

APPLICATION OF WEB 3.0 TECHNOLOGIES IN DISTANCE EDUCATION (BY LEVELS OF HIGHER EDUCATION)

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semantic website (semantic web). Such a change has also benefited the higher education system, especially during its distance implementation (ARAÚJO, MAZIERO, OLIVEIRA, 2018). Recent trends in the higher education system have largely relied on traditional teaching methods (Web 1.0), which have promoted teacher-centered pedagogical practices. There is now an understanding that such a traditional approach is not adequate for effective knowledge acquisition. On this basis, the consistent inclusion of Web 2.0 and Web 3.0 tools and programs in universities can serve as an additional tool to support educational goals, offering students the availability and range of choices of education and learning platforms (OHEI, BRINK, 2019).

The basis of the semantic network is the integration of data, in our case - educational. Web 3.0 technologies help online educators develop courses, support students, assess and maintain records. Students who work online will benefit from personalizing learning and building knowledge based on the Semantic Web (MORRIS, 2011). Itinson (2020) believes that Web 3.0 changes people's perceptions and interactions on the Internet using features and tools that go far beyond social networks (personal assistants, smart agents, 3D games, virtual worlds, open educational resources, or more). On this basis, the scientists Aslam and Sonkar (2019) identify the qualitative characteristics of Web 3.0-technologies that can be used in the system of distance higher education, among them

- intelligence,
- personalization,
- compatibility,
- virtualization.

INTRODUCTION

The informatization of the education system has become the subject of serious changes in society, which leads to a rethinking of the interaction between globalized communication and the means of transmitting information through safer, faster, more efficient ways and forms. The rapid development of Web 3.0 has had a positive impact on additional educational opportunities, as it has opened up access to international trends in higher education. The Law of Ukraine "On Higher Education" (1) for each educational and qualification level provides for the acquisition of various competencies, communication levels, criterion of responsibility and autonomy of the student of higher education. However, pandemic outbreaks have offset these educational challenges, reducing the level of their acquisition. In this way, remotes were updated Web 3.0 technology. Today, for the higher educational institutions, there are the methods and ways of learning that meet modern requirements.

LITERATURE REVIEW

According to Harjanti, Supriati, & Setiyani (2020), a new generation of technology concepts has now evolved from a static website page through a 2.0 website page to a 3.0 website (web 3.0) page, also known as a

Indeed, the availability of data in any format and dimension, the growth of semantic technology and the availability of APIs for web search, as well as the possibility of a new level of data integration and program interaction, stimulate new bold ideas and offer methods, techniques and technologies designed for use in closed environments, can be applied and fully used on the scale of distance learning for higher education (ATZORI, KOUTRIKA, PES, TANCA, 2020).

Web 3.0, e-learning, used in distance higher education, and their role in empowering students are transforming education to improve learning outcomes (CHAUHAN, 2015). The scientist Petryk (2015) proposes an author's method of an alternative variant of identification and construction of interrelation of information and the acquired knowledge based on "knowledge spectrum". In an effort to provide more productive and intuitive user interaction, today's Web 3.0 environments use the synergy of many technologies, such as the semantic network, natural language search, machine learning, referral agents, and artificial intelligence. The main transition is from an information-oriented paradigm to a knowledge-oriented paradigm that offers unprecedented opportunities for the integration of data sources, programs and tools (ATZORI, PES, 2019).

Web 3.0 creates the potential for the implementation of new learning strategies and new forms of professional pedagogical activity of the teacher. Noskova, Pavlova, Iakovleva (2015) suggested trends in the development of Web 3.0: new educational practices require both awareness of new opportunities in communication and acceptance and understanding of new educational strategies of students.

Therefore, 3.0 education technologies now allow us to operate with social and personalized interactions and communications as one of the forms of obtaining educational qualifications (HRICHI, 2020). On this basis, the dissemination of social media (ONETE, ALBASTROIU, DINA, 2017) in education has become a powerful tool through which higher education students can instantly respond to changes or track information in their HEIs.

At first glance, social media should not ensure the functioning of the higher education system. There are some institutional constraints, pedagogical problems and cultural resistance to their cooperation. Martins, Lopes, Roque (2020) conducted a survey among Portuguese university students to identify the level of use of social networks in an academic context. The results showed that social networks are insufficiently used in the learning process not only by students but also by teachers. Contrary to deep awareness of network platforms and programs, they make little or no use of them for academic purposes.

Davies & Eynon (2020) argue that semantic compatibility is a defining feature of the so-called "Internet 3.0". Since its inception, the Semantic Network has given privileged status to metadata to provide the clear levels of contextual expressiveness required for machine reading, including Google, online research repositories (Figshare), and other knowledge platforms. This option of working on platforms is currently the most profitable for the higher education system, as almost two years of the pandemic forced to reconsider the means and methods of movement of educational trajectories. Some scholars, such as Firat E., Firat S. (2021), in the system of studying 3.0 technology in the educational environment focus on the usefulness of learning and learning outcomes through successful software.

On this basis, we can distinguish many tools and services of Web 3.0-technologies used in education, including semantic digital libraries, virtual 3D libraries, semantic blogs, microblogging, virtual worlds and avatars, virtual educational laboratories, intelligent search and intelligent learning systems or something. Google services designed for learning in web applications 3.0 are constantly being improved. The most important Web 3.0 applications are Gmail, Calendar, Drive, Docs, Sheets, Slides, Sites, Vault (MINIC, 2014).

Dominic, Francis, Pilomenraj (2014) determine that Web 3.0 in higher education helps intelligent or semantic network operations to operate on big data, related data, cloud computing, 3D visualization, augmented reality or something. Researchers Ilo, Nkiko, Ugwu, Ekere, Izuagbe & Fagbohun (2021) note that Web 3.0 has the ability to aggregate information from multiple sources and establish semantic relationships between all available content to ensure seamless accessibility, search ability, and usability. It allows you to interact with other devices such as tablets, smartphones and desktops, iPad. It also supports offline use or

consumption of downloaded data, which makes it possible to use information in low bandwidth conditions.

Intelligent Web 3.0 agents (artificial intelligence systems) perform several tasks: computing; querying and searching the database; searching for information on the Internet; search engine functionality and capabilities; learning analytics (CHAUHAN, 2016). Increasing the amount of information available on the Internet changes the type of grouping and access to it for graduates in distance learning. On this basis, it is necessary to look for ways to work with information so that they help to organize, search and obtain specific facts. Web libraries are widely used in the Web 3.0 space. Karibasappa (2020) offers Callimachus DL, a semantic computerized library with voice input.

Moving to Internet 3.0 in higher education to extract information and acquire knowledge without a language barrier, Shih (2018) proposes to use "Webbish", a controlled form of English, to write web texts to present information based on the results of multilingual machine translation (MT). According to Harjanti, Supriati & Setiyani (2020), the new generation of technological concepts used on web pages is best implemented in RDF (Resource Description Framework), SPARQL and web ontologies.

Moving to Internet 3.0 in higher education to extract information and acquire knowledge without a language barrier, Shih (2018) proposes to use "Webbish", a controlled form of English, to write web texts to present information based on the results of multilingual machine translation. As part of media education, the media aesthetic paradigm (MEICHEN, 2020) also has conceptual significance. Image visualization, mental maps, accessible chat, and adaptive materials - these tools allow you to hold the attention of an online student.

However, it is worth noting that the third generation of the Internet (Web 3.0) faces two main problems that affect the quality of higher education. The first is an attempt to associate existing content with semantic meaning using certain types of metadata. The second is to develop a set of programs that use this newly created knowledge based on metadata. Nedjeljko (2017) believes that both problems can be solved without compromising the educational space if you use secure software, as the problems of higher education in Web 3.0 are mainly related to unauthorized access and data manipulation, autonomous initiation of actions and development of malicious scenarios (RUDMAN, GRUWER, 2016).

Education 3.0, Web 3.0 or Semantic Web (Vieira, Isaias, 2016) is implemented in many higher education institutions. This system directs the institution to improve the educational experience. However, the implementation of Education 3.0 also causes some problems, including administrative or academic problems. It is also quite problematic to understand that Internet activity comes from e-learning, and offline activity - from traditional learning (face-to-face). Administrative processes also involved the academic information system (AIS). According to Utomo, Bon, Hendayun (2018), to overcome these problems it becomes necessary to have a training conversation with the practical integration of AIS and e-learning.

Educational knowledge management systems based on Web 3.0 technologies are a modern approach to the management of free education, a new way of teaching and learning, as well as creating your own knowledge in a virtual or real learning and learning environment (Hadi, Amer, 2015). The knowledge management model of higher education seekers covers six areas: semantic, mentoring, access, applications, interface, and interaction (DARWEESH, 2018). Thus, Web 3.0 technologies inevitably led to educational research. Much research has been done on the use of Web 3.0 tools in learning environments. Synthesizing and summarizing the results of these studies with a systematic review is important in terms of sources of future research and promoting the use of these technologies in education.

AIMS

The purpose of scientific research: to identify the need for the use of Web 3.0-technologies in distance education among applicants for higher education initial level (short cycle), first (bachelor's) level, second (master's) level, third (educational-scientific/educational-creative) level, and scientific level.

Research tasks

Achieving a scientific goal involves solving a system of problems, including

1. identifying features and benefits of Web 3.0 in higher education;
2. outlining the list of adapted Web 3.0 programs for distance higher education and their functions;
3. outlining the principles of application of Web 3.0-technologies in distance education among applicants for higher education
4. justification Web 3.0 concepts in higher education;
5. establishing a ratio functions of Web 3.0-technologies in distance education and learning outcomes at all levels of higher education.

RESEARCH METHODS AND METHODOLOGY

The methodological base is based on sociological and statistical methods of intelligence, as well as on a systematic analysis of the content of the concept of Web 3.0-technologies in distance education among higher education seekers. Sociological methods (sociological survey, method of information analysis); statistical methods (ranking method, descriptive statistics) allowed identify the need for Web 3.0-technologies in distance education among applicants initial level (short cycle), first (bachelor's) level, second (master's) level, third (educational-scientific/educational-creative) level, scientific level.

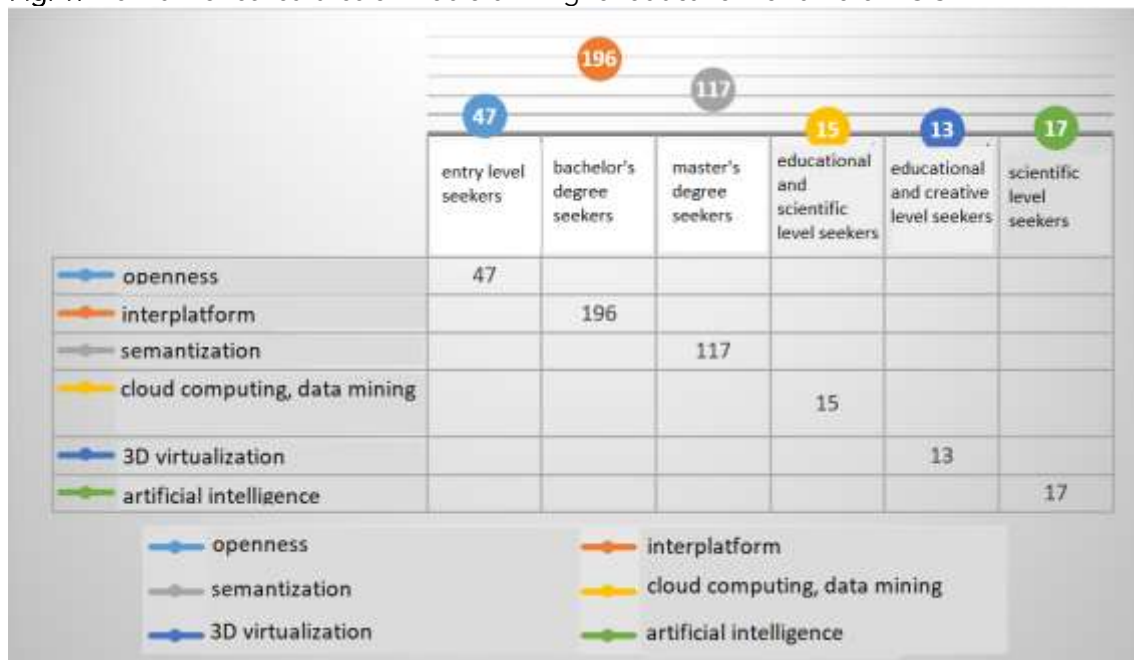
The study was conducted among applicants initial level (short cycle), first (bachelor's) level, second (master's) level, third (educational-scientific/educational-creative) level, scientific level in Kyiv National University of Culture and Arts (Ukraine) on the Google-forms platform. The total sample of respondents was 438 people at the following educational levels: 56 students of OCD "Junior Bachelor", 214 students of OCD "Bachelor", 123 students of OCD "Master", 15 doctors of philosophy, 13 doctors of art, and 17 doctors of science.

Respondents were asked to answer different types of questions to determine the level of understanding of the concept under consideration; identify the features and benefits of Web 3.0 in higher education; substantiate the concepts of Web 3.0 in higher education; outline the principles of its application; explore the functions of implementation platforms. System analysis allowed establish the ratio application of Web 3.0-technologies in distance education and levels of higher education.

RESULTS

438 respondents took part in the poll. They were asked to give answers ("yes", "no", "I do not know"), as well as to rank the categories according to their experience. On the thesis "Indicate which, in your opinion, the main Features of Web 3.0 in Higher Education for Your OCD", applicants of entry level chose openness (47 answers); applicants for the bachelor's degree were chosen inter-platform (196 people); applicants for the master's level preferred semantization (117 marks); applicants of educational and scientific level chose cloud computing and data extraction (15 statements); applicants of educational and creative level preferred 3D virtualization and 3D graphics (13 people), applicants of scientific level chose artificial intelligence (17 selected marks). The results are presented in Fig. 1.

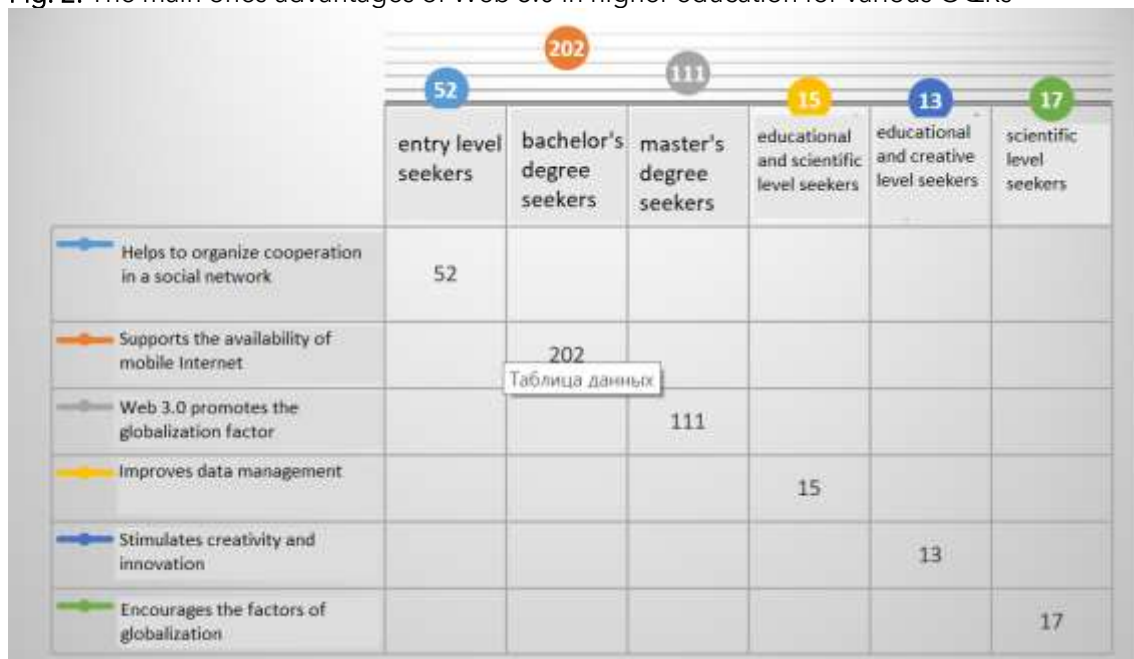
Fig. 1. The main ones features of Web 3.0 in higher education for different OCD



Source: Author's; concluded on the basis of respondents' answers.

On the thesis "Indicate which, in your opinion, is the main the benefits of Web 3.0 in higher education for your OCD" applicants of entry level elected «Helps to organize cooperation in a social network» (52 answers); applicants for the bachelor's degree chose "Supports the availability of mobile Internet" (202 people); applicants for the master's degree chose "Web 3.0 promotes the globalization factor" (111 marks); applicants of educational and scientific level chose "Improves data management" (15 statements); applicants of educational and creative level preferred "Stimulates creativity and innovation" (13 people), applicants of scientific level chose "Encourages the factors of globalization" (17 selected marks). The results are presented in Fig. 2.

Fig. 2. The main ones advantages of Web 3.0 in higher education for various OQRs



Source: Author's; concluded on the basis of respondents' answers.

The third issue concerned the selection of the most adapted Web 3.0 technology (technologies) to work in the context of distance education, when the educational institution was online. The results are presented in Fig. 3.

Fig.3. The most adapted technologies 3.0 for distance education



Source: Author's; concluded on the basis of respondents' answers.

Applicants of entry level chose the language Webbish (56 answers); applicants for the bachelor's degree chose microblogging, virtual worlds and avatars, virtual educational laboratories (214 people); applicants for the master's degree chose semantic digital libraries, virtual 3D libraries, semantic blogs, intelligent search and intelligent learning systems (123 marks); applicants of educational and scientific level chose online research repository (Figshare) (15 statements); applicants of educational and creative level preferred RDF (Resource Description Framework), SPARQL and web ontology (13 people), applicants of scientific level chose Gmail, Calendar, Drive, Docs, Sheets, Slides, Sites, Vault services (17 selected tags). Recipients in the fourth question had to be identified functions of their chosen educational platforms. The results are presented in table. 1.

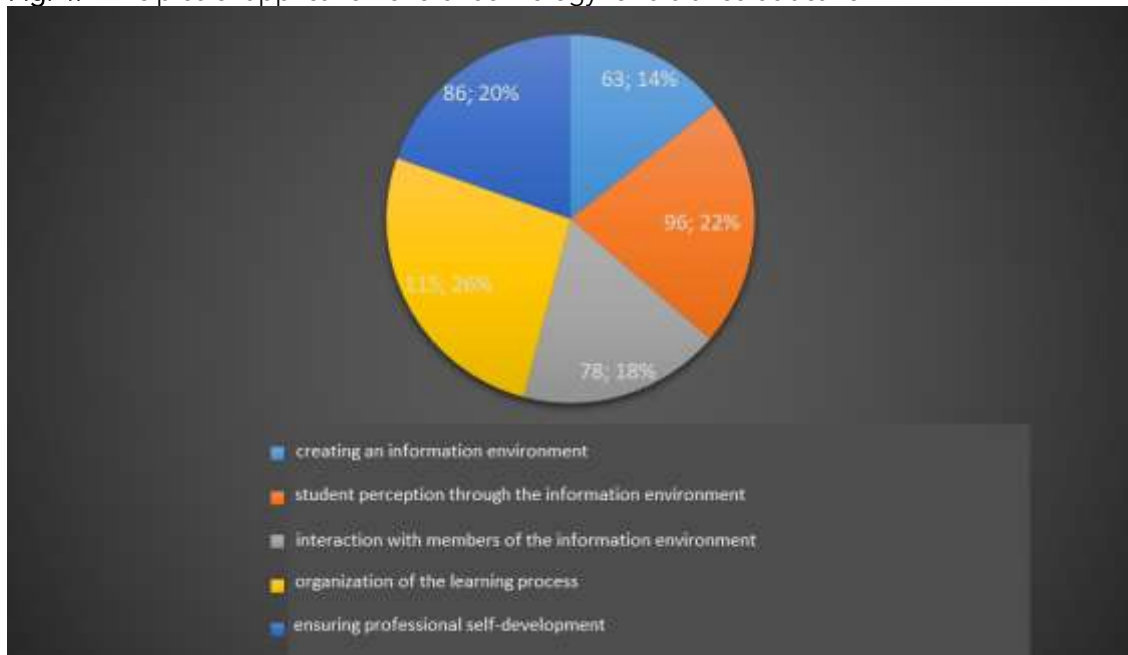
Table 1. Functions of technology 3.0 for distance education

Technology	Functions
Services Gmail, Calendar, Drive, Docs, Sheets, Slides, Sites, Vault	Data universalization
Online research repositories (Figshare)	Possibility to use patents to substantiate research methodologies
Webbish	Linguistic protection of personal data
RDF (Resource Description Framework), SPARQL and web ontology	Organization of data exchange
Microblogging, virtual worlds and avatars, virtual educational laboratories	Ability to extract and collect user metadata on private platforms
Semantic digital libraries, virtual 3D libraries, semantic blogs, intelligent search and intelligent learning systems	Data access protection

Source: Author's; concluded on the basis of respondents' answers.

The fifth question offered to rank principles of application of 3.0 technology for distance education. The results are presented in Fig. 4.

Fig. 4. Principles of application of 3.0 technology for distance education



Source: Author's; concluded on the basis of respondents' answers.

The recipients according to the following indicators arranged the principles of application: organization of the learning process - 115 answers, perception of the student through the information environment - 96 options, professional self-development - 86 positions, interaction with other members of the information environment - 78 answers, creation of information educational environment - 63 options.

The sixth question offered to rank Web 3.0 concept for higher education in distance format. The results are presented in Fig. 5.

Fig. 5. Web 3.0 concepts for higher education in distance format



Source: Author's; concluded on the basis of respondents' answers.

Recipients put the concept of using knowledge to create applied intelligent systems with a rate of 39%, the second place - the concept of self-generation of curriculum content, its certification - 33%, the third place - the concept of adaptive content systems and virtual reality systems that work on the Internet with a rate of 28%.

DISCUSSION

Based on a large number of investigations devoted to the topic under discussion, world and domestic science is based on the following main provisions:

1. Web 3.0 is an integration of the semantic network, big data, cloud computing, 3D-visualization, mobility; intellectual agents; semantic Internet, semantic search, semantic social information spaces, semantic forums;
2. Features of web technology include several application programming interfaces, open source software (OSS) for developing, sharing and configuring applications for global use and application, built-in algorithms for analyzing and interpreting large amounts of data, augmented reality systems, cloud viewing technologies, receiving, sharing and accessing computing services, files and programs, web progress, perception of information at the level of human perception, three-dimensional graphics (museum guides, e-commerce, computer games, movies, etc.) (CHAUHAN, 2016);
3. Web 3.0 promotes the factor of globalization, helps to organize cooperation in the social network, encourages the factor of globalization, improves data management, stimulates creativity and innovation, supports the availability of mobile Internet;
4. The most adapted Web 3.0 technologies for distance education: Gmail, Calendar, Drive, Docs, Sheets, Slides, Sites, Vault, online research repositories (Figshare), Webbish, RDF (Resource Description Framework), SPARQL and web ontology, microblogging, virtual worlds and avatars, virtual educational laboratories, semantic digital libraries, virtual 3D libraries, semantic blogs, intelligent search and intelligent learning systems (ATZORI & PES, 2019; DAVIES & EYNON, 2020; FIRAT E. & FIRAT S., 2021; MINIC, 2014; ILO, NKIKO, UGWU, EKERE, IZUAGBE & FAGBOHUN, 2021; SHIH, 2018; HARJANTI, SUPRIATI & SETIYANI, 2020);
5. Data exchange organizations, language protection of personal data, the possibility of using patents to substantiate research methodologies, the ability to extract and collect user metadata on private platforms, data access protection, data universalization - the main functions of Web 3.0 (Iliadis A., Stevens W., Plantin J.-C., Acker A., Davies H., & Eynon R. (2020);
6. The use of knowledge to create applied intelligent systems, adaptive content systems and virtual reality systems running on the Internet, the behavior of Internet users, self-generation of content, its certification is the basic concepts of Web 3.0 (ATZORI, KOUTRIKA, PES, TANCA, 2020).

CONCLUSIONS

Therefore, based on research, it can be argued that for successful use Web 3.0-technologies in distance higher education for all its levels, it is necessary to rely on the following elements: features and benefits, adapted programs, functions, principles of application, concepts of Web 3.0. Only high-quality interaction of all indicators will allow full implementing the provisions of the Law "On Higher Education". On this basis, intelligence proposes to summarize the functions of Web 3.0-technologies in distance education and learning outcomes at all levels of higher education (Table 2).

Table 2. Consolidated result of interaction Web 3.0 technologies with levels of higher education

Educational level	Promising learning outcome	Recommended features of Web 3.0
initial level (short cycle)	<ul style="list-style-type: none"> • competence: comprehensive specialized • communication: abstract and concrete • responsibility for broad interaction • autonomy: initial management 	Data exchange organizations, language protection of personal data.
first (bachelor's) level	<ul style="list-style-type: none"> • competence: conceptual critical • communication: initial professional • responsibility: documentary informative • autonomy: middle management 	Ability to use patents to substantiate research methodologies, the ability to extract and collect user metadata on private platforms.
second (master's) level	<ul style="list-style-type: none"> • competence: specialized conceptual • communication: social ethical • responsibility: reasoned unambiguous • autonomy: high-level management 	Data exchange organizations, the possibility of using patents to substantiate research methodologies, the possibility of extracting and collecting user metadata on private platforms.
third (educational-scientific/educational-creative) level	<ul style="list-style-type: none"> • competence: conceptual methodological • communication: ideological complex • responsibility: academically • autonomy: high-level self-management 	Ability to use patents to substantiate research methodologies, the ability to extract and collect user metadata on private platforms.
scientific level	<ul style="list-style-type: none"> • competence: conceptual methodological • communication: critical analytical • responsibility: academic • autonomy: continuous self-management 	Ability to extract and collect user metadata on private platforms, data access protection, data universalization.

Source: Author's; concluded on the basis of respondents' answers.

Thus, the high effectiveness of learning in the current educational environment is based on testing the effective functions of the latest web technologies. An important area of further research is the search for new information technologies and platforms for distance learning of HEIs students. The practical significance of the study was the correlation functions Web 3.0 technologies in distance education and learning outcomes at all levels of higher education.

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Application of web 3.0 technologies in distance education (by levels of higher education)

Aplicação de tecnologias web 3.0 na educação a distância (por níveis de ensino superior)

Aplicación de las tecnologías web 3.0 en la educación a distancia (por niveles de educación superior)

Resumo

O objetivo da pesquisa é identificar a necessidade de tecnologias Web 3.0 no ensino a distância entre os candidatos ao ensino superior nível inicial (ciclo curto), primeiro (bacharelado), segundo nível (mestrado), terceiro nível (educacional-científico/educacional-criativo), nível científico entre 438 candidatos para o ensino superior. Recursos (software de código aberto (OSS) para desenvolvimento, compartilhamento e configuração de programas de uso e aplicação globais, algoritmos incorporados para análise e interpretação de grandes quantidades de dados) e os benefícios da Web 3.0 no ensino superior (a capacidade de organizar a colaboração em uma rede social, incentivar a globalização, melhorar a gestão de dados, estimular a criatividade e a inovação, apoiar a disponibilidade de Internet móvel). Estabelece-se a correlação entre as funções da Web 3.0-technologies na educação a distância e os resultados de aprendizagem em todos os níveis do ensino superior. A importância prática dos resultados da inteligência está na correlação das funções da Web 3.0-technologies na educação a distância e nos resultados de aprendizagem em todos os níveis do ensino superior.

Palavras-chave: Web 3.0. Educação a distância. Níveis de ensino superior. Ciclos de educação. Princípios de aplicação.

Abstract

The purpose of the survey is to identify the need for Web 3.0-technologies in distance education among higher education seekers initial level (short cycle), first (bachelor's) level, second (master's) level, third (educational-scientific/educational-creative) level, scientific level among 438 applicants for higher education. Features (open source software (OSS) for developing, sharing and configuring programs for global use and application, built-in algorithms for analyzing and interpreting large amounts of data) and the benefits of Web 3.0 in higher education (the ability to organize collaboration on a social network, encourage globalization, improve data management, stimulate creativity and innovation, support the availability of mobile Internet). The correlation between the functions of Web 3.0-technologies in distance education and learning outcomes at all levels of higher education is established. Intelligence indicates a lack of comprehensive scientific research in the relevant field. The practical significance of the results of intelligence lies in the correlation of the functions of Web 3.0-technologies in distance education and learning outcomes at all levels of higher education.

Keywords: Web 3.0. Distance education. Levels of higher education. Education cycles. Principles of application.

Resumen

El objetivo de la encuesta es identificar la necesidad de tecnologías Web 3.0 en la educación a distancia entre los solicitantes de educación superior nivel inicial (ciclo corto), primer nivel (licenciatura), segundo nivel (maestría), tercer nivel (educativo-científico/educativo-criativo), nivel científico entre 438 solicitantes de educación superior. Características (software de código abierto (OSS) para desarrollar, compartir y configurar programas para uso y aplicación global, algoritmos incorporados para analizar e interpretar grandes cantidades de datos) y los beneficios de la Web 3.0 en la educación superior (la capacidad de organizar la colaboración en una red social, fomentar la globalización, mejorar la gestión de datos, estimular la creatividad y la innovación, apoyar la disponibilidad de Internet móvil). Se establece la correlación entre las funciones de las tecnologías web 3.0 en la educación a distancia y los resultados del aprendizaje en todos los niveles de la educación superior. La importancia práctica de los resultados de la inteligencia radica en la correlación de las funciones de las tecnologías Web 3.0 en la educación a distancia y los resultados del aprendizaje en todos los niveles de la educación superior.

Palabras-clave: Web 3.0. Educación a distancia. Niveles de educación superior. Ciclos educativos. Principios de aplicación.