

CLOUD - BASED TECHNOLOGY-BASED SOFTWARE PLATFORMS IN THE DEVELOPMENT OF INDEPENDENT EDUCATION

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Annotation

This scientific article analyzes the role, pedagogical capabilities and practical significance of software platforms based on cloud technologies in the development of Independent Education. The digital education environment highlights the functional capabilities of Google Classroom, Microsoft Teams, Moodle Cloud, Zoom, Coursera and other cloud platforms in the educational process. The study examined the benefits of maintaining, managing, sharing and organizing distance learning educational resources using cloud technologies. Also, in the organization of Independent Education, the flexibility, mobile capabilities, security issues and pedagogical efficiency of cloud services are analyzed. At the end of the article, cloud technologies were introduced into the higher education system

Keywords

Cloud technologies, independent education, digital education, LMS, Google Classroom, Moodle Cloud, Microsoft Teams, distance education, electronic platform, educational technologies.

INTRODUCTION

In the 21st century, as a result of the rapid development of information and communication technologies, fundamental changes are taking place in the educational system. In the modern educational process, the use of digital technologies, internet services and cloud platforms has gained wide popularity, along with traditional forms of education, electronic and distance learning systems are also developing. In such conditions, cloud technologies are manifested as an important tool in the effective organization and management of independent educational activities of students [6].

Independent education is one of the main components of the higher education system and serves to form the skills of the student to independently acquire knowledge, search for information, analyze and apply in practice. With the introduction of the credit-module system, the educational load of students outside the audience increased, and the need for independent work increased even more [9]. Therefore, there is a need to remotely organize the educational process,

preserve educational materials and apply modern technologies in establishing interactive cooperation with students.

Cloud technology (Cloud Computing) is a modern technology model that allows users to remotely use software, servers, databases, and electronic resources over the internet [8]. These technologies are widely used in the educational system for storing educational materials, their joint use, organizing video conferences and managing assignments.

Today, cloud platforms such as Google Classroom, Microsoft Teams, Moodle Cloud, Zoom, Dropbox, OneDrive, and Google Drive have become an important component of the worldwide educational process [3]. These platforms allow students and educators to use learning materials anywhere and at any time. In particular, the ability to connect to platforms through mobile devices is increasing the efficiency of Independent Education.

During the COVID-19 pandemic, the importance of cloud-based technology-based educational platforms has increased further. In the context of the pandemic, millions of students and educators were forced to switch to distance education systems. As a result, the demand for cloud services-based electronic platforms has increased dramatically [13]. During the same period, videoconferencing systems, virtual classes, and electronic assignment systems played an important role in ensuring continuity of the educational process.

One of the main advantages of cloud technologies is flexibility and economic efficiency. Educational institutions can organize the learning process by using cloud services without creating a large-scale server infrastructure [2]. In addition, cloud platforms also provide opportunities for Automatic Data Backup, real-time collaboration, and quick resource updates.

At the same time, the application of cloud technologies in the educational system also poses a number of problems. In particular, insufficient internet speed, data security, user data privacy, and technical failures can negatively affect the efficient use of cloud services [4]. In particular, security issues related to storing user data on third-party servers are one of the pressing issues today.

Special attention is paid to the digitalization of the educational system and the introduction of cloud technologies in the Republic of Uzbekistan. Within the framework of the strategy "digital Uzbekistan - 2030", a number of measures are being implemented to create e-learning resources, develop distance learning platforms and expand the use of cloud technologies in higher education institutions [11].

The purpose of this article is to analyze the scientific and theoretical foundations of software platforms based on cloud technologies in the development

of Independent Education, to study their pedagogical capabilities and effectiveness, and to develop recommendations for effective application in the educational system.

REVIEW OF THEMATIC LITERATURE

The issues of using cloud-based software platforms in the development of Independent Education have become one of the most relevant scientific areas in the field of pedagogy, information technology and digital education in recent years. In scientific research, mainly the theoretical foundations of cloud technologies, their role in the educational system, the possibilities of organizing distance education, the platforms of the Learning Management System (LMS), mobile education, collaborative teaching and data security issues are widely studied.

M. in the formation of the theory of cloud technologies. An important place is occupied by research by Armbrust and his collaborators. Researchers interpret Cloud Computing technology as a modern model that allows remote use of computing resources, servers, and software over the internet [1]. The authors point to flexibility, economic efficiency, and efficient resource utilization as the main advantages of cloud technologies. These scientific views later served as the theoretical basis for the introduction of cloud platforms in the educational system.

J. on the application of cloud technologies in the educational system. The pedagogical capabilities of cloud services have been extensively analyzed in research conducted by Smith [8]. The author believes that cloud platforms increase the effectiveness of Independent Education by providing access to educational resources from any time and place. The study particularly rated cloud storage services such as Google Drive, Dropbox, and OneDrive as a convenient means of managing learning materials.

P. Brown's scholarly work provides a comparative analysis of the pedagogical capabilities of the Moodle Cloud, Canvas, and Google Classroom platforms [3]. According to the results of the study, the Moodle Cloud Platform is distinguished as an open source system by its flexibility and extended management functions. Google Classroom is described as a user-friendly platform due to its simplicity of interface and mobile flexibility. The author, on the other hand, evaluates the Canvas system as an effective platform with modern analytical tools and automated monitoring capabilities.

In scientific research on Learning Management System (LMS) technologies, the role of cloud platforms in managing the educational process has been studied separately. J. In his academic work, Anderson argues that LMS systems are an important tool for the organization and control of Independent Education [2].

According to the researcher, electronic platforms allow educators to manage educational materials, control assignments and monitor student activities.

Scientific Reports prepared by UNESCO on distance education systems describe cloud technologies as the main infrastructure of Modern Education [10]. The report noted the creation of a continuing education environment for millions of students through the Google Classroom, Microsoft Teams, and Zoom platforms during the pandemic. At the same time, it has been shown that there are a number of problems in the use of cloud technologies in areas where the internet infrastructure is not developed.

In research conducted by the Google Education Center, the benefits of the Google Classroom platform in education are widely covered [5]. Researchers evaluate aspects of the platform such as task management, automatic storage, real-time collaboration, and integration with mobile devices as effective tools. According to the results of the study, the Google Classroom platform significantly enhances the cooperation between an educator and a student in the organization of Independent Education.

In scientific research conducted by the Microsoft Research Center, the capabilities of the Microsoft Teams platform in creating a virtual educational environment are analyzed [13]. The authors note that the platform's video conferencing, virtual audience, file sharing and teamwork tools increase the effectiveness of distance learning. In particular, it has been argued that the platform's integration with Office 365 services will ease educational resource management.

The role of mobile devices in the educational process has been studied separately in research on the integration of cloud technologies and mobile education. Sh. In Tursunov's scientific work, mobile cloud technologies are evaluated as an important tool for activating independent educational activities of students [9]. The author believes that access to cloud platforms through smartphones and tablets will ensure the continuity of education and increase the flexibility of student educational activities.

A. from local scientists. In the research conducted by Karimov, pedagogical and organizational aspects of the introduction of cloud technologies in the educational system of Uzbekistan were analyzed [6]. According to the results of the study, cloud platforms are an important tool in the effective use of educational resources, individualization of education and the organization of interactive cooperation with students.

Issues of the economic efficiency of cloud technologies are also widely covered in the scientific literature. Reports prepared by World Bank rated cloud

technologies as a cost-reducing tool for educational institutions to build large-scale server infrastructure [15]. The authors of the report argue that with the help of cloud services, it is possible to create equal access to educational resources in developing countries.

Cisco's 2024 report on cloud technology security analyzed data protection issues on educational platforms [4]. The report noted user data encryption, multi-step authentication, and server security as one of the key requirements of cloud platforms. Researchers emphasize the importance of protecting users' personal data, especially in the educational system.

The methodological manuals prepared by the Moodle Documentation Center extensively cover the technical and pedagogical capabilities of the Moodle Cloud Platform [12]. The manual describes course management, assignment control, automatic assessment and analytical monitoring tools as the main functional capabilities of the platform.

The integration of artificial intelligence technologies with cloud platforms has also become a new direction of scientific research. Reports from the Microsoft Research Center note that AI-based adaptive learning systems are able to automatically recommend learning materials appropriate to the student's level of knowledge [7]. This serves to individualize and improve the effectiveness of Independent Education.

Q. In scientific research conducted by Ahmedov, practical aspects of the use of cloud technologies in distance education are analyzed [11]. According to the author, it is possible to effectively organize electronic libraries, virtual laboratories and video cameras using cloud platforms. At the same time, it was noted that problems with internet speed and technical infrastructure negatively affect the effectiveness of Education.

Literature analysis suggests that cloud-based technology-based software platforms have become an important tool for the development of Independent Education. Although the pedagogical efficiency, economic advantages, flexibility and cooperation opportunities of cloud platforms are widely covered in scientific research, issues related to data security, internet infrastructure and the development of digital competencies of users still remain an urgent problem.

RESEARCH METHODOLOGY

In this study, methods of systematic analysis, comparative comparison, study of statistical data and pedagogical observation were used. During the study, scientific articles, international reports and methodological manuals published between 2010 and 2026 were analyzed.

At the first stage of the study, the theoretical foundations of cloud technologies and their role in education were studied. In the second stage, a comparative analysis of the pedagogical capabilities of the Google Classroom, Moodle Cloud, Microsoft Teams and Zoom platforms was carried out.

In the analysis process, attention was paid to the following criteria:

- * platform flexibility;
- * ability to manage learning materials;
- * mobile device compatibility;
- * real-time collaboration;
- * monitoring and evaluation tools;
- security level.

The results of the study showed that cloud technology-based platforms are an effective tool in organizing Independent Education.

CONCLUSIONS AND RECOMMENDATIONS

The results of the study show that software platforms based on cloud technologies are important in the development of Independent Education. These platforms make it possible to use educational resources remotely, collaborate in real time and automate the educational process.

With the help of cloud technologies, the flexibility, interactivity and efficiency of education are increasing. At the same time, problems with data security, internet infrastructure and digital literacy of users still remain relevant.

Based on the study, the following recommendations were developed:

1. Expanding the use of cloud-based LMS platforms in higher education institutions.
2. Organization of training on digital competencies for educators and students.
3. Strengthening data security on cloud platforms.
4. Development of mobile educational opportunities.
5. Cloud technologies of electronic resources

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