Possibilities of using smart technologies in the higher education system for high-quality training of specialists

Posibilidades de uso de tecnologías inteligentes en el sistema de educación superior para la formación de especialistas de alta calidad

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Abstract

The goal of Smart-education of the XXI century is written out – the development of skills in the conditions of a digital society, which are necessary for the successful professional activity of specialists; provision of an environment that creates competitive specialists due to a high level of development of the skills and knowledge of modern society among students of higher education. The concept of Smart-education is described, which involves the creation of an intellectual environment for the application of Smart-technologies in the higher education system with the aim of quality training of specialists, and continuous development of phase competencies in participants of the educational process. The main ideas that form the basis of the Smart concept are highlighted. The reason for the necessary implementation of Smart-

learning is proven. Positions unifying the educational process in the Smart environment are shown, the vision of the Smart-education strategy is presented, and its ultimate goal is described. In the process of our search, we conducted a survey of students and university teachers in order to compare the answers of the respondents and their actual attitude to the implementation of Smart technologies in the educational process.

Keywords: Smart education, Smart technologies, Smart environment, the system of higher education, quality training of specialists.

Resumen

Está escrito el objetivo de la Educación Inteligente del siglo XXI: el desarrollo de habilidades en las condiciones de una sociedad digital, necesarias para el éxito de la actividad profesional de los especialistas; provisión de un entorno que cree especialistas competitivos debido al alto nivel de desarrollo de las habilidades y conocimientos de la sociedad moderna entre los estudiantes de educación superior. Se describe el concepto de Educación Inteligente, que implica la creación de un entorno intelectual para la aplicación de tecnologías Inteligentes en el sistema de educación superior con el objetivo de una formación de calidad de especialistas y el desarrollo continuo de competencias de fase en los participantes del proceso educativo. Se destacan las ideas principales que forman la base del concepto Smart. El porqué de la necesaria implementación del Smart-learning está comprobado. Se muestran posiciones que unifican el proceso educativo en el entorno Smart, se presenta la visión de la estrategia Smart-education y se describe su objetivo final. En el proceso de nuestra búsqueda, realizamos una encuesta a estudiantes y profesores universitarios para comparar las respuestas de los encuestados y su actitud real hacia la implementación de tecnologías inteligentes en el proceso educativo.

Palabras clave: Educación inteligente, tecnologías inteligentes, entorno inteligente, el sistema de educación superior, formación de calidad de especialistas.

1. Introduction

Currently, the system of higher education, like society as a whole, is characterized by dynamic changes in educational technologies. The development of information and communication technologies and the Internet necessitates the introduction of smart technologies into the educational process of higher educational institutions.

The development and use of smart technologies in the teaching of disciplines raises the quality of student education to a new level, which meets the current and future needs of society for highly qualified specialists. The advantages of smart technologies are that they can develop students' creative abilities, professional knowledge, communication skills, ICT literacy; to form critical thinking, an innovative approach; to improve the skills of effective cooperation and mutual understanding, leadership, career development.

The 21st century creates a new stage of technological paradigm changes for modern society. The image and essence of the 20th century were determined by information technologies, which have now given way to Smart technologies, intending to open a new path of development in the society of the 21st century: Smart education, Smart economy, and Smart society. A Smart learning environment includes Internet infrastructure and ICT convergence. The development of information and communication technologies and the intensive introduction of e-learning into traditional education have led to Smart-education (Kademiya & Kobysia, 2019).

The smart information society is formed from civil society institutions, educational institutions, organizations of various levels, government bodies, and e nterprises. A key aspect of smart education is the application

of an adaptive approach based on the understanding of the country's citizens' motivation for change and their mentality. In connection with the development of society, the transition to Smart-education involves the opening of the content of higher education institutions to Smart-technologies for high-quality training of specialists, the growth of electronic mass media, the wide implementation of international standards, the emergence of vertical and horizontal competencies, the use of electronic textbooks, educational platforms, increased attention to the possibilities of realizing the potential, innovative resources and opportunities for the use of Smart-technologies in the purpose of high-quality training of specialists in scientists, teachers, students (Podlesnyi et al., 2019).

Mastering the techniques and methods of smart technologies requires the training of specialists in the field of smart education and the upgrading of the qualifications of teachers of higher education. The teacher should create a fundamentally new methodological support for training courses for the effective use of smart technologies.

Wide access to electronic educational materials through smart technologies and IT tools directs the student to independent acquisition of professional competences. Student learning is becoming more personalized, which becomes the basis for the development of personal educational programs focused on intelligence, creativity and creativity of future specialists.

2. Literature Review

The problem of using new information technologies in the educational process has been actively studied over the last decade, but remains quite relevant. In many studies of domestic and foreign scientists and teachers, the peculiarities of the use of new information technologies in the educational process have been considered. In particular, scientists such as Yu. Lukyanova, & V. Komar (2020). They revealed the significance of smart technologies, noted the varieties, and proved that smart technologies initiated a new educational paradigm. They showed the possibilities of smart technologies for the educational process and the formation of a creative personality, developed a trend for the implementation of tasks in the educational space; proposed ways of using smart technologies in the learning process, which encourages learners of educational space to engage in cognitive and creative activities.

Yu. Drachuk, L. Sav'yuk, & Ye. Snitko (2019) developed the stages of application of smart technologies and revealed the priority direction of innovative technologies in the educational process of higher education institutions. Determined the most effective indicators and criteria; characterized the effective principles of using smart technologies. They showed the possibilities of using Smart technologies in the educational process. The professional competencies of education seekers, which can be acquired with the help of Smart technologies, were described.

M. Kademiya, & V. Kobysya (2019), based on modern network technologies, showed the possibilities of Smart-technologies, the ways of designing and implementing Smart-learning, and the possibilities of smart technologies for the higher education system for quality training of specialists. We analyzed the approaches to the formation of requirements for the creation of a Smart textbook, and implemented the design of Smart education for the higher education system using cloud technologies, using network technologies in a higher education institution. The systematization, analysis, and generalization of studies on the problem of using the capabilities of Smart technologies for quality training of specialists for the higher education system in scientific, educational, and organizational activities have been carried out. Recommendations for designing open software and a Smart textbook were developed using Internet resources. The possibilities of smart technologies for the higher education system for high-quality training of specialists are shown.

A. Kushnir (2020) showed the advantages of using Smart technologies, in particular social networks for the higher education system for high-quality training of specialists, which enable students to create their own

content, YouTube as a teaching and learning tool, blogs, which is convenient and fashionable among students; form a special communicative space; complex educational material, a Smart textbook, which is created using the Internet and technological innovations; mobile education technologies (the educational process is carried out with the help of gadgets and software). The importance and necessity of using Smart-technologies in the educational process are shown, and the diversification and interest of using Smart-technologies in the educational process are shown to increase the cognitive interest and motivation of education seekers due to the real, visible result of their professional activity, which allows the application of traditional and innovative learning technologies, ensures the exit of educational services to a new level of quality.

Scientists emphasize that the introduction of ICT into the educational process and its digitalization allows the implementation of a new format of education. The informational and advisory environment, created by means of ICT, is considered by modern scientists as a component of the educational environment and acts as a complex, multifaceted formation.

R. Gurevich, & K. Maya (2016) gave a definition of Smart-education, based on the transition to Smart-education and the development of e-learning, showed the peculiarities of improving the educational system in higher education institutions, emphasized the need to develop open online courses, use modern ICT and their use in the educational process of higher education institutions, improve the qualifications of specialists throughout their lives with the help of such components that are the basis of the implementation of Smart-education in higher education institutions: organizational, technological, pedagogical.

O. Rogulska, & O. Tarasova (2016) showed ways to implement Smart-education in a higher education institution, which will contribute to the acquisition of competencies by the training of specialists for lifelong learning and the conditions of the modern labor market. Based on the smart Board, the importance of the software-technological educational complex, which is known as the "interactive board" and is the main component of smart technologies, was revealed. The software-technological educational complex with the help of traditional and innovative pedagogical learning technologies allows to create an information and communication environment.

T. Lagutina (2014) presented the meaning of the concepts of "Smart-education", "Smart-society", "Smart-learning", "Smart-university", where the teacher is not a carrier of information, but a facilitator of communication in the process of joint activities with students of education. The main factors for the application of Smart technologies are described: dynamic adaptation to social changes and the surrounding environment of future specialists; rapid transfer of knowledge and information by the requirements of the information society reforming the educational system.

A. Sydorenko (2019) proved the significance of technological smart tools for the field of education: programs: Bridgit, Calameo, Prezi, PhotoPeach, Dipity; software for implementing the educational process of a communicative and interactive nature; Smart projectors; Smart-boards that allow you to carry out the educational process with high quality and quickly present presentations for partners and others all over the world.

Analyzing the works of scientists, we note that smart technologies, despite their prevalence and undeniable value in the educational environment of higher education institutions, are not fully used for the purpose of professional training of teachers.

The analysis of psychological and pedagogical literature proves that the effective introduction of smart technologies into the educational process is possible under the conditions of the introduction into the educational process of their preparation of information and communication technologies of education.

Purpose of the article: to find out the possibilities of Smart-technologies for the higher education system for high-quality training of specialists.

3. Methodology

To achieve the goal, research methods were applied: comparative analysis of normative, legislative documents, pedagogical, psychological, philosophical, methodical sources – to determine the component composition and essence of the studied ability, clarify the state of development of the problem of applying Smart technologies for the higher education system for the purpose of high-quality training of specialists, clarification of the conceptual and categorical research apparatus; generalization, synthesis – to justify the methodological and theoretical foundations of the research; modeling – for designing a pedagogical system for the application of Smart technologies for the higher education system for the purpose of high-quality training of specialists; systematization – for formulating conclusions; pedagogical forecasting – to develop the possibility of Smart technologies for the higher education system with the aim of quality training of specialists and promising areas of professional training of competitive specialists.

The study is based on the introduction of developed Smart technologies for the higher education system with the aim of quality training of specialists that ensure the effective formation of a competitive person, purposeful training in the created Smart society, oriented in the educational process to the modernization and modification of components using modern technologies.

Based on the approaches of scientists, the results of the analysis of the scientific search for Smart-technologies for the system of higher education for quality training of specialists in the Smart-society, education is considered as an educational process using the Internet and technological innovations, which contains a large number of sources, is flexible, includes a variety of multimedia, and can simply adjust to the needs of the future specialist.

The scientific search for proving the importance of Smart technologies for the higher education system with the aim of quality training of specialists in the unity of interrelated concepts: methodological, theoretical, technological, and practical.

The methodological concept of purposeful application of Smart technologies for the system of higher education for high-quality training of specialists represents approaches to the study of the specified problem, which are the main ones:

– systemic, which ensures the organization of systemic actions aimed at the formation of the studied phenomenon; study of the problem of applying Smart technologies for the higher education system with the aim of quality training of specialists, quality formation of the consciousness of future specialists in the process of preparation for competitive work at all stages of research;
– personally oriented, which involves the creation of methods, content, and environment for the application of Smart-technologies for the higher education system for high-quality training of specialists, individual self-realization of education seekers, disclosure of the personal potential of the future specialist, self-development of a person's personal qualities;
– competency-based, which involves the reorientation of the educational paradigm to creative, active, independent activity for the higher education system for high-quality training of specialists, when the potential of each student of higher education is revealed, which allows them to actively apply acquired competencies and act professionally in various life situations;
– activity, which justifies the use of Smart technologies for the higher education system for high-quality training of specialists in the process of active activity;

– axiological, which directs educational activities to the application of Smart technologies for the higher education system for high-quality training of specialists, humanistic development of the individual to acquire the value of life;
– reflexive, aimed at the formation of Smart technologies for the higher education system to stimulate professional self-development and self-improvement, quality training of specialists, and self-monitoring of the effectiveness of professional activity in the professional sphere.

4. Results and Discussion

Smart education generates this new quality of society, this "Smart-Society", new ideas, and knowledge aimed at the development of a Smart-environment, Smart-society, such an intellectual environment where future specialists are specially prepared for the implementation and implementation of the latest ideas and concepts (Kademiya & Kobysia, 2019).

Currently, the world is witnessing a paradigm shift in the development of the educational sector, which is associated with the emergence of innovative open online courses (Massive Open Online Course (MOOC)). Because of open access to the Internet, they are interactive, large-scale, free, educational courses. Since 2013, an innovative platform for MOOS – NovoED – has been launched. This project was proposed by the developers of Stanford University. Where they offered many practice-oriented courses, which are characterized by: the implementation of projects, productive teamwork, a new rating system, strengthening of communication between members of working groups, absence of tests, and responsibility of each participant for the performance of a common task. All this contributes to the successful assimilation of integral courses and motivates students to study. MOOS was created as a network project in the USA for leading institutions of higher education but has proved to be very popular and constantly attracts a large number of institutions of higher education from all over the world. The EDX project was first joined in 2013 by such institutions of higher education as Seoul National University, South Korea (SNUx), Hong Kong University of Science & Technology (HKUSTx), The University of Hong Kong (HKUx), Peking University, China (PekingX), Kyoto University, Japan (KyotoUx) and others. The first European MOOS was created in May 2013. The project presented 40 free courses in 12 different languages, which were created by the European Association of Distance Learning Universities (EADTU). Great Britain, Israel, Italy, Spain, Lithuania, Netherlands, Portugal, Slovakia, Turkey, and France took part in the project. Therefore, each institution of higher education should not develop its MOOS in full (Gurevych & Maya, 2016).

In the Smart society, education is considered as a process using the Internet, smart technologies for the higher education system for quality training of specialists. The Smart-education paradigm presupposes an active exchange of experience and ideas, a large number of sources, personalization of the course, the ability to easily and quickly adapt to the needs and level of the learner, including the flexibility and variety of multimedia, saving time on refining already existing educational content instead of creating it from scratch (Ivanenko, 2014).

The main goal of Smart-education is to develop the skills necessary for the successful professional activity of specialists in the conditions of a digital society.

When analyzing technological innovations for the field of education, which are positioned as Smart, we will list the following: software for creating educational content, Smart-textbooks, Smart-projectors, Smart-boards, software of an interactive and communicative nature for the distribution of educational content; Smart technologies: Web 2.0 (Data Mining technologies, types of Social Media) used in the Smart-education segment, Google services and tools, Facebook social service, Wiki website, for distribution of video and sound files, blogs, YouTube video hosting, etc (Martyniuk et al., 2022).

The concept of Smart-education provides for the creation of an intellectual environment for the application of Smart-technologies for the higher education system with the aim of quality training of specialists, and continuous development of phase competencies in participants of the educational process. The technical basis for the implementation of Smart technologies for the higher education system for high-quality training of specialists is a set of devices (smartphones, laptops, computers, tablets, etc.) belonging to both students and educational institutions, as well as the presence of an Internet network (Kushnir, 2020).

The concept of smart education contributes to the formation of a paradigm of Smart technologies for the higher education system with the aim of quality training of specialists capable of ensuring the quality organization of the learning process throughout life and in close relationship with the requests and needs that are programmed by the system of social reproduction. Integration of Smart-education in the system of higher education gives rise to several paradoxical phenomena, which are related to software, teaching, financial, material, and technical support of the educational process; the process of knowledge transfer, the transformation of the composition of education providers by its results and effectiveness, monitoring of their assessment (Lypov, 2019).

The mechanization of human life requires a high level of literacy among all members of society (Omonayajo et al., 2022). The development of the world economy requires well-trained specialists of various levels. The concept of "Smart" can respond very quickly to the demands of the world and its economy. As part of the development of progress, most developed countries promote the concept of Smart not only in the education system but also in the economy as a whole (Alelaiwi et al., 2015).

Let's highlight three main ideas that form the basis of the Smart concept:

1. Mobile access. Providing all kinds of digital services anywhere in the world, while the services are directed individually to each user.
2. Creation of new knowledge. The development of each country is not possible without the constant acquisition of competitive knowledge, which forms the basis of the modernization of the economy.
3. Creating a Smart Environment. The appearance of certain technological developments is possible in the Smart environment, which allows stimulating science and industry and reaching the world level when one of the main ideas is the basis of a "smart" economy and the information and technological environment approaches natural intelligence (Huzenko, 2020).

The intensive development of applications to digital technologies and their rapid development contributed to the emergence of mobile education technologies, in the case when training is carried out using:

– own gadget;
– Smart application;
– special software.

The Google system helps to install the software, using the "Play Market" application. Such an application is installed in the tools of the mobile operating system of Android smartphones and tablets.

In the Google system, when registering an account, students have access to all network applications of the Google system. The application provides education seekers with a wide range of categories for study and leisure. When you enter the name of an educational subject in the Google Play Market search engine, a list of mobile apps will appear from any subject, such as: "Kahoot", "LearningApps", "WiseMapping", "Thinglink", "Word It Out!" etc. The "Plickers" application, which simplifies the teacher's life, allows you to survey students in any subject directly and in just a few minutes. The basis is the website, mobile application, and cards with QR codes (Quick Response). Using "Plickers" provides an opportunity to get away from routine activities and is real entertainment for students, because the game form can be given to answer questions (Kushnir, 2020).

The main aspects of Smart-learning are the creation of an open and flexible educational environment: the use of open educational resources, gadgets, and an educational process management system.

To the new requirements of a Smart society and Smart economy, the reason for the actual implementation of Smart education is the urgent possibility of improving the entire existing educational system (Yang et al., 2022).

The main goal of Smart-learning in the 21st century is to provide an environment that creates competitive specialists at the expense of a high level of development of the skills and knowledge of modern society in the students of education:

– ability to think critically;
– social responsibility;
– cooperation and communication;
– prompt and high-quality problem-solving (Washizaki et al., 2020).

For the modern system of higher education with the aim of quality training of specialists in a Smart environment, the educational process combines:

– knowledge and databases, electronic textbooks, libraries, additional materials, educational and methodical complexes, etc.;
– in the open model of individual asynchronous learning, the interaction of education seekers;
– means of electronic communication, software shells.

The vision of the Smart-education strategy and its ultimate goal is the promotion of global human talents, and the development of creative abilities, through the "revolution in the group", to update the content of education, teaching methods, and knowledge monitoring:

– to work and collaborate on project tasks, teachers join SNS social networks (https://education.microsoft.com);
– teachers work in Smart Classroom (https://classroom.google.com), at the level of an educational institution for the successful implementation of Smart-education, improving classes in workshops, laboratories, and classrooms, solving educational problems of students.

The organization of feedback is an important factor of Smart-education, to preserve educational materials, student motivation, and records. In this process, the creation of cyberspace is necessary for the joint further use of resources.

Therefore, for Smart-learning, a created Smart-environment, a Smart-textbook with authorization based on the construction of an individual learning trajectory and the help of an account are necessary (Kademiya & Kobysia, 2019).

The implementation of Smart-technologies for the system of higher education for the purpose of quality training of education specialists should be aimed, first of all, at determining what needs to be studied in specific conditions, at ensuring the search, acquisition, transfer and presentation of knowledge. In the process of our search, we conducted a survey of students and teachers. A total of 200 respondents took part in the survey: 126 students and 74 teachers. The text of the questionnaires for students and teachers contained questions where you could choose one of the possible answers to each question: Some questions of questionnaires and teachers were identical. With this, we followed the goal: to compare the answers of the students of the educational process and their actual attitude towards the implementation of Smart

technologies in the educational process. We present the results of the conducted survey, where we included only those questions, the answers to which gave us the opportunity to make a comparison.
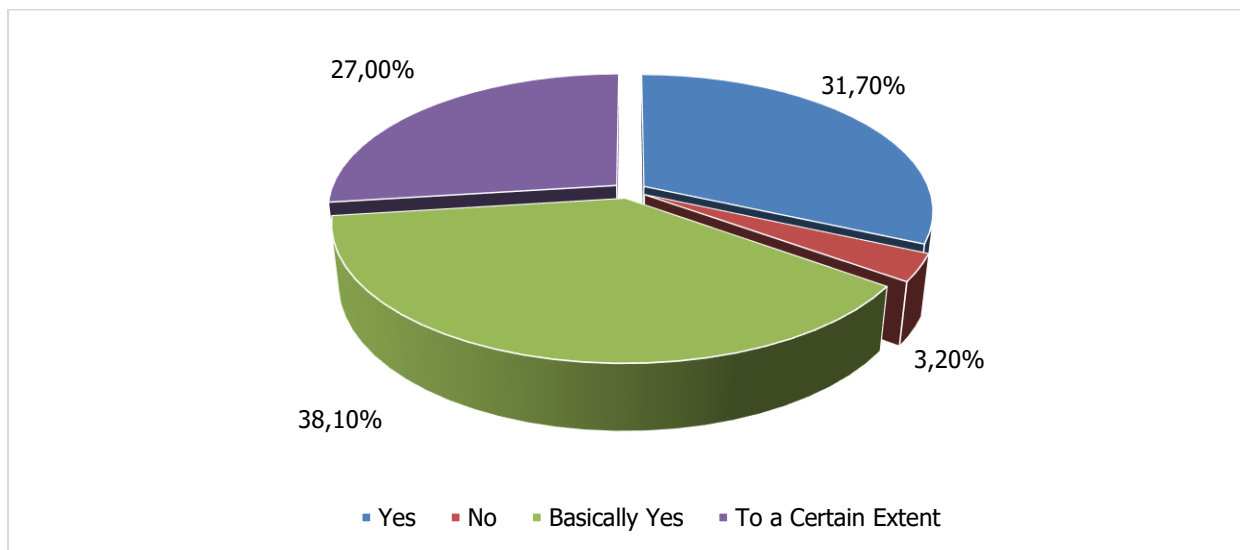

Figure 1. Answers of the respondents regarding the necessity of implementing Smart learning technologies in the system of professional education.

As we can see from fig. 1. the majority of respondents agree that it is necessary to implement Smart learning technologies in the system of professional education.
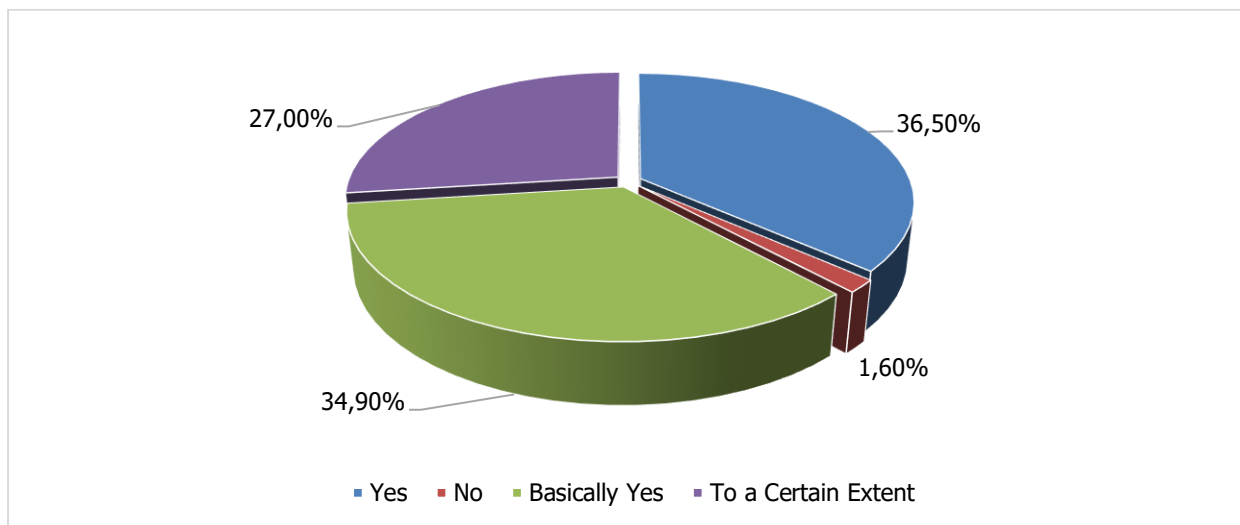

Figure 2. Answers of respondents regarding the actual benefits of using Smart learning technologies in the process of professional training in vocational schools

Fig. 2 a diagram is presented, which testifies to the benefits of using Smart learning technologies in the process of professional training of specialists in higher education institutions.
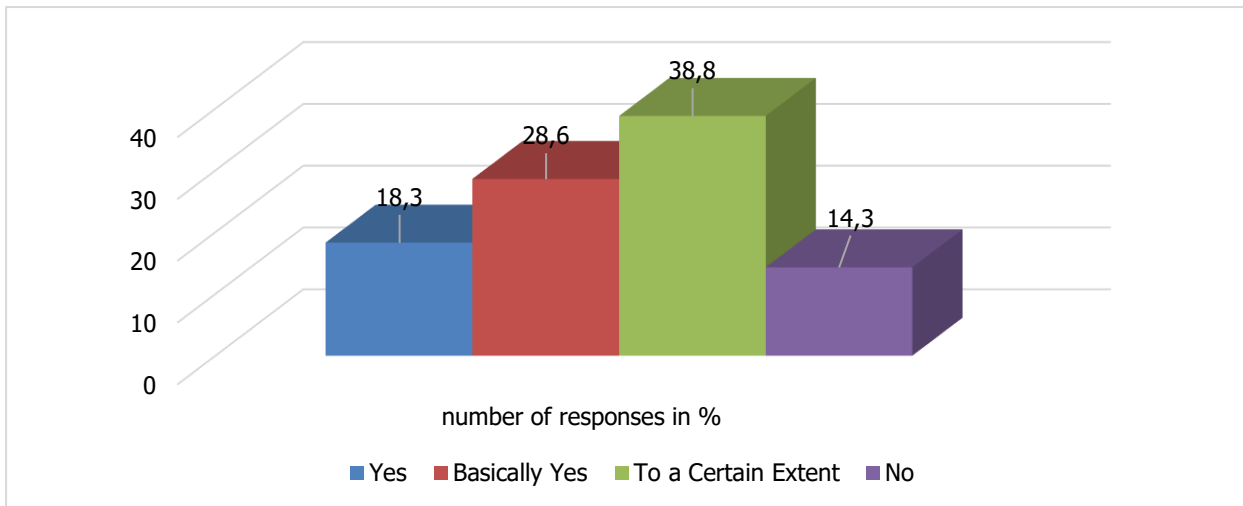
Figure 3. The results of the students' answers regarding their attitude to learning with the use of Smart technologies of learning in university.
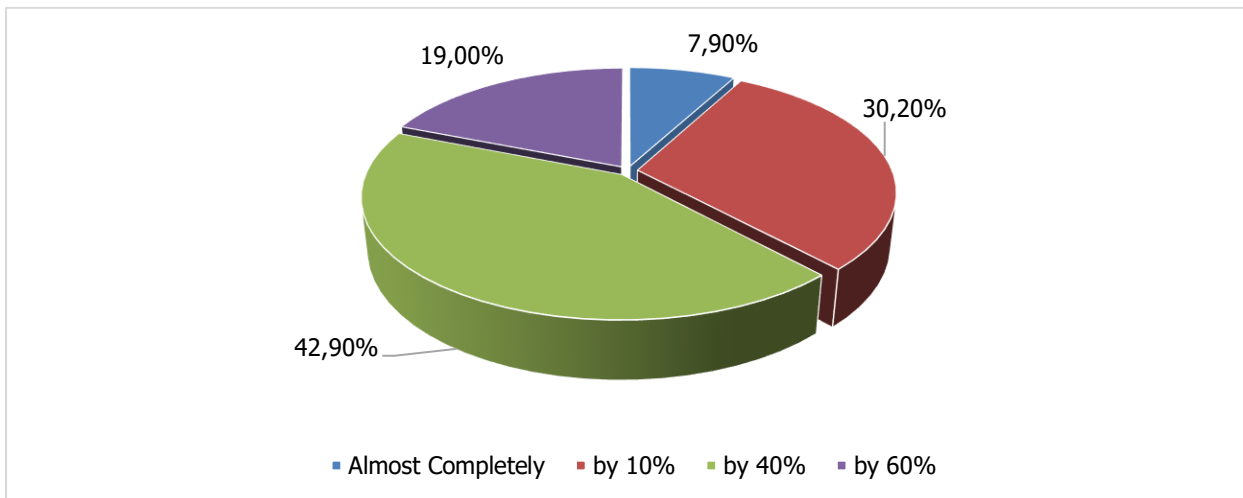

Figure 4. The results of students' answers on the direct impact of Smart learning technologies.

Fig. 4 diagram of the results of students' answers on the direct impact of Smart learning technologies on the formation of their personal qualities 42.9% of students answered that, in their opinion, almost 40% of the introduction of Smart-technologies into the educational process of higher education ensures the formation of their personal qualities (Fig. 4). To the question: what percentage of teachers who work with you are focused on the use of Smart learning technologies, 42.9% of students answered that, in their opinion, almost 10% (Fig. 5).
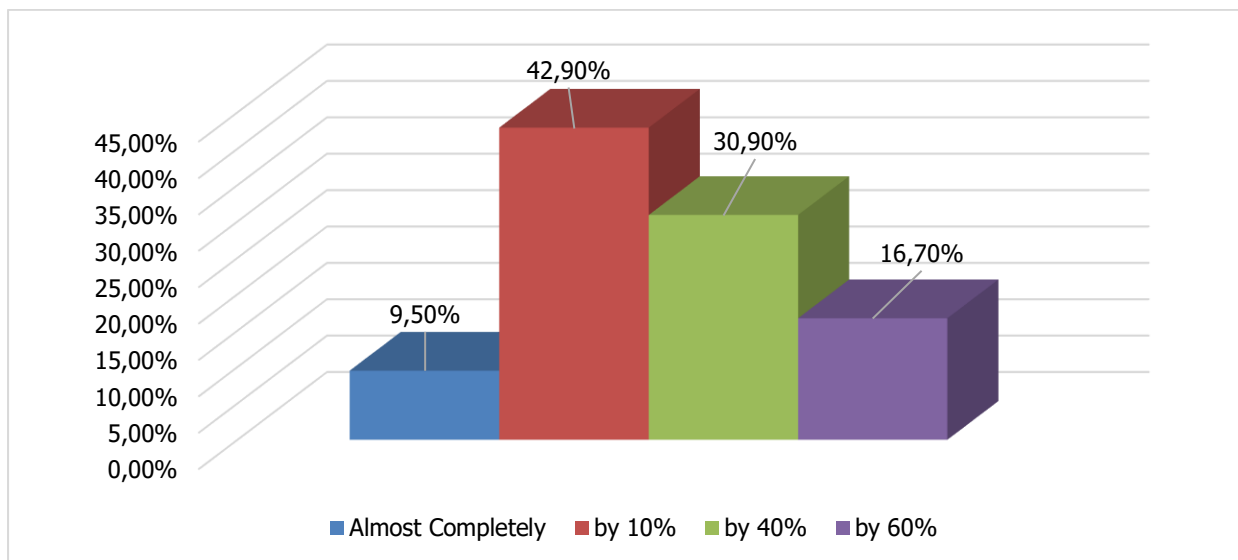
Figure 5. Orientation of teachers to the use of Smart technologies in the educational process (based on the results of a student survey).

Fig. 6, we have presented a diagram that allows us to compare the answers of students and teachers regarding the actual use of Smart technologies in the educational process of higher education institutions.
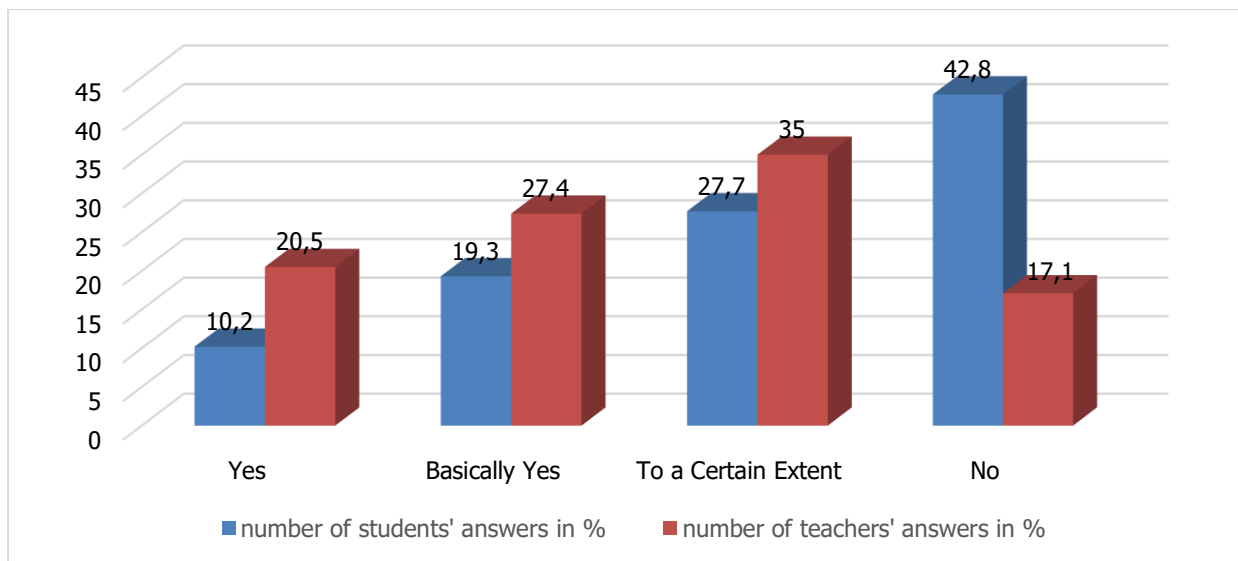

Figure 6. Results of a survey of students and teachers on the actual use of Smart technologies in the educational process of higher education.

As we can see, the results of students and teachers differ somewhat. In our opinion, this is explained by the fact that some of the teachers did not answer the question honestly enough. However, in terms of the effectiveness of using the method in the educational process of Smart-technologies, the answers of teachers and students differ little from each other (Fig. 7).
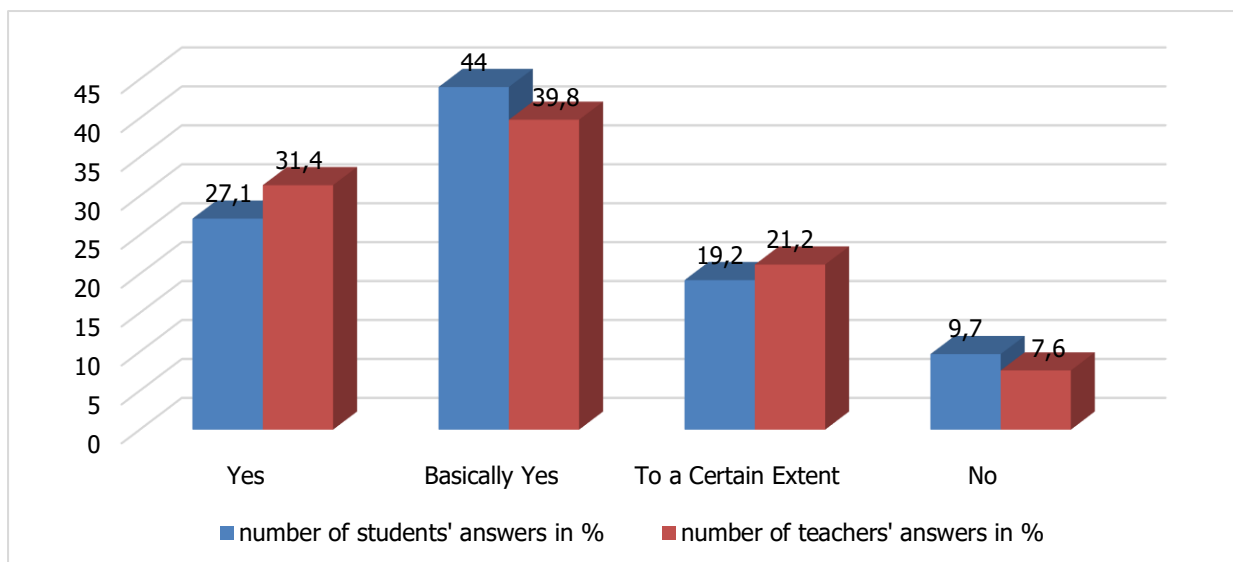
Figure 7. Results of a survey of students and teachers on the effectiveness of innovative methods using Smart technologies in teaching subjects in a higher education institution.

The results of the study showed the need to introduce Smart technologies into the educational process for the purpose of quality training of competitive specialists.

Opportunities to realize the potential of innovative resources are laid in scientists, teachers, and students. In order to implement high-quality Smart education, it is necessary to implement the principles of Smart education and three main components: technological, organizational, and pedagogical.

Let's highlight the main principles of Smart education:

1. Organization of research, independent, project, cognitive activities of education seekers. This principle is the main one for the higher education system, contributes to the high-quality training of specialists, and encourages students to research independent, informational activities, and creatively search for solutions to assigned tasks.
2. Use of current information to solve educational problems according to the educational program. In the world and professional activities of specialists, the volume and speed of information flow are growing rapidly. Educational materials, to solve practical tasks, must be supplemented with information in real time, to work in a real situation.
3. Implementation of the educational process in a distributed educational environment. Nowadays, the educational environment is not limited to the distance learning system or the territory of the higher education institution. The learning process to apply Smart-technologies for the system of higher education should be continuous, including educational activities with the use of tools of professional activity in a professional environment.
4. Interaction of education seekers with the professional community. In the educational process, a professional environment for the quality training of specialists is important. The use of Smart technologies for the higher education system in the educational process provides an opportunity for all students to participate in telecommunication projects, create software products, work in professional environments, and more. The task of a higher education institution is to provide educational services by the needs and capabilities of those seeking education.
5. Individualization of training and the use of flexible educational trajectories for this purpose. The educational process is carried out not only by education seekers, but also by working citizens who wish

to carry out their retraining, gain competitive knowledge, and improve their qualifications. The task of an educational institution is to provide, by the needs of each person, educational services.

6.   Multifaceted educational activity for all those who wish to learn, providing wide opportunities, from any educational program by the capabilities of the institution of higher education, social conditions, and laboratories.

To implement Smart-education, it is necessary to implement three main components: technological, organizational, and pedagogical.

The basis of the technological component is information Smart technologies, the properties of which are: the possibility of data personalization, interactivity, the creation of a virtual personality of the user, and the ability to intelligently analyze data. In the higher education system, for high-quality training of specialists, a variety of multimedia capabilities, and capabilities of Smart technologies that allow the creation of educational content can be used. "Smart" technologies create a "presence effect", significantly speed up the exchange of content, change its qualitative composition, and enable communication between students of education.

The organizational component of Smart education is based on the effective application of Smart technologies. Educational programs should be formed based on the profiling of education, taking into account the possibility of integration of various educational programs, and individual educational trajectories. Compliance of educational programs with the principle of continuity of learning (lifelong learning) is mandatory. Great importance should be attached to the management of educational resources, educational content in Smart education. To achieve this goal, it is necessary to constantly adjust educational resources, supplement educational activities with information from blogs, sites, web quests, etc.; implement academic knowledge management to ensure flexibility in the development and use of educational content (Koval-Mazyuta et al., 2023).

The pedagogical component of Smart-education is an effective combination of pedagogical methods of learning and technologies for their achievement. Training tools are formed on their basis and specialized information Smart technologies are used (Gurevych & Maya, 2016).

During the experiment, we saw the need, when applying Smart technologies, to develop such requirements for teachers as: the ability to use the available pedagogical toolkit of the lesson, to integrate it into the multimedia space. With this approach, the teacher uses interactive infographics, slides, presentations, audio and video materials, etc., that is, independently developed multimedia products and products obtained by connecting to external sources. To master the methods and techniques of Smart-technologies, it is necessary to improve the qualifications of higher education teachers and innovative training of specialists in the field of Smart-education (Kademiya & Kobysia, 2019).

During the experiment, the main tasks of implementing Smart technologies in the higher education system with the aim of quality training of specialists were highlighted:

–   creation of infrastructure for the implementation of Smart technologies;
–   the electronic board and tablets must be connected, to ensure convenient work in the classroom for the quick transfer of data from the teacher's tablet or blackboard to the device of the students;
–   application of platforms for Smart technologies;
–   conducting teacher training in specially equipped Smart-classes;
–   for life-long learning in an electronic environment with Smart-devices to enhance teachers' ICT competencies;
–   based on wireless Internet, conducting educational events with the expansion of the influence of mobile learning;

- provision of educational space with Smart devices (tablets such as Galaxy Tab, Galaxy Note, Ipad mini, Ipad; mobile phones, portable computers with telephone functions based on the operating systems IOS, Windows Phone, Android, and others that perform the function of downloading and deleting programs);
- the creation of an educational trajectory of an individual route of knowledge acquisition and professional development of the personality, which reflects the creativity of teachers, talent, and personal abilities of a person;
- creation of an educational community for active learning from the provided content on the Internet with the greatest efficiency of knowledge acquisition;
- creation of flexible learning in an interactive educational environment, uniting teaching staff and educational organizations in the "Internet" network for joint educational activities based on agreements, common standards, and Smart technologies;
- application of "Flipped Classroom", a new teaching method;
- support of bilateral services using smart technologies for the higher education system for high-quality training of specialists: on one platform, education seekers choose different services;
- development of training courses using Smart technologies, human resources, and improvement of the educational environment;
- conducting interactive online lessons with the creation of tasks for the online monitoring and evaluation system;
- active use of social networks to solve professional problems of education seekers, resources of network communities of teachers;
- for the development of Smart-technologies and determining the effectiveness of establishing open interaction with various social spheres;
- the application of the principle of "peer-to-peer" education, each teacher who has undergone professional development passes on the acquired knowledge and pedagogical experience to colleagues at his institution and other institutions of higher education;
- development of the content of digital manuals;
- construction of a single platform and creation, management, and distribution of educational content (Huzenko, 2020).

For the effective management of the new education system and the formation of Smart e-learning, the following provisions must be fulfilled:

1) a clear strategy of the educational space;
2) lifelong professional development of teachers and students;
3) creation of Smart pedagogy;
4) solving the problem of competencies for the knowledge society;
5) to form a generation of educated people;
6) promote effective management of the educational system;
7) create and update the technical environment.

Currently, the Internet helps the application in the educational space of Internet portals that offer educational materials for free, including online courses from leading teachers. The best free courses that are available for improving the qualifications of specialists in various fields or a specific area are called:

1. Massachusetts Institute of Technology – mit.edu – a project launched by OpenCourseWare University, which offers more than 1,800 free courses for education.
2. Carnegie Mellon University – cmu.edu – offers materials and online courses based on the Open Learning Initiative program.
3. Open University – open.ac.uk – the OpenLearn site provides free access to the university's educational course materials.
4. Tufts University – tufts.edu – the OpenCourseWare university program is available to everyone.

5. Stanford – stanford.edu – one of the world's leading educational institutions, Stanford University has joined Tunes U to provide access to Stanford courses.

For high-quality training of specialists for the higher education system, mobile learning is of great importance, which is considered with the help of mobile devices as e-learning, the use of mobile technology is proposed both jointly and separately with other ICT, regardless of the place and time of the educational process. Such an educational space corresponds most to the idea of Smart-Education, as it is maximally oriented towards conscious independent work because it is created according to the BYOD ("bring your own device") model.

Thus, the application developed for mobile devices and for stationary computers Mobl21 (http://www.mobl21.com/workflow/) can ensure the educational process: to allow repeating the learned material, to get advice from the teacher, to provide access to methodical material, etc. To organize the independent work of students, teachers use Mobl21 in offline mode, which helps motivate students to independently search for information, create tests and create video files and podcasts this.

More than 10,000 lectures are presented to education seekers on the mobile application of the TED project. Plickers with the help of cards with QR codes enable teachers to instantly assess the reaction of the audience to the learned program material and allow them to use a maximum of channels to receive educational information (visual, audio, and tactile). This is the beginning of the widespread use of augmented reality elements in the educational process.

The mobile application Google – Classroom, supported in 42 languages, open to everyone, and integrated with the well-known applications Drive and Google Docs, allows you to quickly create and send tasks, and check them online (Harris et al., 2022).

More and more institutions of higher education are using smart technologies for the higher education system for high-quality training of specialists, entering the interactive sphere of mobile learning. With this approach, the teacher is a constant guide of knowledge and a more active mentor in the life of a modern student of education (Kostyria et al., 2023).

Let's consider three e-learning models that exist in the educational space and are necessary for high-quality training of specialists, which was proven during the experiment:

1. "Teacher-directed activity". Educators are provided with educational content that is accessible to all on mobile devices for individual or group completion, in and out of the classroom. The tasks proposed by the teacher are obligatory for students to complete. With this approach, it is mandatory to have your own device.
2. "Teacher-set activity" gives students freedom of action: the proposed tasks can be performed or not performed, because they are additional, not educational, but developmental in nature. Such an e-learning model is focused on supporting the initiative of the learner and motivating cognitive activity.
3. "Autonomous learning activity" emphasizes autonomous, independent educational activity, which means it contributes to practical direction. This model is conducive to self-directed learning. Education seekers independently choose the content to master the educational layer.

LMS (Learning Management System) remains the most popular mobile service for the higher education system for quality training of specialists, the purpose of which is the organization and monitoring of the administration of the educational process as a whole and the use of electronic educational materials. Modular ObjectOriented Dynamic Learning Environment (Moodle) remains the most popular LMS in modern institutions of higher education for quality training of specialists. In the system of higher education, the majority of "Open (network) universities" work on this platform for quality training of specialists. The evolution of forms of communication of people in the Global Network, sameness, and universality as essential properties of LMS, in particular

Moodle, contribute to the innovative transition from LMS systems to the concept of organizing a personal educational environment PLE (personal learning environments) (Podlesnyi et al., 2019).

5. Conclusions

In the Smart society, education is considered as a process using the Internet, smart technologies for the higher education system for quality training of specialists. The goal of Smart-education of the XXI century is written out – the development of skills in the conditions of a digital society, which are necessary for the successful professional activity of specialists; providing an environment that creates competitive specialists due to the high level of development of the skills and knowledge of modern society among students of higher education:

The concept of Smart-education is described, which involves the creation of an intellectual environment for the application of Smart-technologies for the higher education system with the aim of quality training of specialists, and continuous development of phase competencies in participants of the educational process. The technical basis for the implementation of Smart technologies for the higher education system for high-quality training of specialists is represented by a set of devices.

Three main ideas that form the basis of the Smart concept are highlighted. The reason for the actual implementation of Smart-learning is shown (an urgent opportunity to improve the entire existing educational system).

Positions unifying the educational process in the Smart environment are shown, the vision of the Smart-education strategy is presented, and its ultimate goal is described. The organization of feedback, which is an important factor of Smart education, is characterized.

In the process of our search, we conducted a survey of students and teachers of university in order to compare the answers of the respondents and their actual attitude to the implementation of Smart technologies in the educational process.

The main principles of Smart-education and the main components: technological, organizational, and pedagogical are highlighted.

The implementation of Smart technologies in the system of higher education for high-quality training of specialists involves solving such tasks as shown in the article.

The provisions necessary for the effective management of the new education system and the formation of Smart e-learning are described.

Currently, the Internet helps the application in the educational space of Internet portals that offer educational materials for free, including online courses from leading teachers. The best free courses are offered to improve the qualifications of specialists in various fields or in a specific area that are available.

Three models of e-learning that exist in the educational space are considered.

Further research will be aimed at solving the problems of implementing Smart technologies in the higher education system for quality training of specialists.

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