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Methodological bases of the introduction of cloud technologies in educational institutions

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Abstract

The aim of the study is to consider all the possibilities and types of cloud technologies, to apply the methodological basis of their implementation in educational institutions via psychological, pedagogical and methodical literature review. According to the results of the analysis, we can talk about a high degree of familiarity with cloud services, but the level of everyday use of cloud services is not so high. In conclusion, the emerging tasks require new solutions in the creation and updating of the organization of training, the inclusion of the latest technical and technological tools in order to improve efficiency and optimization.

Keywords: Cloud, Technologies, Methodological, Informatization, Education.

Bases metodológicas de la introducción de tecnologías en la nube en instituciones educativas

Resumen

El objetivo del estudio es considerar todas las posibilidades y tipos de tecnologías en la nube, para aplicar las bases metodológicas de su implementación en instituciones educativas a través de la revisión de literatura psicológica, pedagógica y metódica. Según los resultados del análisis, podemos hablar de un alto grado de familiaridad con los servicios en la nube, pero el nivel de uso diario de los servicios en la nube no es tan alto. En conclusión, las tareas emergentes requieren nuevas soluciones en la creación y actualización de la organización de la capacitación, la inclusión de las últimas herramientas técnicas y tecnológicas para mejorar la eficiencia y la optimización.

Palabras clave: Nube, Tecnologías, Metodología, Informatización, Educación.

1. INTRODUCTION

Strategic guidelines for the modernization of education, reflected in the «Concept of the e-learning system of the Republic of Kazakhstan for 2011-2020», in the «Strategy of informatization of the education system of the Republic of Kazakhstan until 2020», in the Message of the President of the Republic of Kazakhstan «The Third Modernization of Kazakhstan: Global Competitiveness» dated January 31, 2017 years, determine the need for orientation of educational systems to ensure the modern quality of education, determining the result of training

graduates in the form of the formation of their general cultural and professional competence (PC).

A competence-based, modern and computerized approach, which combines his professional qualifications with general disciplinary requirements for the result of education and, as a result, the preparation of a future computer science teacher should be based on the logic of the competence approach and be reduced to the formation of professional competence.

One of the modern and promising information technologies, which is almost not paid attention in the educational process, and the use of which is implied by the existing concept of the e-learning system of the Republic of Kazakhstan, is cloud computing technology (cloud computing), which is understood as an infrastructure designed to provide ubiquitous access using Internet to storage devices, applications and services. Problems, the state and directions of development of information technologies, the possibilities of their application in educational systems and their introduction into the educational process are widely discussed in the scientific community.

The following scientists were engaged in the method of introducing network services into the learning process, in particular, for organizing the network interaction of students:

ABDURAZAKOV (2012), AZAROVA (2010), ZENKINA (2009), MNATSAKANYAN (2016), AND PATARAKIN (2002). and

others. However, the use of network services based on cloud technologies in the educational process, the selection of cloud services for their further implementation in the educational activities of students and teachers and ensuring information security when working with cloud services currently insufficient disclosed (LI, 2019).

Despite heightened attention to the issue of using network services in the learning process, holistic research from the perspective of using cloud technologies for introducing into the educational process and developing methods for its formation under the conditions of using cloud technologies has not been carried out (MACHADO ET AL, 2019).

The educational and methodological support for the introduction of cloud technologies in the educational process, in the use of cloud technologies in educational activities, has not been sufficiently developed, and the method of its formation has not been sufficiently developed in this regard. Thus, there is a need for scientific and methodological substantiation of the need to use cloud technologies and the development of methods for its implementation in terms of using cloud technologies. In addition, it is necessary to formulate the conditions for the safe use of network services based on cloud technologies in the educational activities of students and teachers, and also it is necessary to develop criteria for the selection of cloud services. Thus, in the system of higher education the following contradictions are highlighted between:

- The need for pedagogical workers to use modern Information and Communications Technology (ICT) tools in the context of modernizing the education system and developing network technologies;

- The conditions of the rapidly changing information educational environment and the inadequate preparedness of teachers to adapt for educational purposes a large variety of network services based on cloud technologies;

- The possibilities of network services based on cloud technologies for education and the inadequate preparedness of the pedagogical worker for the application of these services for the realization of the goals and objectives of teaching a particular discipline;

- The need to ensure the information security of subjects of educational activities when working with network services based on cloud technologies, and the lack of methodological recommendations and practical guidelines for the targeted selection of the necessary cloud services for training that meet the required security requirements.

The next decade of the 21st century provides plenty of opportunities for education. The American Scientist K. Bonk in his book *The World is Open: How Web Technologies Revolutionize Education* presented a number of key open-world trends affecting education. Consider the main trends that form the skills needed in the 21st century and have a positive effect on education and open up many new opportunities for students and teachers.

1. Search the Internet. The Internet is a repository in which virtually everything is open for access: information, e-books and documents, various libraries, resources and applications, and the teacher and student must be able to find the necessary information and sources from all the diversity presented. Therefore, Internet search skills are important components of ICT literacy for students in the digital world.

2. Blended learning. Internet resources are placed on a par with important reading and writing skills, presentation and technological skills, and based on this, the learning process should be commensurate with the available hardware and software capabilities. Blended learning implies not only face-to-face and group communication, but also real-time interaction using modern information technologies.

3. Free / open-source software (F / OSS). Software developed in the framework of F / OSS can be used in educational institutions in the study of disciplines, as an accompanying software, as well as to improve various skills.

4. Open Courseware. Massachusetts Institute of Technology (MIT) has become the main provider of Open Course Ware. The training materials contained in such resources are useful both for teachers and students (ZAGVYAZINSKY, 2005).

5. Educational portals. Such portals are now quite developed and allow you to both learn new material and develop your knowledge in various scientific fields.

6. Students as teachers. Currently requires a lot of initiative from students. They should be able to independently study the material that is useful for their education.

7. Electronic collaboration. Training organizations develop e-collaboration skills using appropriate tools.

8. Alternative reality, including serious games. Games as one of the interactive teaching methods can also be used in the educational process. They allow you to simulate real-life situations, forcing learners to seek and make decisions.

9. Mobile learning. With the help of mobile devices, you can train those who do not have the opportunity to attend educational organizations; they can be trained in after-hours from any place, providing advice and advice (Buzhinskaya & Makarov, 2016).

10. Personalized learning networks. For training, you can use network resources that are popular with the modern generation, for example, the social networks Facebook, Vkontakte, etc. These resources allow you to use many of your applications for educational purposes, as well as develop and implement your own.

11. Development platforms. At the moment there are many content management systems, which are platforms for their own development, which allows educational organizations to easily deploy their training systems.

12. Cloud Computing Resources. Cloud technologies provide educational organizations with free cloud services that can be used in the educational process. All the above trends can be easily implemented on cloud resources.

It is safe to say that they will continue to evolve, because now cloud technologies provide users with ample opportunities without the need to have powerful hardware, both in business and in everyday life.

2. DETAILS EXPERIMENTAL

2.1. Materials and Procedures

The methodology can be viewed in two sections: both theoretical, and formed by the section of philosophical knowledge of gnoseology, and practical, oriented to the solution of practical problems and purposeful transformation of the world (NIGMATULAEV ET AL., 2018).

Means for creating a methodological tool can be divided into groups using a comprehensive criterion, including such indicators as the purpose and functions performed, requirements for technical support, and features of the application. In accordance with the specified criterion, the following classification is possible:

- Multimedia;
- Hypertext and hypermedia tools;
- Special software tools for creating methodological tools;

- Programming languages.

We performed the following:

1. Study of theoretical material on the use of cloud technologies
2. Determination of the role and place of cloud technologies in education.
3. Development of methodological tools for the introduction of cloud technologies in education
4. Carrying out a pedagogical experiment.

To solve the problems of research and testing the hypothesis, the methods of theoretical analysis were used: psychological, pedagogical and methodical literature on the problem of research; analysis of educational standards, rules, curricula and teaching materials); empirical research (observation of the course of study in an experiment, conducting surveys and testing students and teachers); Pedagogical experiment, its quantitative and qualitative analysis by statistical and probabilistic methods.

We built the structure of the methodological tools for the use of cloud technologies. On the main page, a methodical tool for using cloud technologies has sections such as Section 1 - Theoretical Foundations. This section provides the necessary theoretical material for further perception and understanding of practical material.



Fig. 1: Main menu

Section 1 consists of two points, such as: «Service models of cloud technologies», «Models of cloud technologies deployment». Section 2 consists of 2 items, such as: «Google services», «Educational data storage systems». The item «Google services» consists of 6 sub-items such as: «Google Docs», «Gmail», «Google Groups», «Google Site», «Google Calendar», «Google Translate». From each page of the sub-items, it is possible to return to the page from the main page of section 2. And from each main page there are 4 sections on the main page of the methodical tool. 3 section «Glossary», it contains all the terms found in the methodological tool with annotations to them.

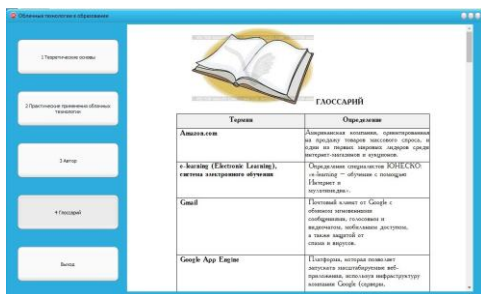


Fig. 2: The Glossary section

The terminological dictionary is designed so that the user can use it at any stage of training. This dictionary provides a brief explanation of the basic concepts (glossary).

3. RESULTS AND DISCUSSION

The pedagogical experiment is a scientifically formulated experience of transforming the pedagogical process in precisely accounted conditions. Unlike the methods that only register what already exists, the experiment in pedagogy is constructive. Experimentally, for example, make their way into the practice of new techniques, methods, forms, systems of educational activities. The pedagogical experiments can cover a group of students, class, school, college, university. The decisive role in the experiment belongs to the scientific hypothesis. The study of the hypothesis is a form of transition from the observation of phenomena to the disclosure of the laws of their development. The reliability of experimental conclusions directly depends on the observance of experimental conditions. Types of pedagogical experiments depending on the purpose:

- Stating experiment in which existing pedagogical phenomena are studied;
- Verification, clarifying experiment, when testing a hypothesis created in the process of understanding the problem;

- Creative, transformative, formative experiment, in the process of which new pedagogical phenomena are constructed.

At the venue distinguish between natural and laboratory pedagogical experiments. A natural pedagogical experiment is a scientifically organized experience in testing an advanced hypothesis without disrupting the educational process. The objects of a natural experiment most often are plans and programs, textbooks and teaching aids, methods and methods of training and education, forms of the educational process. A laboratory pedagogical experiment is used when it is necessary to check a particular question or if it is necessary to ensure particularly careful observation of the subject in order to obtain the necessary data, while the experiment is transferred to special research conditions. To test the developed methodological tools for the use of cloud technologies in the educational process, experimental work was carried out aimed at solving the following tasks:

- Analysis of the use of cloud technologies by teachers in the classroom;
- Analysis of the demand for cloud technologies in educational institutions;

In accordance with the tasks set, an experimental study was conducted at various levels in the system of higher education: among the teachers of Pavlodar State University named after S. Toraigyrov, among teachers of secondary school № 25 of Pavlodar, among

undergraduates of PSU. In general, the experiment took 50 people. At the first stage of the experiment (ascertaining) the analysis of the scientific-pedagogical and educational-methodical literature on the research problem was carried out; identified educational capabilities of cloud-based network services for learning; possible options for using cloud technologies in the teacher's professional-pedagogical activities were considered; identified the need to develop methodological tools based on the use of cloud technologies; the purpose, tasks, subject, object, working hypothesis of research were determined; planning of pilot work was developed; carried out the theoretical development of the dissertation problem.

In this connection, electronic Internet resources, educational and methodical publications of pedagogical universities were studied. In addition, a number of scientific and educational publications on the problems of introducing network services, including those based on cloud technologies, both by foreign and domestic authors, were studied. At the same stage, a survey was conducted of future informatics teachers, informatics teachers and ICTs of the city of Pavlodar and analyzed existing approaches to the study of cloud technologies and their use in educational activities. At the second stage of pedagogical research (search), the results of the survey were analyzed; the material was selected to build a methodical tool in terms of using cloud services as basic software; An experimental test of acquaintance with the cloud services of future teachers, informatics and ICT teachers was carried out.

During the pedagogical experiment, the following cloud-based network services were selected: cloud-based office applications (for co-creation, editing and using text documents, spreadsheets and presentations on the Internet); graphic editors (for co-creation, editing and use of graphic images); database management systems (for co-creation, editing and use of databases); programming services (for co-creation and testing of programs). The use of network services based on cloud technologies makes it possible to increase the effectiveness of training, to identify the interests and abilities of students, to work with various information sources, Internet resources, independently conduct research, and develop teamwork skills.

At the third stage of the pedagogical experiment, the results of the experimental work carried out were analyzed; the obtained empirical data were compared; relevant conclusions and analysis of the experimental results were made by statistical methods; the text of the dissertation research was drawn up. For these purposes, analysis and mathematical processing of the results of experimental work were performed, and the criteria for experimental research were determined.

Let us consider in more detail the results of the survey:

Question number 4 what cloud services do you know?

The percentage of the selected response is shown in the chart.

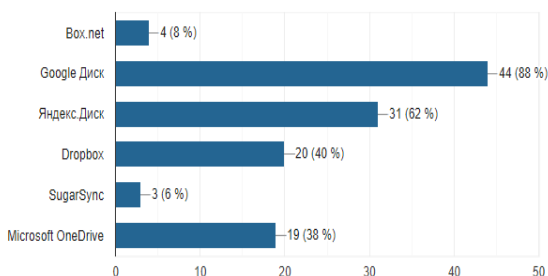


Fig. 3: Answer to question 4 questionnaire

From the data chart, it is clear that the majority (88%) are familiar with the cloud service Google Drive. And also with Yandex.Disk (62%). Of all the respondents, only 6% are familiar with the SugarSync cloud service. Question number 5 what kind of cloud services do you use in your classes? From the data, we obtained that the majority (86%) use Google Drive in their classes. And only 18% use the Microsoft OneDrive cloud service in its class. Question number 6 How often do you use cloud services? Many (44.9%) use cloud services in class rarely, and only 26.5% of respondents use cloud services in each class, and 24.5% use them once a month.

Question number 7 is it safe, in your opinion, to use cloud services? The majority (63.3%) consider the use of cloud technologies to be completely safe, and only 14.3% are sure that the use of cloud funds is safe. And many 22.4% believe that they are not entirely safe. Question number 8 the use of cloud services facilitates the work of the teacher? These answers prove that the majority (73.5%) agree that the use of cloud facilitates the work of teachers. And only 4.1% answered that they are not sure that cloud services facilitate the work of teachers.

Question number 9 how do you think, is it possible to interest students to the discipline under study, using cloud services in the classroom? From the responses received, it can be seen that the majority (59.2%) are confident that students can be interested in the discipline under study using cloud services in the classroom. And only 10.2% refrained from answering.

Question number 10 «How do you think cloud services are sufficiently embedded in the educational process? ». This answer to the question confirms, 46.9% believe that cloud services are not sufficiently implemented in educational institutions. And only 20.4% believe that cloud services are sufficiently embedded in educational institutions. Question number 11 what measures need to be carried out to cloud services have become in demand in the educational process? The majority (77.6%) believe that the cloud services are sufficiently implemented, the interest of both the teacher and the student is necessary. And only 16.3% believe that it is necessary to solve this problem at the legislative level. Analysis of the results of the survey leads to the following conclusions:

1. most are familiar with cloud services, mostly well acquainted with the cloud service Google Drive. Nevertheless, half of them (50%) use them rarely;
2. most of them are confident that the use of cloud services in the classroom will cause interest in the discipline, while they believe

that cloud services are not sufficiently embedded in the educational process;

3. Most consider it necessary the interest of both the teacher and the student in order for the cloud service to be sufficiently demanded in the educational process.

In general, according to the results of the analysis, we can talk about a high degree of familiarity with cloud services, but the level of everyday use of cloud services is not so high.

4. CONCLUSIONS

The use of cloud technologies allows us to expand the scope of e-education, taking into account the individual characteristics of the perception of material by students and the improvement of the teaching system as a whole. With this approach, education will become accessible to almost all students, the process of communication of all members of the educational environment will be simplified, the level of savings on educational expenses with technical equipment and training materials will increase.

The introduction of cloud technologies in the educational process will increase the cognitive interest and activity of students in training, to achieve high performance in academic disciplines and deepen students' knowledge in the field of modern information technologies. Training in the information educational environment with the use of cloud

technologies will provide an opportunity to organize the educational activities of students in accordance with modern requirements and taking into account the effectiveness of the use of innovative technologies in training.

Organizing the learning process at an affordable level, with a developed technical and methodological base, as well as according to the individual characteristics of students, will be possible as part of training using modern cloud systems. The modern development of society is characterized by the transition to a new stage in which new information and communication technologies play an important role. Therefore, the emerging tasks require new solutions in the creation and updating of the organization of training, the inclusion of the latest technical and technological tools in order to improve efficiency and optimization.

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