The Use of Digital Open Systems in the Preparation of Students

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Abstract
The main purpose of the article is to study the process of using digital open systems in student training. The development of information and communication technologies (ICT) and their integration into all spheres of human activity and society affect the nature of production, scientific research, education, culture, life, social relations and other processes. Given this, a digital transformation of social development is taking place, in particular, the digitalization of education is an imperative for reforming the educational industry, the main and primary task of the effective development of the information society in the world. As a result of the study, the current state of the use of innovative information and communication technologies in the process of preparing students, as well as the use of an open educational environment as an advanced means of developing the pedagogical environment and higher education, was analyzed.
Keywords:
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1. Introduction

The main condition for promoting the creative development of science and education and for intensifying international scientific cooperation is open and free access to scientific publications, in particular to the results of dissertation research. In modern conditions, information support is the main component of the research activities of graduate students, doctoral students, scientific and scientific and pedagogical employees [1].

Thanks to the development of information and communication technologies, the time for searching for information resources for educational purposes and conducting scientific research has been significantly reduced, because for this it is enough to have access to the Internet. However, the ability to find the necessary and reliable material is an important element of the information and communication competence of a person, especially a modern scientist. For scientists, it is important to match the thematic focus of information resources, the reliability and quality of materials, the convenience and comfort of working with electronic documents. In the publication of institutions of higher education and scientific institutions, on the basis of their autonomy and self-government, the right is granted to independently develop and implement educational and scientific programs within the framework of a licensed specialty, introduce the necessary specializations, determine their content and programs of educational disciplines. There are difficulties in developing the content of educational and scientific programs for training specialists at the third level of higher education, which is due to [2]:

- the lack of state-approved standards of higher education for each specialty and passports (standards) for new specialties, according to which the training and defense of doctors of philosophy and the awarding of scientific degrees and academic titles will be carried out;
– the uncertainty of the subject field of the training of doctors of philosophy in the field of education, which cannot but affect the content of doctoral programs..

Similar problems still arise, but most institutions of higher education and research institutions have already received licenses for the training of postgraduate students and have begun the educational component of their training. However, the use of information and communication technologies in the process of training students is not carried out in full. In addition, there is a disregard for the potential of using digital open systems in order to ensure the

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implementation of certain stages of dissertation work and the dissemination of scientific results of students.

2. Methodology

The theoretical and methodological part of the study is presented by demonstrating the results of a theoretical analysis of the specialized scientific and pedagogical literature concerning the use of innovative information and communication technologies, in particular the system of open digital systems as a powerful factor in helping students prepare. To achieve the goals set, the main and particular research methods were used - abstract-logical analysis, methods of analysis and synthesis. For clarity, the key data of the study were systematized and placed in a tables.

3. Research Results

The quality of education largely depends on the quality of education in general. The main idea can be summarized as follows: in order to educate the younger generation of people so that they can adequately meet the demands of the time, it is necessary to create conditions for quality education. Improving the quality of student learning directly depends on the professional level of teachers. Improving the quality of education can be achieved with the help of appropriate computer technologies. Cloud-based systems are now increasingly used in the educational process. Since the financing of government agencies is an urgent issue, therefore, in most cases, free cloud-based platforms and services are chosen.

It turns out that the majority of teachers of pedagogical educational institutions are familiar with cloud services and express their intention to use cloud-based systems in the educational process. However, not all teachers have experience in using cloud-based systems and cloud services.

Therefore, some of them advise students to use cloud services or cloud-based systems in the process of performing cumbersome calculations. It was found that teachers using the cloud service in the educational process fully involve all its possible tools. However, in the absence of methodological developments for the use of cloud-based systems, the effectiveness of their pedagogical use is questioned. According to studies conducted in world pedagogy, teachers see the prospects for using cloud services in the study of mathematical disciplines in the following: individualization of learning; saving the teacher's time; variety of learning. As for the forms of organization of the educational process, according to the majority of respondents, they first of all need active support: lectures and practical exercises [3].

Cloud-centric systems have been studied by scientists more than once. In particular, there are techniques for using both cloud-based systems and cloud services. However, the problem of introducing cloud-based systems into advanced training courses for teachers has not yet been sufficiently studied by Ukrainian scientists. Including taking into account the principles of open science. Open science is a very broad term that refers to different concepts, ranging from scientific philosophy and cultural norms, such as ownership of scientific methods and principles according to which results should be judged by significance (i.e. universalism), to specific practices, that they operate with such norms, even as simple as the consistent observance of citation standards. However, open scientific practice is a relatively new concept and, as a result, educators and teachers are unsure of its intended purpose and usefulness.

Table 1 [4] summarizes the main principles for the formation of a cloud-oriented educational and scientific environment of a pedagogical educational institution.

Therefore, open science can lead to an increase in the quality and credibility of domestic research, not only in part by reducing certain questionable research practices, but also through a positive and productive research culture, timely data sharing, and transparency in the educational and scientific process with published results. Cloud-oriented systems act as a tool for implementing the principles of open science in pedagogical systems.

Table 1: The main principles for the formation of a cloud-oriented educational and scientific environment of a pedagogical educational institution.

Principles	
General principles	– mobility of teachers and students; – equal access to open educational systems; – ensuring quality education; – formation of the structure and subsequent implementation of educational services.
Specific principles	– full-scale interactivity; – personalization of the delivery of services; – compatibility and standardization; – infrastructure unification; – adaptability; – scalability and flexibility; – consolidation of resources and data; – safety and reliability; - innovation.

The implementation of these principles can be ensured by solving a certain set of tasks within the computer-oriented educational environment of an institution of postgraduate education (Table 2).

The introduction of cloud platforms and services in the educational process leads to the emergence and development of forms of organizing training and scientific research focused on joint educational activities, creating more opportunities for the implementation of educational and scientific projects. The methods and approaches of open science have a significant impact on the educational process, in particular teacher education [5-6].

Table 2: The main tasks of the process of using digital open systems in student training

Tasks	
	rganization by the management of the educational and cognitive process of advanced training of students both during advanced training courses and in independent, distance learning
2	identifying and taking into account the training of students (teaching staff) of their individual educational interests and social needs;
3	- coverage of the entire spectrum of formal, informal and remote retraining of teaching staff
4	dissemination of open knowledge, promotion of the exchange of progressive pedagogical experience, provision of access to open cloud resources and services

When using cloud-based systems in institutions of postgraduate pedagogical education, it is possible to implement [7]:

- publication of information about the results of the students' own activities in the public domain;

– Establishing real-time communication through cloud services (e.g. e-mail, forums);

– implementation of preliminary electronic registration, as well as open diagnostics of students;

- introduction of the practical implementation of individual training modules for the professional development of teaching staff;

– publication of the electronic training schedule in the cloud-oriented systems of institutions of postgraduate pedagogical education;

– accumulation of professional experience of pedagogical workers in the region with the help of cloud technologies;

- orientation towards the further development of the professional competence of participants in the educational process of training courses for teachers or its individual components;

- publication of the results of applied scientific research on educational problems in open electronic educational publications or free duplication of printed publications in electronic versions;

– placement in cloud repositories of educational, psychological and pedagogical materials in the most common formats;

- expanding the access of pedagogical workers to educational materials through the functioning of cloud-oriented hybrid libraries;

- support for the educational and cognitive activities of students through professional pedagogical communities with the tools of cloud-based systems;

– implementation of combined training with a combination of remote and full-time forms of work;

– introduction of distance learning based on cloud-based systems.

So, based on our own experience and analysis of scientific literature, recommendations for students on the use of digital open systems to develop their own image are substantiated:

1) electronic libraries, depositories - self-archiving of scientific results. Own scientific works (articles, monographs, manuals, audio recordings of various scientific events, electronic presentations and abstracts of reports, etc.) should be placed (self-archived) in electronic libraries. Self-archiving is understood as the placement by the author of a free

copy of an electronic document on the World Wide Web in order to provide open access to it. Preferably, the term refers to the self-archiving of scientific peer-reviewed journal articles and conference proceedings, as well as dissertations, research results, etc. to increase its accessibility, use and citation. Various electronic libraries have a section of statistics, with which you can perform a quick cut of data on the use of information resources. The researcher can track the dynamics of using his own scientific papers, how often they are interested in the results of scientific research, and therefore assess how relevant the problem he is working on, or his colleagues are working on [8].

2) scientometric systems - creation and support of personal profiles. A postgraduate or doctoral student, having created a personal profile in the scientometric system, can track bibliographic references to their publications, view citations, citation graphs of their publications. Scientometric systems can be a powerful tool for publishing, disseminating and analyzing the use (citation) of scientific research results [9]. Using these systems, it is possible to carry out a quantitative and qualitative assessment of the scientific results of both individual researchers and research teams or organizations. Indeed, the "citation index" is a kind of rating scale that determines the quantitative and qualitative contribution of a scientist to science. However, despite the fact that this criterion is formalized and, thus, to a lesser extent depends on subjective influences, it still cannot be recognized as the only reliable one. Most experts believe that the citation index is just one of the indicators of the scientific level that a scientist has reached.

3) Electronic social networks. We believe that it is electronic social networks, thanks to the convenience of their tools and services, that have become the main ones for quick feedback from the public and dissemination of their own scientific results [10]. For example, there are electronic social networks created specifically for the scientific community, namely: Ukrainian Scientists in the World (Ukrainian Scientists Worldwide), Computer Science Student Network, LinkedIn, Scientific Social Community, SciPeople, etc. Directions for the use of electronic social networks by graduate and doctoral students: 1) self-presentation of a young scientist; 2) search for scientific material and tracking news about scientific mass events; 3) support of scientific contacts and organization of thematic groups or pages; 4) evaluation and monitoring of the effectiveness of their own scientific work [11].

4) digital identifier of the ORCID scientist. The author's unique digital identifier solves the problem of correctly identifying the documents of a particular author. To save time, it is advisable to exchange information between profiles and import-export bibliographic records from profiles and other resources, use the capabilities of specialized bibliography management systems (Mendeley, EndNote) [12].

5) scientific mass events - performances on approbation of the results of scientific research. An important role in shaping the image of a scientist is played by his dialogue with the public, both directly during meetings and through the media. This is participation in public, scientific discussions, open round tables, seminars, press conferences, as well as in such image events as Science Days, exhibitions, seminars, festivals, intellectual and scientific-educational games, talk shows on television, etc. d. .

4. Discussions

The digitalization of education depends on the objective conditions and current trends in the development of the information society, the main of which are the development of artificial intelligence (Artificial intelligence), the development of the so-called "machine learning" (Machine Learning), the creation of a neural network (Artificial Neural Networks); ensuring the mobility of information and communication activities of users in the information space (Mobility); further development of mobile-oriented means and ICT access to electronic data; the introduction of blockchain technologies (Blockchain) into the work of government bodies, communications between subjects of various human activities, including educational, along with other events; introduction of cryptocurrencies (Cryptocurrencies); development of cloud computing technology and the introduction of fog computing technology (Cloud Computing and Fog Computing); development of telemedicine (Telemedicine); development of new functions of augmented reality (Added Reality - AR) and the availability of equipment for virtual reality (Virtual Reality - VR); widespread introduction of chat bots (Chat Bots) and virtual assistants (Virtual Assistants), the formation and use of electronic

information databases and systems (Big Data, Data Mining, Data Bases), in particular electronic libraries (Electronic Libraries, Repositories) and scientometric databases (Scientometric Data Bases); development of user characteristics of the Internet of People (IoR), deployment of the topology of broadband high-speed electronic communication channels (Broadband Communication Channels), systems for the formation of an ICT space for wireless user access to electronic data (Cordless Access to Digital Data, Wi-Fi, Bluetooth Cellular networks); the formation of the Internet of Things (Internet of Things - IoT), the development of its software and hardware, in particular microprocessor and integration platforms, to ensure the configuration, control and monitoring of electronic devices using modern telecommunication technologies; development of robotics (Robotics), robotic systems, in particular, 3D printers and 3D scanners; development of the software industry (Software Development Industry), in particular, the publication of electronic educational resources; – ensuring the compatibility of ICT tools and ICT applications built on different software and hardware platforms (Compatibility); development of networks of ICT service providers (the market of ICT outsourcers), primarily cloud services (Cloud Services) and a network of Data Processing Centers (Computing Center Network); development of data protection systems in information systems and counteraction to cybercrime (Data Security and Counteraction of Cybercriminality) [13].

The priorities in building an information and educational environment should be: the widespread use of computer-oriented tools and ICT training in the educational process, the introduction of distance learning technologies, the provision of support for research work using ICT, the introduction of ICT in education management at its various levels, in different industries, for all types of educational institutions. The technological principles for the development of such an environment should be, first of all, the use of cloud computing technologies, taking into account the features of various computer technology platforms by developers of web applications and electronic educational resources, effective mechanisms for the use of ICT outsourcing, requirements for educational and learning environments from the state, subjects educational process [14].

The end-to-end content of education should be the strengthening of information and communication support, information and information training of students, students and teachers; introduction of ICT in teaching and learning of all disciplines of educational institutions. To create a wide range and pedagogically balanced use of electronic educational resources and software for various purposes, in particular educational and managerial, it is advisable to introduce an industrial approach that takes into account the psychological and pedagogical aspects of building methodological training systems and an open computer-oriented learning environment. ulcerative involvement in the creation of EER of scientists, teachers, teachers-innovators of educational institutions. The proportion of educational materials in electronic form should constantly increase.

The determining factor for the transformation of education and the formation and continuous development of the information and educational space is the creation of a target information and educational environment for the development of digital competence of pedagogical and scientific-pedagogical workers, librarians, educational leaders, familiarizing them with new relevant developments in the field of ICT; advanced training of employees of IT departments of methodological services, educational institutions, scientific institutions and education management bodies of pedagogical workers, taking into account the characteristics of different levels and branches of education, different types of educational institutions [15]. At the same time, it is relevant to adapt and implement internationally recognized procedures for standardization, certification of education specialists, in particular teachers, regarding the possession of ICT, the formation and development of digital competence.

5. Conclusions

Thus, in the process of preparing students, we recommend using digital open systems not only to disseminate the results of scientific research, but also to conduct individual stages of dissertation work, namely: expanding the source base of research, in particular, familiarization with foreign publications of famous scientists and experienced teams; receiving quick feedback from colleagues and

participants in pedagogical experiments; presentation in open access of own scientific results; monitoring the distribution of own scientific publications; conducting surveys, surveys, observations; support of scientific contacts; conducting experimental education; study of statistical data of the pedagogical experiment, etc.

Also, the use of digital open systems is a relevant measure, since the general public will be able to get acquainted with scientific results that will affect the development of the scientific image of a graduate and doctoral student and the image of the institution where he receives education or works as a researcher. In subsequent studies, we believe that it is advisable to highlight the main components of the methodological system for using open digital systems among students.

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