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## INNOVATIVE SMART TECHNOLOGIES: EDITING, CREATION, AND DISTRIBUTION OF AN INTERACTIVE COMPLEX OF MULTIMEDIA EDUCATIONAL MATERIALS

### TECNOLOGÍAS INTELIGENTES INNOVADORAS: EDICIÓN, CREACIÓN Y DISTRIBUCIÓN DE UN CONJUNTO INTERACTIVO DE MATERIALES EDUCATIVOS MULTIMEDIA

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#### ABSTRACT

The article theoretically substantiates the peculiarities of the use of Smart technologies in the educational process of higher education institutions for the implementation of high-quality training of a competitive specialist. The main feature of Smart technologies is named, their uniqueness is proven; and specific features are singled out (polyfunctionality, integrability, dynamism). The analysis of questionnaires showed that 89% of students believe that the use of Smart technologies reduces the time they spend on studying a subject. As a result of research and experimental work, it was possible to achieve in most students of the experimental group an increase in interest in learning, in the organization of independent work, in the efficiency of the educational process, and in teachers, we observe an increase in professional skill in their professional work.

The necessity and importance of using one of the components of Smart technologies in the educational space is offered for interactive learning. The most essential principles of Smart education are highlighted. Based on these principles, attention is focused on the three important elements of Smart Education (innovation, flexibility, creativity), which lead to the disclosure of creative possibilities and potential of the individual.

#### Keywords:

Smart technologies, institutions of higher education, quality training, Smart Board, concept of Smart education.

#### RESUMEN

El artículo fundamenta teóricamente las peculiaridades del uso de tecnologías inteligentes en el proceso

educativo de las instituciones de educación superior para la implementación de una formación de alta calidad de un especialista competitivo. Se nombra la característica principal de las tecnologías inteligentes, se demuestra su singularidad; Se destacan características específicas (polifuncionalidad, integrabilidad, dinamismo). Se realizó un estudio experimental. El análisis de los cuestionarios mostró que el 89% de los estudiantes cree que el uso de tecnologías inteligentes reduce el tiempo que dedican al estudio de una materia. Como resultado de la investigación y el trabajo experimental, se logró lograr en la mayoría de los estudiantes del grupo experimental un aumento en el interés por aprender, en la organización del trabajo independiente, en la eficiencia del proceso educativo, y en los docentes observamos un aumento. en la habilidad profesional en su labor profesional. Se analiza el concepto de Smart-education, que es importante para el proceso educativo de calidad de las instituciones de educación superior. Se muestra la necesidad e importancia de utilizar uno de los componentes de las tecnologías Smart en el espacio educativo, es decir, el uso de Smart Board; Se ofrece software (Smart Notebook, Learning Apps) para el aprendizaje interactivo. Se destacan los principios más esenciales de la educación inteligente. Sobre la base de estos principios, la atención se centra en los tres elementos importantes de la educación inteligente (innovación, flexibilidad, creatividad), que conducen a la revelación de las posibilidades creativas y el potencial del individuo.

#### Palabras clave:

Tecnologías inteligentes, instituciones de educación superior, formación de calidad, Smart Board, concepto de educación inteligente.

#### INTRODUCTION

The modern world is in a state of global systemic permanent changes. The importance of educational services and innovative products in the cultural and socio-economic life of a person is constantly increasing, and the role of information communications is growing rapidly. Our life takes place in the reality of Industry 4.0 – the world of Big Data, automated production, and the Internet of Things. The most successful countries in the world see the answer to the challenges of the digital age in innovative education, where people are the main and valuable capital. This requires significant substantive changes in the modern educational space in the direction of harmonization to comply with the technological structure of Industry 4.0. (Luchko & Dobrovitska, 2022).

They are actively introduced into education at the beginning of the 21st century. the latest information and computer technologies. This enables the use of interactive whiteboards, “smart” laboratories, electronic textbooks,

etc. for independent work of students of higher education, classroom classes; leads to an active discussion of practical and conceptual issues of the transition to “start education”, a new innovative form of education of the younger generation (Dovhodko et al., 2020).

Such continuous development of the universe requires the training of a new specialist who has a theoretical fundamental base of professional disciplines, possesses modern teaching methods, is capable of constant professional self-improvement, and knows how to apply practically innovative methods and approaches in professional activity. Practical, high-quality implementation of innovative educational tasks is carried out by introducing into the process of higher education, in the preparation of future competitive specialists, a system of electronic learning using the Internet and multimedia – e-learning. This kind of e-learning provided an opportunity for the development of Smart education – e-learning, the basis of which is the use of an educational interactive environment.

Therefore, to ensure the quality education of future specialists, Smart technologies are an effective tool, and to organize innovative educational activities in the context of Smart education, higher education institutions must ensure the functioning of such an educational environment that will make it possible to use mobile technologies, place and create new open electronic resources, to implement educational content management systems and create opportunities for interactive exchange of information data for the transformation of the knowledge of those seeking education.

Smart technologies contribute to the formation of an individual educational trajectory for students of higher education and provide an opportunity to develop innovative educational materials (Kazak, 2022).

In the article, we carried out research and experimental work, which has an ascertaining and formative stage. The tasks of research and experimental work were as follows:

1. To study the theoretical provisions of the application of Smart technologies in the educational process.
2. To analyze computer programs and systems used in education.

A theoretical and methodological analysis of the problem was carried out based on the study of the theory and experience of educational institutions operating in the innovative mode.

Respondents were asked questions that were supposed to be answered during the experiment.

The solution of professional tasks with the use of Smart technologies in the learning process has a positive effect on the readiness for pedagogical activities in new conditions.

Also in the article, we considered: trends in the use of Smart technologies in the learning process; tasks containing Smart education for its development; the main advantages of introducing Smart technologies into the educational process of universities; the most important principles of intelligent education; focused attention on three important elements of Smart Education (innovation, flexibility, creativity), which lead to the disclosure of its creative possibilities and potential; considered aspects of the application of Smart Education technologies in higher educational institutions; identified categories that are the most popular for use in educational activities of Smart technologies.

## Literature review

Seeing the urgency of implementing innovative Smart technologies for editing, creating, and distributing an interactive set of multimedia educational materials, we will proceed to the next stage of the research search – the logical-semantic and terminological analysis of the problem. To gain a deeper understanding of the phenomenological features of Smart technologies, let's delve into scientific sources.

Nezhyva (2021) disclosed the main characteristics of Smart education, analyzed its main principles, and presented Smart education as an innovative educational process where Internet resources and technological innovations are used to enable higher education seekers, based on a systemic multidimensional vision, to acquire professional competencies and study professional disciplines taking into account their continuous updating of content and multifacetedness. The scientist explained the content of the concept of Smart education, which reflects the process of creating continuous development of participants in the educational process, forming their competencies, creating an intellectual environment, including measures of the informal and formal process of the educational space based on the latest technologies.

Hritchenko & Malyshevskiy (2023) considered Smart education as a paradigm that provides for the adaptive implementation of the educational process based on the use of Smart information technologies. The conditions for the implementation of Smart education and the trends of its development are highlighted. The main conceptual provisions of Smart education are characterized. The scientific, methodological, and theoretical aspects of the use in the modern intellectual environment of professional training of future specialists of Smart technologies in institutions of higher education are highlighted.

Karamanov & Voitovych (2022) characterized the main aspects of the application of Smart education and Smart technologies in the modern educational space. It has been proven that Smart education reflects a new innovative

type of education system aimed at the process of forming competencies and acquiring skills for adapted and flexible interaction of student youth with the social, technological, and economic environment. The basic principles of Smart education and the role of modern Smart technologies in the domestic educational space are defined, and their innovative and creative character is emphasized. It pointed out the importance and necessity of taking into account three important elements of Smart education in education, which determine the disclosure of its potential – innovation, flexibility, and creativity.

Voropaieva, & Davydova (2021) during the educational process presented innovative ways of using Smart technologies thanks to the possibility of connecting to the Internet and open access. The possibilities of Smart learning are singled out, which allows students of education to use modern multimedia technologies, motivation in learning, the possibility to obtain quality knowledge, makes it possible to form the potential of students of higher education, and teachers – to educate a comprehensively developed personality and in the professional field of activity provides better awareness, respectively to the requirements of the XXI century.

Kuchai et al. (2020) revealed the possibilities of using Smart technologies in the training of future specialists; highlighted the functions of Smart technologies; proved the importance of using Smart technology in the professional training of specialists, showed ways of successful application in the field of education. A special place is given in the article to the use of computer educational multimedia systems in the educational process, to increase the number of students per teacher, deepen knowledge, and shorten the period of study.

Mironets & Fedosenko (2019) conducted research and proved effectiveness in the process of learning the use of Smart technologies. The role in the educational process of using Smart technology is presented; possibilities of using Smart Board technology, its main advantages and functions; the role of the Internet resource LEARNING APPS and the capabilities of the Smart Notebook software are shown. Examples of providing support for the educational process and the teaching process with the help of interactive exercises are given, an analysis of interactive exercises is carried out and the possibilities of public access to them are shown; describes the capabilities of the LEARNING APPS constructor intended for storage and development of interactive multimedia didactic tasks, with the help of which the teacher in a game form can check and consolidate the acquired knowledge of the students of education, which contributes to the motivation for learning and the formation of cognitive interest in the students of education. The effectiveness of conducting classes using Smart technology is shown.

Umiarov & Konkova (2023) showed the importance, uniqueness, and necessity of using Smart technologies in the educational process, proved the possibility of independently developing a digital educational resource, and showed the ways of using tools that are technically based on a single informational educational platform. Innovative information technologies are grouped according to group characteristics of technical means of the educational process in institutions of higher education (computer systems, technical, audiovisual; Smart technologies, digital teaching aids, software). The use of structural components is described: as reflective, meaningful, target, and procedural, which shows the innovativeness of the work of a teacher of a higher education institution that is ready for innovations in the education system.

Kazak (2022) studied the peculiarities of using Smart technologies in the process of learning German. Based on her own experience and analysis of scientific literature, the author analyzed the prospects and features of using innovative Smart technologies in the professional training of future teachers of the German language. The most important educational sites, which should be used by those seeking education in the process of learning German, are offered. The main advantages of the introduction of Smart technologies are outlined when teaching the German language.

So, Smart technologies are interpreted as information technologies aimed at developing the participants' competencies in the educational process. Scientists have explored the concept of Smart education, which reflects the process of creating continuous development of participants in the educational process, proven the impact of Smart technologies on the quality of education and the improvement of digital and didactic competencies of teachers, students of higher education, which are necessary for innovative activities in the conditions of a digital society. The functions of Smart technologies are highlighted; the importance of the use of Smart technology in the professional training of specialists is proved, and the role of the Internet resource LEARNING APPS and the capabilities of the Smart Notebook software are shown.

But the need and importance of using innovative Smart technologies in the educational space for editing, creating, and distributing an interactive set of multimedia educational materials, for interactive learning, software (Smart Notebook, Learning Apps) has not been proven experimentally, the most essential principles of Smart education have not been singled out, attention is focused on the three important elements of Smart-education (innovation, flexibility, creativity), which cause the disclosure of creative possibilities and potential of the individual.

The purpose of the study is to theoretically substantiate and experimentally prove the importance of introducing

innovative Smart technologies for editing, creating, and distributing an interactive set of multimedia educational materials in the educational process of higher education institutions for the implementation of quality training of a competitive specialist.

## MATERIALS AND METHODS

To achieve the goal, the following theoretical research methods were used: synthesis, analysis, comparison, analogy, comparison, deduction, and induction, which made it possible to characterize the state of problem-solving in scientific sources, to study legislative and regulatory documents in the field of education, to substantiate the conceptual and categorical apparatus, to develop professional and educational standards, electronic resources, dissertations, describe the work experience of employees of higher education institutions.

The preparation of future specialists for the implementation of the content of Smart technologies in the educational process of institutions of higher education is a continuous systemic process oriented to the requirements of the standards of higher education and the profession; aimed at introducing qualitative changes in content, professional and personal, organizational and technological contexts; takes place by legislative and regulatory provisions, taking into account the values and peculiarities of pedagogical activity; due to the need to implement innovative ideas of foreign experience. This process exists based on the study of pedagogical regularities of the educational process, scientifically based methodology, the introduction of targeted measures, and systematic didactically balanced pedagogical actions, which contribute to the creation of optimal pedagogical conditions for educational activity.

Research covers the following interrelated concepts: methodological, theoretical, and practical.

The methodological concept reflects the mutual influence and interaction of modern achievements of natural sciences, scientific fundamental approaches (activity, system, axiological, person-oriented, competence, environmental, integrative); foreign trends in the use of Smart technologies in the educational process of higher education institutions; a set of general didactic (systematic, scientific, visual, humanization, continuity, consciousness) and specific principles (interdisciplinarity, instrumentality, socialization, fractality, activity, didactic and developmental environment) of training future specialists.

The theoretical concept includes normative and legal principles, ideas, and an innovative system of initial conceptual provisions, making it possible to identify leading theories (theories of cooperation, people-centeredness, tolerance, value orientations, etc.), definitions, initial



parameters, analysis, generalization, and synthesis, as well as justification of the system of the specified process.

The practical concept implements the possibilities of introducing and developing a Smart technology system in the educational process of higher education institutions and provides for the practical implementation of checking the effectiveness of all components of the developed system and the effectiveness of theoretically grounded scientific provisions.

We conducted an experiment that had ascertainment and formative stages.

The leading methods in the experiment were questionnaires, introspection of the respondents' professional qualities, and direct and indirect observation.

The confirmatory stage of the experiment revealed the main problems of the application of Smart technologies in the practice of using them in higher education institutions, inefficient and fragmented use.

The most stable results during the experiment were observed among students with average success rates. Some deviations were observed in strong and weak students during the experiment.

A questionnaire was conducted among the students of the experimental group to find out their attitude towards the Smart technologies used.

The analysis of questionnaires showed that 89% of students believe that the use of Smart technologies reduces the time they spend studying a subject. As a result of research and experimental work, it was possible to achieve an increase in interest in learning, in the organization of independent work, and in the effectiveness of the educational process among the majority of students in the experimental group.

As the results of questionnaire processing show, the degree of closeness to the reproductive level and readiness for professional activity based on the use of Smart technologies among teachers who have undergone training is higher by 0.82 points.

The conducted study showed that the use of Smart technologies in the educational process allows to improve the educational process through the use of multimedia educational materials.

## RESULTS-DISCUSSION

The development of the information society at the current stage of human existence allows us to create the latest information and educational environment in our time, the basis of which is innovative Smart technologies, which are an educational interactive complex that facilitates the editing, creation, distribution of multimedia educational

materials and makes learning possible in the classroom, at home and in any other place (Kazak, 2022).

Smart learning is a comprehensive modernization of all methods and technologies in educational processes. Smart learning can provide a high-quality and high level of education that meets the opportunities and tasks of today's global educational space, makes it possible to ensure the transition from book content to active, to adapt to young specialists in conditions of an unstable, rapidly changing environment, in the presence of an analytical search system, with the help of a single general repository of educational materials. At the same time, the quality of educational materials in the repository must be constantly monitored, it allows working in a single team with educational process management systems, and the introduction of various materials (Babak, 2022). Today, there is a need to find effective unique, and universal combinations of Smart technologies for acquiring communication skills, organization of the educational process, intercultural understanding, critical thinking, cooperation, and leadership, the career of scientific and pedagogical workers, which corresponds to the innovative educational paradigm to increase their information- digital competence (Luchko & Dobrovitska, 2022).

The integration of digital technologies requires every specialist to master the skills of working with new technologies and affects all spheres of society as a whole and human activities (Kostyria et al., 2023). When using digital technologies, readiness in the professional activity of every qualified specialist, every person becomes a necessary competence (Shuliak et al., 2022). Smart technologies today are one of the most innovative and modern digital technologies used in the educational space of the century. Translated from the English language, the origin of the word Smart means intelligent.

When using Smart-technologies in the educational field, a wide variety of interconnected types of information technologies and technical educational tools are meant (document cameras, a knowledge control system for students with digital activity data analysis, interactive whiteboards, knowledge control systems for students, software for conducting online training and creating educational content, etc.).

Let's name the main feature of Smart technologies, which is that all tools (questions for self-control, lecture material, test tasks, practical tasks) are based on a single educational information platform, with the help of which students have the opportunity to get the necessary information.

In educational activity, Smart technologies are digital technologies that are integrated and include technical means, and various types of educational information technologies that help the teacher organize active educational activities

of students during classes and design a digital educational resource.

The uniqueness of Smart technologies lies in the technical basis of tools grouped on a single informational educational platform, and their use allows the teacher to develop and apply an educational digital resource aimed at creating such an innovative model in the educational process of a higher education institution when teaching professional disciplines, which implements modern technologies to master innovative means of educational activity with various sources of information; quality education management; creation of conditions for the formation of universal educational processes during the use of Smart technologies; optimization of the educational process, expansion of the information environment (Semenikhina, 2013).

To prove the necessity of implementing innovative Smart technologies for editing, creating, and distributing an interactive complex of multimedia educational materials, research, and experimental work was carried out, which was carried out in several stages – ascertaining and forming. Let us consider these stages in more detail.

Let's clarify the tasks of research and experimental work.

1. Study of theoretical provisions on the application of Smart technologies in the educational process:

- Smart technologies, considered from the perspective of innovative technologies, represent an educational interactive complex that facilitates the editing, creation, and distribution of multimedia educational materials and makes learning possible in the classroom, at home, and in any other place. The main feature of Smart technologies is named, their uniqueness is proven; and specific features are singled out (polyfunctionality, integrability, dynamism). The concept of Smart education, which is important for the quality educational process of higher education institutions, is analyzed. In the world of educational practice, the trends are highlighted, the task containing Smart education for its development is considered, and the main advantages of the implementation of Smart technologies in the educational process of higher education institutions are defined;
- identifying contradictions between the rapidly changing content of education and the forms, methods, and principles of Smart education. Based on these principles, focus on the three important elements of Smart education (innovation, flexibility, creativity), which lead to the disclosure of the creative possibilities and potential of the individual, the distribution of an interactive set of multimedia educational materials;
- identification of the current state of education informatization;
- identifying a system approach to the design of interactive learning and offering software (Smart Notebook, Learning Apps);

- identification of didactic conditions for realizing the intellectual potential of education seekers and the creative potential of a person;

2. Analysis of computer programs and systems used in education:

- analysis of the use of Smart technologies in educational institutions, to show the necessity and importance of using one of the components of Smart technologies in the educational space, i.e. the use of a Smart Board;
- analysis of existing tool systems for developing software (Smart Notebook, Learning Apps);

3. Implementation of the identified didactic conditions for the use of Smart technologies.

4. Clarification and verification of criteria for the effectiveness of the use of Smart technologies in the educational process.

Questionnaires, self-analysis of the professional qualities of respondents, and direct and indirect observation appeared as the leading research methods at this stage. Together with this, a theoretical and methodological analysis of the problem was carried out based on the study of the theory and experience of educational institutions operating in the innovative mode.

The confirmatory experiment revealed the main problems of the application of Smart technologies in the practice of using them in higher education institutions, inefficient and fragmented use.

Respondents were asked questions that were supposed to be answered during the experiment:

- are you satisfied with the existing paper textbooks;
- attitude to Smart technologies;
- assessment of properties of Smart technologies.

The survey was conducted among teachers and students.

Based on the results of the questionnaire, the following conclusions were made.

1. Students practically do not use textbooks regarding disciplines. According to students, textbooks used in classes on paper media are overloaded with irrelevant material, many textbooks lack information about scientific achievements, and the information in textbooks quickly becomes outdated. Only a small percentage of students (20%) use additional literature and that is only for the preparation of reports and essays (which is quite rare). Most students rely solely on the teacher's presentation of the material.
2. Teachers are not satisfied with the textbooks due to the overload of informational material, the insufficiency of modern provisions, the lack of a clear structure of the studied material, and the small number of tasks.

Among the properties that a teacher would like to see in a modern textbook, a logical presentation of theoretical material dominates. Textbooks in any discipline must be mobile, quickly and easily updated.

The surveyed teachers consider the use of Smart technologies in the educational process justified and note that the use of electronic learning aids increases the effectiveness of student learning and saves time spent by students on studying subjects; learns the vast majority of educational material, as evidenced by tests and control papers.

The interviewed teachers consider it appropriate to create and implement Smart technologies in the educational process: 94.5% of them believe that the use of electronic educational tools affects the teaching method of the subject and saves the teacher's time in explaining new material; 60% of teachers agree with the statement that the systematic use of Smart technologies is necessary, and the remaining 40% – with the statement that their use is more necessary than not.

There is a need and desire for teachers to use Smart technologies in education to intensify the educational process.

The main goal of the formative experiment was to study the ways of using Smart technologies in educational institutions, to show the necessity and importance of using one of the components of Smart technologies in the educational space, i.e. the use of Smart Board; analyze the existing tool systems for developing software (Smart Notebook, Learning Apps); clarify the proposed method of applying Smart technologies.

At the beginning of the experiment, the students of the control and experimental groups were dominated by the formation of knowledge at low and medium levels. According to the results of the control tests, there is a tendency to increase the share of students with a high level of knowledge (by 19.4%) and to decrease the share of students with a low level of knowledge (by 25%) for the experimental group. In the control group, the share of students with a low level of knowledge increased (by 2.9%), although the share of students with a high level of knowledge increased slightly (by 3%), the share of students with an average level of knowledge decreased – by 5.9%) ( Table 1.).

**Table 1. Levels of students' knowledge before the beginning and after the end of the experiment in the control and experimental groups**

	CONTROL WORK BEFORE THE START OF THE EXPERIMENT		CONTROL WORK AFTER THE END OF THE EXPERIMENT	
LEVEL OF KNOWLEDGE	EXPERIMENTAL (%)	CONTROL (%)	EXPERIMENTAL (%)	CONTROL (%)
Low	41,7	41,2	16,7	44,1
Average	44,4	50,0	50,0	44,1
High	13,9	8,8	33,3	11,8

Source: Own elaboration

Based on the above, it can be stated that the use of Smart technologies has affected the effectiveness of training.

The most stable results during the experiment were observed among students with average success rates. Some deviations were observed in strong and weak students during the experiment. Thus, the level of anxiety increased in three strong students while working with the curriculum. The reasons for this may be as follows – individual psychological characteristics of students are not sufficiently taken into account, doubts about their abilities during training using Smart technologies.

A questionnaire was conducted among the students of the experimental group to find out their attitude towards the Smart technologies used.

Questionnaire for surveying students studying with the use of Smart technologies.

1. How much do you like working in classes using Smart technologies?
2. Does the use of Smart technologies reduce the time you spend studying the subject?
3. How do you assess the role of Smart technologies in classes?

4. Would you like classes using Smart technologies to be held more often?

5. What attracts you most in Smart technologies?

The analysis of questionnaires showed that 89% of students believe that the use of Smart technologies reduces the time they spend studying a subject. As a result of research and experimental work, it was possible to achieve an increase in interest in learning, in the organization of independent work, and in the effectiveness of the educational process among the majority of students in the experimental group.

We considered the optimality of teachers' work when using Smart technologies: the growth of teachers' professional skills in the field of using Smart technologies – a targeted increase in the level of information training (culture) of the teacher.

One of the important didactic conditions for the creation and use of Smart technologies is the preparation of teaching staff for the use of information technologies. As a result of the conducted surveys, we found insufficient readiness of teachers to use Smart technologies.

At the stage of analysis of the results of the conducted monitoring, the degree of closeness to the levels (adaptive, reproductive, heuristic, creative) appeared as performance indicators.

The goal was to determine the dynamics of self-assessment of knowledge and skills necessary for the implementation of pedagogical activities based on the use of Smart technologies. The analysis of the results made it possible to adjust both the organization and the content of the process of forming the information culture of teachers.

The results of the «input» testing for the implementation of the formation of information culture for the free and problem-free use of Smart technologies showed that the teachers poorly understood the connections between the main concepts in the field of information culture, there was no knowledge system of the application of Smart technologies, there was uncertainty in the ability to perform the tasks of practical orientation, lacked knowledge of the main software tools of their professional field.

The higher degree of self-esteem of teachers after the implementation of the formation of information culture with the use of the conducted activities is connected, in our opinion, with the fact that teachers got acquainted with the functionality of Smart technologies in the educational process and began to more clearly present their professional activities with their use. Difficulties associated with the use of Smart-technologies, ignorance of the methods of working with various technical means, inability to select the necessary software, and even incorrect answers to students' questions are the most common problems that teachers may encounter in their professional

activities using Smart-technologies. The respondents were introduced to the possibilities of Smart technologies, the algorithm of their application in pedagogical work, the criteria for selecting software tools, and the use of specific software tools in professional activities.

A questionnaire was developed to assess the degree of closeness to the reproductive level of formation of the teacher's information culture. The assessment was carried out on a five-point scale (from 1 to 5 points) similar to the scale proposed in the assessment of the adaptive level.

As the results of questionnaire processing show, the degree of closeness to the reproductive level and readiness for professional activity based on the use of Smart technologies among teachers who have undergone training is higher by 0.82 points.

The solution of professional tasks with the use of Smart technologies in the learning process has a positive effect on the readiness for pedagogical activities in new conditions. Teachers gain confidence in their abilities, they clearly imagine what tasks they are solving, what problems may arise, and how they can be solved.

Thus, the research has shown that the use of Smart technologies in the educational process, taking into account the identified didactic conditions for the creation and use of electronic learning tools, allows for improvement in the educational process through the use of multimedia educational materials and makes learning possible in the classroom, at home and in any other place. The results of the pedagogical experiment confirm the task of our research, the effectiveness and practical significance of the work performed, where Smart technology is considered from the perspective of innovative technologies, which are an educational interactive complex that contributes to the editing, creation, and distribution of multimedia educational materials.

Smart technologies in educational activity are manifested as technical means, integrated digital technologies that, despite the distance between teachers and students of education, help the teacher to design an educational digital resource and organize high-quality and active educational activities during and outside the class.

The use of Smart technologies at the current stage of the development of society is distinguished by the following specific features (multi-functionality, integrability, dynamism), dynamic composition (document camera, interactive panel, student knowledge control system; cloud version of templates for solving gamification issues in classes in higher education institutions, software, visualization of 3D objects, etc.) and leading functions (creating conditions for education seekers to master the means of educational and cognitive activities with



various sources of information; innovative model of the educational process; expansion of the information and educational environment; optimization of the educational process (Umiarov & Konkova, 2023).

After conducting an experimental study, identifying the main feature of Smart technologies, proving their uniqueness, revealing specific features (polyfunctionality, integrability, dynamism), we will show the importance of the concept of Smart education, which is important for the quality educational process of higher education institutions, and highlight trends that include Smart education for its development, we will define the main advantages of implementing Smart technologies in the educational process of higher education institutions, we will show the necessity and importance of using one of the components of Smart technologies in the educational space, i.e. the use of Smart Board; software (Smart Notebook, Learning Apps) is proposed for interactive learning, we will highlight the main principles of Smart-education, determine the main conditions for the realization of the intellectual potential of education seekers and the creative potential of a person.

The concept of Smart education, which is important for the quality educational process of higher education institutions, is the ability to quickly adapt to the needs and level of students, and flexibility, which leads to the use of a significant number of sources (Kiryakova et al., 2018). The concept of Smart education depends on the latest educational trends published by Forbes magazine.

The following trends are distinguished in global educational practice:

- distance education is leading among educational technologies – video courses on YouTube and iTunes are becoming popular among the younger generation. With the help of IT and network technologies, even a few dozen institutions in the world will be able to train millions of future specialists in various fields, therefore, the significant increase in popularity of a large number of electronic educational materials indicates a reduction in the number of higher education institutions in the future;
- the technology of incentives and rewards (one of which is gamification) contributes to the improvement and motivation of the quality of learning – the use of game forms in non-game situations;
- the foundation for the creation of educational programs should be the individual psychological characteristics of the individual, as an alternative to standardized approaches in the educational space is the personalization of education. In this connection, there is a steady interest and motivation for learning, and creativity, intelligence, and creativity acquire a new stimulus in the development;

- the use of video games in the educational process contributes to the acquisition of knowledge about the real world through the imaginary world;
- an alternative to text presentation and linear structure of courses should be interactive textbooks, which ensure the multidimensionality of the modern educational process;
- Internet courses (in particular, Musk, and Coursera) are distinguished by a large number of downloads, demonstrating the globalization of learning, and the popularity of electronic educational resources. This is evidence of the gradual blurring of traditional learning technologies, the physical framework of higher education institutions, the inevitability of changes in the learning technologies they use, and the functioning of educational institutions (Semenikhina, 2013).

The concept of Smart education is the main component of the education of the future, it involves the expansion of space, time, methods of education, educational materials aimed at the availability of a large number of sources, a significant variety of multimedia materials (video, audio, graphics), which can be easily adjusted according to levels and requirements of education seekers (Koval-Mazyuta et al., 2023). So, with such an approach, there is a transition from education, which is concentrated on arithmetic, writing, and reading, to education, which in the 21st century improves such seven skills (7 c's) as:

- communication;
- cross-cultural understanding;
- creativity and innovation;
- ICT literacy;
- collaboration and leadership;
- critical thinking and problem-solving;
- career and life skills.

Let us define the main advantages of implementing Smart technologies in the educational process of higher education institutions:

- the possibility of live communication with specialists from advanced developed countries;
- increasing the motivation of students of higher education to study professional disciplines, increasing the volume of individual independent and group work;
- creation of an individual educational trajectory, a personally-oriented approach to learning;
- access to various sources of information, free placement of materials on the network;
- prompt feedback with other higher education applicants and teachers;
- accessibility and mobility of education.

So, we are talking about opportunities to get an education in the most comfortable educational environment for a modern student of higher education. The use of Smart technologies in the institution of higher pedagogical education during independent work, classroom, and non-classroom classes, during distance learning not only contributes to the quality training of a competitive competent specialist but also increases the interest and motivation of students in their profession, diversifies the educational process, allows to create for everyone individual educational trajectory and enables live communication with the best specialists of the universe (Kazak, 2022).

Let us show the necessity and importance of using one of the components of Smart technologies in the educational space, which is the use of a Smart Board. To work with it, everyone can master the technology of interactive learning of who is a user of a personal computer and at the same time no special skills are required (Stratan-Artyshkova et al., 2022). Smart Board is a touch-friendly screen that works together with a computer, allows you to display the object in many different ways, and helps the teacher work with various multimedia visuals. The multimedia projector transmits the image to the board and is part of the board. Various media players are widely used in working with the Smart Board, which is necessary for viewing and listening to audio and video materials; a traditional package of application programs; working online with Internet resources; and software for interactive learning (Smart Notebook, Learning Apps). The collection of interactive exercises and general access to them is one of the goals of the programs. The Learning Apps constructor is intended for storing and developing interactive multimedia didactic tasks, with the help of which the teacher in a game form can check and consolidate the acquired knowledge of students, which contributes to the motivation for learning, the formation of cognitive interest (Pozdniakova, 2018). The Learning Apps service in various languages of the world has a user-friendly interface. This Internet service helps to create individual exercises for students of education and exercises, to use them together with the Smart Board. A significant advantage of this service in distance learning systems is the possibility of task integration (Mironets & Fedosenko, 2019).

Let's highlight the most essential principles of Smart education:

- using current information of the educational program to solve didactic tasks;
- individualization of the education process, flexible educational trajectories;
- implementation of the educational process in a demarcated (distributed) educational environment;
- interaction of education seekers with society and the professional environment;

- organization of cognitive, project, independent, and research activities of education seekers;
- considerable versatility and variety of educational activities (Hurevych, 2016).

Based on these principles, we focus on the three important elements of Smart Education (innovation, flexibility, creativity), which lead to the disclosure of its creative possibilities and potential.

1. The innovativeness of Smart education stems from the nature and content of its orientation because teachers willingly involve Smart technologies in the educational process, which allows them to meaningfully and interestingly implement a balanced educational program, with the help of innovative approaches to the implementation of these technologies – cultural, systemic, technological, operational, axiological, research, personally oriented, etc. The innovativeness of Smart education is defined as a practically oriented method of the educational process, it enables the teacher to purposefully build the educational process in the educational institution, taking into account the appropriate program according to its trajectory.

2. The flexibility of Smart education for creating high-quality educational content is determined by its significant potential and in cooperation with the participants of the educational process such activity elements that can perfectly represent various fields of knowledge. Smart education involves the availability of a large number of sources, flexibility, quick adjustment to the level and needs of the listener, and maximum variety of different multimedia. This is the basis for the application of Smart education technologies, for the continuous development of educational institutions that create an opportunity: for the development of each student of education, the realization and determination of his professional path, and becoming a specialist.

3. The creativity of Smart education is determined by the development of students of higher education in the ability to plan, critically thinking independently, and the ability to organize all stages of their own educational activities (from project implementation to self-assessment, reflection, and self-control, from goal formulation to implementation of innovative project operations). This process involves the development of independent development skills, the creation of various educational projects covering several stages, familiarization with a new type of activity, initial mastery of it, and awareness of its meaning (Karamanov & Voitovych, 2022).

Studies show that «curriculums developed based on Smart technologies should create a single electronic intellectual educational space, become a kind of entry point not only to the system of extended educational materials but also to the Smart educational space itself,

which contributes to the socialization of one of the most important functions of Smart-education. In this way, the educational program serves as a means of developing the intellectual competence of a future specialist in higher education» (Hritchenko & Malyshevskyi, 2023).

The main task of the space for Smart education is to create conditions for the realization of the intellectual potential of education seekers and the creative potential of a person since Smart technologies are tools for training future specialists that are integrated, include all types of information and educational technologies, cover all their aspects that help the teacher to organize the educational process during the lesson and outside of it with various types of activities of the learners (Popovych et al., 2022).

So, Smart technologies in the field of education are considered:

- as a tool for forming a virtual intellectual integrated environment of education. Smart education involves the availability of a large number of sources, flexibility, quick adjustment to the level and needs of the listener, and maximum variety of different multimedia. Smart technologies make it possible to: determine and realize the purpose of the educational space, to develop the abilities of each student of education;
- how to use various devices (tablets, smartphones, and other similar innovative assistants) to provide knowledge to students of higher education;
- the ability to agree on the distribution of roles and functions in joint activities;
- cooperate with each other;
- to carry out constructive mutual control;
- resolve all conflicts, taking into account the interests of the parties (Karamanov & Voitovych, 2022).

We will single out several categories among the list of Smart technologies that are the most popular for use in educational activities:

1. The platform for interactive science and virtual laboratories – Smart-resources; software platform of education management systems Learning Management Systems; the iNaturalist platform; the Labster platform; a free Power BI analytical tool for creating reports.
2. Free open learning management systems – E-learning; Moodle; M-learning; U-learning; SMART Classroom (mobile and stationary).
3. Technical resources – small wireless presentation devices; Smart Board; Canva (Luchko & Dobrovitska, 2022).

Smart education provides new opportunities to everyone interested in gaining knowledge: teachers, students, and specialists. With the help of interactive technologies,

students choose and analyze information, and interact with the software system, which encourages the student to work independently (Nezhyva, 2021).

## CONCLUSIONS

The peculiarities of the use of Smart technologies in the educational process of higher education institutions for the implementation of high-quality training of a competitive specialist are theoretically substantiated.

The main feature of Smart technologies is named, their uniqueness is proven; and specific features are singled out (polyfunctionality, integrability, dynamism).

An experimental study was conducted. The analysis of questionnaires showed that 89% of students believe that the use of Smart technologies reduces the time they spend studying a subject. As a result of research and experimental work, it was possible to achieve in most students of the experimental group an increase in interest in learning, in the organization of independent work, in the efficiency of the educational process, and in teachers, we observe an increase in professional skill in their professional work.

The concept of Smart education, which is important for the quality educational process of higher education institutions, is analyzed. In the world educational practice, the trends are highlighted, the task containing Smart education for its development is considered, the main advantages of the implementation of Smart technologies in the educational process of higher education institutions are defined; and the need and importance of using one of the components of Smart technologies in the educational space, i.e. the use of a Smart Board, is shown; software (Smart Notebook, Learning Apps) is offered for interactive learning.

The most essential principles of Smart education are highlighted. Based on these principles, attention is focused on the three important elements of Smart Education (innovation, flexibility, creativity), which lead to the disclosure of creative possibilities and potential of the individual.

The main task of the space for Smart education is to create conditions for the realization of the intellectual potential of education seekers and the creative potential of a person, which will be the focus of our further research.



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