The purpose of the article *is to identify the components, criteria, indicators and levels of readiness for professional activity of foreign students-future aircraft and engine maintenance engineers.* ***The task of research*** *is to determine the components and identify the criteria, indicators and levels of readiness for professional activity of foreign students-future aircraft and engine maintenance engineers. To achieve this goal, the following* ***research methods*** *were used: scientific analysis, systematization, generalization, comparison. As* ***a result of research****, the structural components that are part of the professional training of foreign students-future aircraft and engine maintenance engineers were identified: career guidance, motivational and value, cognitive and activity, personal. The criteria for the formation of readiness for professional activity are motivational, cognitive-activity, reflective. The initial (low), sufficient and high levels of readiness for professional activity of foreign students-future specialists of the aviation industry are allocated.* ***Conclusions.*** *Indicators of motivational criterion: orientation and motivation to carry out professional activities in the aviation industry; tolerant attitude to representatives of other cultures and nationalities; professional and value orientations. Indicators of the cognitive-activity criterion: a set of acquired theoretical knowledge, skills and abilities in fundamental and humanitarian disciplines, as well as professionally significant qualities and skills acquired during university studies. Indicators of the reflexive criterion: stress resistance, tolerance to uncertainty, ability to resolve conflict situations, creativity, ability to think outside the box and make professional decisions in complex uncertain situations, ability to reflect.*

Key words: *aviation engineers; foreign students; components, criteria, levels of readiness for professional activity; professional activity*

DOI
UDC 378.147(045)

V. Rakhmanov

HOLOGRAPHIC TECHNOLOGIES OF EDUCATION AS A COMPONENT OF TRAINING OF FUTURE ENGINEERS IN THE CONDITIONS OF EDUCATIONAL AND INFORMATION ENVIRONMENT

Abstract

The article presents *the results of training future engineers with the help of holographic technologies for lectures, practical and laboratory classes. When there is a global change (pandemic, war), education faces the risk that it will not be able to continue its usual processes and will have to move to instant managerial change.* ***The aim of the article*** *is to identify and outline the positive elements of holographic technologies that will help increase interactivity in the teaching and learning process.* ***The task of the study*** *is to find an alternative solution to attract the latest learning technologies in the training of future engineers. Experience shows that in this case, the educational and information environment is the best solution for classes. But the problem of learning is the interactivity of the student to improve the motivation of future professionals with the help of new technologies. At the Technical University, we propose to introduce innovative teaching and learning methods, including games, simulations and holograms. Meanwhile, training is not only the transfer of knowledge, but also an active, constructive and cognitive process through which the future engineer manages internal resources for the formation of key professional competencies.* ***Research methods*** *are to study and generalize domestic and foreign experience to substantiate the conceptual provisions of holographic learning technologies, structural and scientific analysis, as well as monitoring the learning process.* ***Results.*** *To improve the training of future engineers in an educational information environment, holographic technologies can be useful and become another resource that can change the way you create and conduct classes. To obtain this result, it is necessary to study the feasibility of holographic technologies in accordance with the training in the educational and information environment. The article reveals the essence of the considered holographic technologies, describes the advantages and features of their implementation in the educational process of the Technical University. This helps students to intensify cognitive activities and stimulate them to self-education. In the course of elaboration of a number of research ideas, various scientific approaches to*

the interpretation of the term "holographic technologies" are proposed. ***Conclusion.*** *According to existing concepts, holographic technologies can be considered as a result of the creative process and as a process of innovation. Peculiarities, prospects of introduction of holographic technologies into the educational process of the technical university are determined, which require further detailed analysis and study in complex interaction with information systems.*

Key words: *holographic learning technologies; information systems; learning process; educational and information environment; training of future engineers*

Introduction. The introduction of new technologies for the training of modern specialists, Ukraine's desire to join the single European educational space are actively influencing the reform changes taking place in the socio-economic, political and cultural spheres of life in Ukraine. The effectiveness of the organization and provision of quality educational services in higher professional education is a guarantee of training a highly qualified future specialist in the technical field of knowledge. The main idea of the educational process is to prepare a future specialist who can respond quickly to changes in the socio-economic environment, professionally and socially mobile, who has deep knowledge of integrated professions, has economic, legal, psychological and pedagogical knowledge, basics of scientific organization of labor and culture of production, capable of technical and social creativity, self-improvement, self-development, ready to work in various forms of labor and production in conditions of fierce competition, as well as in the diversity of communicative interaction through information systems (Ezenwoke et al, 2016). Therefore, the use of holographic technologies is available and appropriate to use in the educational process as part of the training of future engineers in the educational and information environment of the Technical University, which allows faculty and students to intensify cognitive activity. The image itself is broadcast in full size, with high-definition real-time playback and online sound (Gallagher & Bayne, 2018). Hologram technology in an educational information environment will help students attend classes without leaving home or anywhere in the world. This could reduce travel time and, in the long run, conduct pandemic or martial law training in the country (Aina, 2010; Potkonjak et al, 2016; Redmond et al, 2016).

Research methods are to study and generalize domestic and foreign experience to substantiate the conceptual provisions of holographic learning technologies, structural and scientific analysis, as well as monitoring the learning process.

The purpose of the article is to identify and outline the positive elements of holographic technologies that will help increase interactivity in the teaching and training of future engineers in an educational and information environment.

The task of the study is to find an alternative solution to attract the latest learning technologies in the training of future engineers with the help of educational and information environment.

Analysis of scientific psychological and pedagogical literature of recent years (Bykov, 2012 – Zapata & Larrondo, 2016), in particular, not related to the use of holographic technologies directly, but extremely important due to its fundamentality, developed by scientists in the direction of formation of educational and information environment: basic theories of pedagogical systems and innovative processes in education (V. Yu. Bykov, Yu. M. Bohachkova, M. Yu. Bukharkyna, T. M. Derkach, M. I. Zhaldak, Yu. O. Zhuk, O. H. Kolhatina, V. M. Madzihon, N. V. Morze, E. S. Polat); issues of modeling and technologicalization of learning, programmed learning (Yu. K. Babanskyi, N. B. Bulhakova, V. P. Bespalko, B. S. Hershunskyi, I. Ya. Lerner, N. D. Nikandrov, O.M. Spirin, N. F. Talyzina, M. I. Sherman); foreign scientists who have studied holographic learning technologies (Abbasi H., Abd, N., Agocs T., Balogh T., Danaher P., Forgacs T., Kitagawa T., Lock J., Magreñán Á., Mohd N., Orcos L., Paredes, S., Redmond P., Vázquez N., Sando Y., Satoh K., Zarei T.) та ін.

By educational and information environment we mean a systematically organized set of academic resources and services, principles of interaction of participants in the educational process, didactic, organizational and methodological support in the form of a set of technical and software means of storing, processing and transmitting information. and development of processes of educational and network interaction between objects and subjects of training, and also formation of activity of subjects of training, encouragement of educational and social initiatives for development of competences as socially and personally-significant value (Rakhmanov, 2015).

With the help of an integrative approach there is an opportunity to interact with holographic systems with learning platforms in an educational and information environment. However, it should be borne in mind that the introduction of information technology for the educational process is not always

effective: special terms are difficult to adapt to the necessary conditions and become misunderstood and reluctant to use the latest learning tools (Orcos & Magreñán, 2018).

Holography is a method of recording, reproducing and transforming wave fields based on the interference of oscillations of the corresponding frequency range, which allows the light-sensitive surface to obtain complete information about the three-dimensional image of the object. With the help of holographic technologies, learning is aimed at three-dimensional, multidimensional acquisition of knowledge, which corresponds to the peculiarities of the perception of educational material for the acquisition of integrative competencies. In addition, there are holograms that you can touch and feel. This hologram is based on femtosecond laser technology, which mixes particles in the air at a certain point in space, creating the desired image. When focusing the laser is the ionization of air, there is a light-emitting plasma. The main advantage of the hologram is the ability to touch the image, a person will feel like a solid object. Holographic screen phone is an indispensable tool in the field of education, namely in the educational information environment, with a holographic projector, it is possible to display holograms 360 degrees and allows you to interact with them: rotate, zoom in and out, look inside (Polianskyi та ін. 2013; Aina, 2010).

The holographic approach to the training of future engineers is a learning process of volumetric disclosure of the content of the studied knowledge, combining at least three projections with centered vectors, providing educational mechanisms of impression, namely specific elements of increased perception of educational material under the influence of the environment. motive of educational activity, purpose, value (Orcos & Magreñán, 2018).

Developing the idea of the holographic method in education, holography is considered as a pedagogical method of modeling educational objects. She defines the holographic approach in pedagogy as a method of obtaining a three-dimensional image (hologram), which models the educational object by refracting and connecting at one point three information waves - signals from three main sources: from the object under study and two subjects of the pedagogical process.

The quality of the holographic image in the educational process depends on a number of factors, which include:

- the quality of information presented by the teacher in the form of educational objectives;
- essence, presentation and interest of educational information by the teacher about the educational object, namely skillful use of technical means, additional sources of information for the purpose of comprehensive multidimensional influence on consciousness of the future engineer, display of object in statics and dynamics, comparison and comparison with others or similar objects, etc.;
- personal characteristics of students: the degree of development of perception of educational information, imagination, intelligence; ability to compare information; readiness to accept, process, evaluate, interpret educational information received from the object and the teacher educational material; ability to exercise self-control of their knowledge;
- a multidimensional approach in the modeling of an educational object, which involves the use of various technologies, methods, techniques, forms and tools that allow you to represent the object of study in all its dimensions and manifestations.

3D-image is able to convey the three-dimensional effect and depth of the real model. This optical structure allows you to achieve the clearest and brightest image, as well as provides more optical effects. Such images are colored and can change shades when rotated in different directions on all axes. Graphic educational information is transformed into holographic. The image is visible depending on the angle of view when viewing the hologram. With directional light, the edges and colors of the holograms become clear and bright, and under normal lighting, the colors lose their contrast. Holographic technologies are based on the use of cameras that capture the teacher from several angles to create a 3D effect. Graphics, diagrams and other educational elements of the presentation can be reproduced in 3D for both the teacher and the audience (Abbasi et al, 2014; Katsioloudis, & Jones, 2018; Mohd & Abd, 2016; Redmond et al, 2015).

Discussion. There is a possibility that a new model based on the provision of holographic devices will appear when it becomes a standard practice and will attract attention to the educational process, scientific conferences, etc. The main advantage is that holographic presentations give the audience a real image of the teacher. At the same time, the camera is also addressed to the audience, which shows the teacher to the students and provides real-time interaction.

The holographic method of projection in teaching is a system of educational methods and technologies that corresponds to the peculiarities of the multidimensional perception of educational material both online and in recording. The holographic method of projection in the educational and information environment is a system of educational methods, technologies in the educational process, aimed at the three-dimensional presentation of the studied material, which corresponds to the multidimensional perception of educational material online (Balogh et al, 2006).

Results. Holographic technologies in the training of future engineers in the educational and information environment draw attention to lectures, practical, laboratory classes, conferences, etc. (Rivera & Tarín, 2015). Despite the fact that holograms have interactive features related to the presentation, there is a possibility that in lectures a virtual teacher becomes a source of information, and in practical classes - conducting classes through dual teaching of educational material, when online teacher helps students repeat previous learning material. and the teacher, who is in the classroom, helps the student to solve complex current problems (Agocs et al, 2006). In the laboratory there is an opportunity to create a virtual object, where the teacher with the help of hand waves can divide the parts into parts and show what is in the middle of the sample under study (Bailenson et al, 2008; Martín-Gutiérrez et al, 2017; Rivera & Tarín 2015; Potkonjak et al, 2016).

With the help of holographic technologies in the educational information environment, future engineers apply the acquired prior knowledge with their practical skills to solve educational problems to achieve educational goals. During such training on the basis of virtualization, the future engineer acquires important skills such as teamwork, leadership, communication, professional decision-making, prioritization and process management, developing resilience to stress. Practical classes can be carried out individually or in a team, which leads to cooperation and exchange of knowledge. With the development of such technologies, the opportunities for active interaction with technological applications and promoting access to information, exchange of ideas, knowledge exchange and content creation increase. Digital learning, which attracts future engineers to an interactive and independent process of acquiring competencies, promotes the activation of cognitive activity in higher education. The educational and information environment is an important element for the creation and implementation of holographic technologies, which provides relevant results - practical professional skills, and experience in using information systems - will increase interest in learning. This helps to improve the individual trajectory of each student, to increase the overall result of the whole study group. Holograms make a clearer three-dimensional image of the subject matter, helping to increase motivation to gain the most important competencies. Future engineers typically use logical approaches to solve learning problems, which leads to improved logical thinking and analytical skills.

The introduction of holographic learning technologies in practice needs to be revised (Paredes & Vázquez, 2020):

– teacher of educational material for each student separately, as well as take into account his diligence and activity in the group, self-esteem, reflection, etc.;

– psychological and pedagogical readiness of the teacher to implement the latest technologies in the educational process, his theoretical and practical knowledge, the ability to choose rational information and communication technologies that will provide an opportunity to build an interactive, problem-solving model of learning;

– communicative component of the educational process, aimed at creating a favorable psychological climate and psychological optimization of activities and interpersonal relationships between teacher - holographic system - student, student - holographic system - student. It should be dialogical and provide for the attitude to another person as a value, individuality, because it is during the dialogue that the optimal psychological background is created, which allows each of the parties to reveal;

– designing non-standard situations, which requires from the teacher the ability to create educational problem tasks, to form heuristic questions, cognitive and problem-solving tasks;

– integrative ness, which provides developmental learning, which requires a flexible approach to the use of forms, methods of organizing educational and cognitive activities of future engineers;

– differentiation of learning, namely the combination of modern and holographic technologies, which gives priority to the development of independent work with creative didactic material for self-development of the individual;

– structured content of academic disciplines, namely the selection of such methods, techniques, teaching aids to maximize the disclosure and use the subjective experience of each future engineer, adapting teaching methods to the educational and information environment;

– designing training sessions to reduce forced sitting time, using didactic games and moving activities with a virtual teacher.

Conclusion. The paper was an attempt to analyze and identify the main approaches to holographic technologies in the educational and information environment. Flexibility, availability of electronic resources and ease of learning are key support factors through holographic technology. These results are proof that technology has a positive impact on learning. The integration of holographic training technologies will create information about the object, process or phenomenon being studied, as well as expand and improve the process of gaining practical experience for future engineers. Holographic technologies are a promising area of the educational process, which opens up new opportunities for work in the field of education. The general result of using the system of holographic technologies is positive and is promising for obtaining competencies in educational activities in an educational and information environment.

Undoubtedly, modern training of future engineers requires the latest educational approaches, the introduction of innovative pedagogical technologies in order to form a modern future specialist who will meet the requirements of today. We are convinced that the engineering profession is one of the most creative and complex because it combines creativity, professional experience and knowledge. Therefore, the training of competitive in the domestic and global labor market engineering personnel is a priority for development at the Technical University.

Today offers new requirements for young professionals, and therefore the specific tasks of training are such areas of work as:

– ensuring the effective implementation of educational tasks;
– raising the level of professional training of young competitive staff;
– flexibility of management and readiness for innovations;
– quality of higher education;
– disclosure of creative potential of a graduate of a technical university, etc.

СПИСОК ЛІТЕРАТУРИ

Биков, В. Ю. (2012). Інноваційний розвиток засобів і технологій систем відкритої освіти. Сучасні інформаційні технології та інноваційні методики у підготовці фахівців: методологія, теорія, досвід, проблеми. Зб. наук. праць, Випуск 29. Київ-Вінниця : ТОВ фірма «Планер», 32-40.

Василенко, Н. В. (2015). Хмарні технології в управлінні навчальним закладом / Н. В. Василенко. – Х. : Вид. група «Основа», 112 с.

Полянський, П.В., Фельде, Х.В., & Богатирьова, Г.В. (2013). Голографія. – Чернівці : Чернівецький нац. ун-т, 208 с.

Рахманов, В. О. (2015). Методичні засади формування освітньо-інформаційного середовища у вищому технічному навчальному закладі. Вісник Національного авіаційного університету. Серія : Педагогіка. Психологія : зб. наук. праць. К : НАУ, вип. 2 (7), 98-103.

Спірін, О. М., & Головня, О. С. (2018). Застосування технологій віртуалізації Unix-подібних операційних систем у підготовці бакалаврів інформатики. Інформаційні технології і засоби навчання, 3 (65), 201-222.

Спірін, О. М., & Вакалюк, Т. А. (2018). Хмаро орієнтовані інтелектуальні карти як засіб інформаційно-аналітичної підтримки професійної діяльності викладача. Наукові записки Бердянського державного педагогічного університету. Серія : Педагогічні науки : зб. наук. пр., вип.1. Бердянськ : БДПУ, 227-234.

Abbasi, H., Zarei, T., Jalali Farahani, N., Granmayeh, & Rad A. (2014). Studying the recent improvements in holograms for three-dimen- sional display. Int. J. Opt. 2014, 1–7.

Agocs, T., Balogh, T., Forgacs, T., Bettio, F., Gobbetti, E., Zanetti, G., & Bouvier, E. (2006). 'A large scale interactive holographic display', in VR '06: Proceedings of the IEEE Virtual Reality Conference, IEEE Computer Society, Washington, DC, USA, 57.

Aina, O. (2010) Application of Holographic Technology in Education. Kemi-Tornio University of Applied Sciences, Tornio, 67.

Bailenson, J. N., Yee, N., Blascovich, J., Beall, A. C., Lundblad, N., & Jin, M. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. The Journal of the Learning Sciences, 17(1), 102-141.

Balogh, T., Dobranyi, Z., Forgacs, T., Molnar, A., Szlobod, A.L., Gobbetti, E., Marton, F., Bettio, F., Pintore, G., Zanetti, G., Bouvier, E. & Klein, R. (2006). An interactive multi-user holographic

environment', in SIGGRAPH '06: ACM SIGGRAPH 2006 Emerging Technologies, ACM Press, New York, NY, USA, 18.

Ezenwoke, A., Ezenwoke, O., Adewumi, A., & Omoregbe, N. (2016). Wearable technology: opportunities and challenges for teach- ing and learning in higher education in developing countries. INTED2016 Proceedings, vol. 1, Valencia, España, 1872–1879.

Gallagher, M., & Bayne, S. (2018). Future teaching trends: science and technology. Near Futu Teach, 1–10.

Katsioloudis, P., & Jones, M. (2018). A Comparative Analysis of Holographic, 3D-Printed, and Computer- Generated Models: Implications for Engineering Technology Students' Spatial Visualization Ability. Journal of Technology Education, 29 (2), 36-53.

Martín-Gutiérrez, J., Mora, C.E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. Eurasia J. Math. Sci. Technol. Educ. 13, 469–486.

Mohd, N.M., & Abd, N.D. (2016) A review of application of 3D hologram in education: a metaanalysis. In: 2016 IEEE 8th International Conference on Engineering Education Enhancing Engeering Education Through Academic Collaboration ICEED 2016, IEEE, 257–260.

Orcos, L., & Magreñán, Á.A. (2018). The hologram as a teaching medium for the acquisition of STEM contents. Int. J. Learning Technology, Vol. 13, No. 2, 163-177.

Paredes, S. G., Vázquez, N. R. (2020) Is holographic teaching an educational innovation? vol. 14, 1321–1336.

Rivera, R., & Tarín, C. (2015). Learning and teaching technology options, 1–134.

Potkonjak, V., Gardner, M., Callaghan, V., Mattila, P., Guetl, C., & Petrović, V.M., et al. (2016). Virtual laboratories for education in science, technology, and engineering: a review. Comput. Educ. 95, 309–327.

Redmond, P., Lock, J., & Danaher, P. (2015). Educational innovations and contemporary technologies: enhancing teaching and learning, 1st edn. Palgrave Macmillan, Hampshire, 169.

Sando, Y., Satoh, K., Kitagawa, T., Kawamura, M., Barada, D., & Yatagai, T. (2018). Super-wide viewing-zone holographic 3D display using a convex parabolic mirror. Scientific Reports, 8 (1), 1-8.

Subrahmanyam, V., & Swathi K. (2018). Artificial Intelligence and its Implications in Education. Int. Conf. Improv. Access to Distance High. Educ. Focus Underserved Communities Uncovered Reg. Kakatiya University, 1–11.

Upadhye, S. (2013). Use of 3D Hologram Technology in Engineering Education. IOSR Journal of Mechanical and Civil Engineering, 62-67.

Zapata, L., & Larrondo, M. (2016). Models of collaborative remote laboratories and integration with learning environments. Int. J. Online Eng. 12, 14–21.

REFERENCES

Bykov, V. Yu. (2012). Innovatsiinyi rozvytok zasobiv i tekhnolohii system vidkrytoi osvity. Suchasni informatsiini tekhnolohii ta innovatsiini metodyky u pidhotovtsi fakhivtsiv: metodolohiia, teoriia, dosvid, problemy [Innovative development of means and technologies of open education systems. Modern information technologies and innovative methods in training: methodology, theory, experience, problems]. Zb. nauk. prats, Vypusk 29. Kyiv-Vinnytsia: TOV firma «Planer», 32-40.

Vasylenko, N. V. (2015). Khmarni tekhnolohii v upravlinni navchalnym zakladom [Cloud technologies in the management of the educational institution]. N. V. Vasylenko. – Kh. : Vyd. hrupa «Osnova», 112 s.

Polianskyi, P.V., Felde, Kh.V., & Bohatyrova, H.V. (2013). Holohrafiia. [Holography]. Chernivtsi : Chernivetskyi nats. un-t, 208 s.

Rakhmanov, V. O. (2015). Metodychni zasady formuvannia osvitno-informatsiinoho seredovyshcha u vyshchomu tekhnichnomu navchalnomu zakladi [Methodical bases of formation of educational and information environment in higher technical educational institution]. Visnyk Natsionalnoho aviatsiinoho universytetu. Seriia : Pedahohika. Psykholohiia : zb. nauk. prats. K : NAU, 2 (7), 98-103.

Spirin, O. M., & Holovnia, O. S. (2018). Zastosuvannia tekhnolohii virtualizatsii Unix-podibnykh operatsiinykh system u pidhotovtsi bakalavriv informatyky [Application of virtualization technologies of Unix-like operating systems in the preparation of bachelors of computer science]. Informatsiini tekhnolohii i zasoby navchannia, 3 (65), 201-222.

Spirin, O. M., & Vakaliuk, T. A. (2018). Khmaro oriientovani intelektualni karty yak zasib informatsiino-analitychnoi pidtrymky profesiinoi diialnosti vykladacha [Cloud-oriented smart cards as a

means of information and analytical support of the teacher's professional activity] Naukovi zapysky Berdianskoho derzhavnoho pedahohichnoho universytetu. Seriia : Pedahohichni nauky : zb. nauk. pr., 1. Berdiansk: BDPU, 227-234.

Abbasi, H., Zarei, T., Jalali Farahani, N., Granmayeh, & Rad A. (2014). Studying the recent improvements in holograms for three-dimen- sional display. Int. J. Opt. 2014, 1–7.

Agocs, T., Balogh, T., Forgacs, T., Bettio, F., Gobbetti, E., Zanetti, G., & Bouvier, E. (2006). A large scale interactive holographic display', in VR '06: Proceedings of the IEEE Virtual Reality Conference, IEEE Computer Society, Washington, DC, USA, 57.

Aina, O. (2010). Application of Holographic Technology in Education. Kemi-Tornio University of Applied Sciences, Tornio, 67.

Bailenson, J. N., Yee, N., Blascovich, J., Beall, A. C., Lundblad, N., & Jin, M. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. The Journal of the Learning Sciences, 17(1), 102-141.

Balogh, T., Dobranyi, Z., Forgacs, T., Molnar, A., Szlobod, A.L., Gobbetti, E., Marton, F., Bettio, F., Pintore, G., Zanetti, G., Bouvier, & E. Klein, R. (2006). An interactive multi-user holographic environment', in SIGGRAPH '06: ACM SIGGRAPH 2006 Emerging Technologies, ACM Press, New York, NY, USA, 18.

Ezenwoke, A., Ezenwoke, O., Adewumi, A., & Omoregbe, N. (2016). Wearable technology: opportunities and challenges for teach- ing and learning in higher education in developing countries. INTED2016 Proceedings, vol. 1, Valencia, España:, 1872–1879.

Gallagher, M., & Bayne, S. (2018). Future teaching trends : science and technology. Near Futu Teach, 1–10.

Katsioloudis, P., & Jones, M. (2018). A Comparative Analysis of Holographic, 3D-Printed, and Computer- Generated Models: Implications for Engineering Technology Students' Spatial Visualization Ability. Journal of Technology Education, 29 (2), 36-53.

Martín-Gutiérrez, J., Mora, C.E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. Eurasia J. Math. Sci. Technol. Educ. 13, 469–486.

Mohd, N.M., & Abd, N.D. (2016). A review of application of 3D hologram in education: a metaanalysis. In: 2016 IEEE 8th International Conference on Engineering Education Enhancing Engeering Education Through Academic Collaboration ICEED 2016, IEEE, 257–260.

Orcos, L., & Magreñán, Á.A. (2018). The hologram as a teaching medium for the acquisition of STEM contents. Int. J. Learning Technology, 13, 2, 163-177.

Paredes, S. G., Vázquez, N. R. (2020). Is holographic teaching an educational innovation? 14, 1321–1336.

Rivera, R., & Tarín, C. (2015). Learning and teaching technology options, 1–134.

Potkonjak, V., Gardner, M., Callaghan, V., Mattila, P., Guetl, C., & Petrović, V.M., et al. (2016). Virtual laboratories for education in science, technology, and engineering: a review. Comput. Educ. 95, 309–327.

Redmond, P., Lock, J., & Danaher, P. (2015). Educational innovations and contemporary technologies: enhancing teaching and learning, 1st edn. Palgrave Macmillan, Hampshire, 169.

Sando, Y., Satoh, K., Kitagawa, T., Kawamura, M., Barada, D., & Yatagai, T. (2018). Super-wide viewing-zone holographic 3D display using a convex parabolic mirror. Scientific Reports, 8 (1), 1-8.

Subrahmanyam, V., & Swathi K. (2018). Artificial Intelligence and its Implications in Education. Int. Conf. Improv. Access to Distance High. Educ. Focus Underserved Communities Uncovered Reg. Kakatiya University, 1–11.

Upadhye, S. (2013). Use of 3D Hologram Technology in Engineering Education. IOSR Journal of Mechanical and Civil Engineering, p. 62-67.

Zapata, L., & Larrondo, M. (2016). Models of collaborative remote laboratories and integration with learning environments. Int. J. Online Eng. 12, 14–21.

В. Рахманов

ГОЛОГРАФІЧНІ ТЕХНОЛОГІЇ НАВЧАННЯ ЯК СКЛАДОВА ПІДГОТОВКИ МАЙБУТНІХ ІНЖЕНЕРІВ В УМОВАХ ОСВІТНЬО-ІНФОРМАЦІЙНОГО СЕРЕДОВИЩА ТЕХНІЧНОГО УНІВЕРСИТЕТУ

Резюме

У статті ***представлені*** *результати підготовки майбутніх інженерів за допомогою голографічних технологій для проведення лекційних, практичних та лабораторних занять. Коли*

відбувається глобальні зміни (пандемія, війна) освіта стикається з ризиком того, що не зможе продовжити свої звичні процеси і повинна перейти до миттєвих управлінських змін. ***Мета статті*** *полягає в тому, щоб визначити та окреслити позитивні елементи голографічних технологій, які допоможуть підвищити інтерактивність у процесі викладання та навчання.* ***Завдання дослідження*** *полягає у знаходженні альтернативного рішення щодо залучення новітніх технологій навчання у підготовку майбутніх інженерів. Як свідчить досвід, у такому випадку, освітньо-інформаційне середовище є найкращим рішенням для проведення занять. Але проблема навчання полягає в інтерактивності студента щодо покращення мотивації майбутніх фахівців за допомогою новітніх технологій. У технічному університеті пропонуємо запровадити інноваційні методи викладання та навчання, включаючи ігри, моделювання та голограми. Тим часом, підготовка є не лише передавання знань, але й активний, конструктивний та когнітивний процес, за допомогою якого майбутній інженер управляє внутрішніми ресурсами для формування ключових професійних компетентностей.* ***Методи дослідження*** *полягають у вивченні й узагальненні вітчизняного та зарубіжного досвіду для обґрунтування концептуальних положень голографічних технологій навчання, структурно-наукового аналізу, а також спостереження за навчальним процесом.* ***Результати.*** *Для покращення підготовки майбутніх інженерів в умовах освітньо-інформаційного середовища голографічні технології можуть бути корисні та стати ще одним ресурсом, який може змінити спосіб створення та проведення занять. Щоб отримати цей результат, необхідно вивчити доцільність голографічних технологій відповідно до підготовки в умовах освітньо-інформаційного середовища. У статті розкрито сутність розглянутих голографічних технологій, описано переваги та особливості їх впровадження у навчальній процес технічного університету. Це допомагає студентам активізувати пізнавальну діяльність та стимулювати їх до самоосвіти. У ході опрацювання низки дослідницьких ідей запропоновані різні наукові підходи до трактування терміну «голографічні технології».* ***Висновок.*** *Відповідно до наявних концепцій, голографічні технології розглядають як результат творчого процесу і як процес впровадження нововведень. Визначені особливості, перспективи впровадження голографічних технологій у навчальний процес технічного університету потребують подальшого детального аналізу та вивчення в комплексній взаємодії з інформаційними системами.*

Ключові слова*: голографічні технології навчання; інформаційні системи; навчальний процес; освітньо-інформаційне середовище; підготовка майбутніх інженерів*

DOI
УДК 658.386.012:656.7

L. Smolinchuk, O. Alpatova, N. Lytvynchuk

TRAINING OF INSTRUCTORS OF THE AVIATION EDUCATIONAL INSTITUTIONS AT THE NATIONAL AVIATION UNIVERSITY

Abstract

The article deals with the peculiarities of training of instructors of the aviation educational institutions at the National Aviation University. The purpose of training instructors is the formation of professional competencies within the existing qualifications, necessary for professional activity as a teacher. This activity has its own specifics and requires thorough psychological and pedagogical training.

Study Conduct. *The Department of Pedagogy and Psychology of Occupational Education carried out the study to improve the training of instructors as well as to take into account the experience of organizing relevant training. The survey of teachers (5 teachers with more than 20 years of work experience) and students (76 people) was conducted, regarding the structure, content of the program, the sequence of studying topics, methods and technologies of education.*

Results*. At the National Aviation University, the training of instructors of aviation educational institutions is carried out according to the improved program "Instructor (teacher) of an aviation educational institution". The proposed program includes five main content blocks, which allows the*