and pedagogical activities: a study guide / edited by Professor I.S. Kernyskyi. Lviv: Lviv State University of Internal Affairs. 264.
- [10] Kotiash, I., Shevchuk, I., Borysonok, M., Matviienko, I., Popov, M., Terekhov, V., Kuchai O. (2022). Possibilities of Using Multimedia Technologies in Education. *IJCSNS International Journal of Computer Science and Network Security*, 22(6), 727-732.
- [11] Kremen V. (2007). *Philosophy of the national idea*. Man. Education. Society. K.: Diploma. 576.
- [12] Krystopchuk T. E. (2013) Pedagogical education in the Republic of Poland: structure and content. *Continuing professional education abroad*. Part 5. 127-134.
- [13] Kuchai O.V. (2014). Theoretical and methodological principles of training future primary school teachers using multimedia technologies in higher educational institutions in Poland. Cherkasy: publisher Chabanenko Yu. A. 361.
- [14] Kuchai, O., Skyba, K., Demchenko, A., Savchenko, N, Necheporuk, Y., & Rezvan, O. (2022). The Importance of Multimedia Education in the Informatization of Society. *IJCSNS International Journal of Computer Science and Network Security*, 22(4), 797-803.
- [15] *Multimedia / Sub. ed. A.I. Petrenko K.: Trading and Publishing Bureau BHV, 1994. 272.*
- [16] Novatska U. (2002). Organization of pedagogical practices of students of the mathematics and natural science department of the higher pedagogical school: autoref. thesis for obtaining sciences. candidate degree ped. Sciences: spec. 13.00.04. Kyiv. 20.
- [17] On the approval of the Conceptual foundations of the development of pedagogical education of Ukraine and its integration into the European educational space: Order of the Ministry of Education and Culture No. 998 dated 12.31.2004 6 URL: <http://www.mon.gov.ua/images/education/average/topic/rozv/knc.doc>
- [18] Shunkov, V., Shevtsova, O., Koval, V., Grygorenko, T., Yefymenko, L., Smolianko, Y., Kuchai, O. (2022). Prospective Directions of Using Multimedia Technologies in the Training of Future Specialists. *IJCSNS International Journal of Computer Science and Network Security*, 22(6), 739-746.
- [19] Vasylieva D. V. (2013). Multimedia in mathematics lessons: 5-6 grades. K.: Editorial offices of newspapers of the natural and mathematical cycle. 128.
- [20] Zabolotnyi V.F. (2009). Formation of methodological competence of a physics teacher by means of multimedia: monograph. Vinnytsia: PE "TD "Edelweiss and K". 456.
- [21] Zyazyun I. A. Philosophy of pedagogical quality in the system of continuing education URL: <http://eprints.zu.edu.ua/853/1/05ziasno.pdf>