Using Means of Cloud Technologies of Training in the Study of Discipline “Discrete Mathematics” in the Professional-Pedagogical Training of Math Teachers*

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Abstract. The article discusses the theoretical and practical foundations of the development and implementation of the system for studying the discipline "Discrete Mathematics" by future teachers of Mathematics. The professional and pedagogical training of a future teacher of Mathematics is considered from the standpoint of a systematic approach as the integrity of such components: subjects of education, content of education, technological teaching aids, communications and relations between these components. The purpose of the life of the pedagogical system - the development of the personality of the subjects of education - becomes a factor forming the factor.

Modern educational systems cannot be viewed outside the modern educational environment. This environment has been undergoing tremendous changes over the last decades in terms of access to information resources. The emergence of cloud technologies has determined the formation of cloud-oriented educational environments within which cloud-oriented learning tools are developing. Analysis of modern pedagogical research allowed to consider a detailed classification of cloud-oriented teaching aids in a higher educational institution. These include primary and secondary cloud-oriented facilities. Based on the appropriate combination of the use of traditional and cloud-oriented (basic and additional) teaching aids, a methodology was developed for teaching the Discrete Mathematics discipline. As the means of cloud oriented educational means the following Applications are being used: Google Apps for Education, Wolfram/Alpha, MoodleCloud. The use of this technique allowed the future teachers of Mathematics to be included in professionally oriented educational and cognitive activity. As a result, an increase in the quality of students' knowledge was noted.

Keywords: a pedagogical system, professional and pedagogical training, future Mathematics teacher, cloud-oriented learning technologies.

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1 Introduction

The Concept for the Development of Mathematical Education in the Russian Federation emphasizes that the modern system of Russian mathematical education is the direct heir of the Soviet system and should preserve accumulated experience and improve it. At the same time, modern Mathematics education at all educational levels requires the use of time-appropriate technologies, methods and teaching aids. Now this requires "ensuring the availability of publicly available information resources ... for the implementation of curricula for Mathematical education, including in electronic format, tools for students and teachers, the use of modern technologies of the educational process" [1].

Constantly improving information and communication technologies have become a powerful tool for improving the quality of modern mathematical education. Their use contributes to the solution of such important tasks: "ensuring equal access of all participants in the educational process to learning resources and technologies; increasing the information and communication culture of students; implementation of remote control of the educational process; creation of conditions for the automation of the educational process; providing lifelong learning opportunities, etc. " [2].

The influence of scientific and technical achievements of mankind on the content, structure and organization of the learning process is mediated and has a tangible expression in the means of learning, as tools of learning activities. The use of modern teaching aids is most clearly manifested in the results of the educational process in the process of teaching natural-mathematical and technological disciplines.

2 Task setting

Modern pedagogical research is conducted on the basis of various methodological approaches, one of which is a systematic approach. In accordance with this approach, pedagogical phenomena of different levels are considered as pedagogical systems.

Symbolically, the modern pedagogical system has the form:

$$\Sigma: \{\{M\};\{x\}\ F, G\},$$

where {M} is the set of system components, {x} is the set of links and relations between them; F is a function (new property) of a system that characterizes its interactivity and integrity, G is a system-forming factor [3].

In accordance with the formula, the pedagogical system M includes the following components: the subjects of training (students and trainers), the content of training (determined by standards, plans and programs), technological teaching aids (in a particular case, the conditions of training); X - relations and relations between these components, which are realized in the form of methods and techniques, means, organizational forms of education, as well as different forms and types of communication between subjects of education at all levels, the relationship of subjects of education to the content and means of education. The backbone component of G is the development of the personality of the subjects of study.

The structural components of the pedagogical system are basic and characteristic only for pedagogical systems. The professional and pedagogical training of the future teacher of mathematics is investigated by us as a hierarchy of pedagogical systems, one of the subsystems of which is the methodical system of this preparation. The main components of the methodological system: the goal (the base point of the system); information flow (content condition of the system); technological component (tools, forms and teaching methods); the contingent of students; teachers who own knowledge and organize activities. From pedagogical staff depends on the performance of the pedagogical system [4]. The vital activity of the system is not considered outside the didactic environment. In the context of the study, the main didactic environment is considered from the point of view of informational and personal orientation. This article is devoted to one of the components of the methodical system - its technological component. That it includes learning tools. These include learning tools based on cloud technologies and services.

3 Method Development

The means of teaching as a pedagogical phenomenon were the subject of study by the famous didactors of M.Skatkin, N.Metelskogo, A.Savchenko, A.Dmitriev and many other researchers. An interesting analysis of classifications of teaching aids, by which one can trace their development in a historical aspect. At the same time, a sharp jump in the qualitative characteristics of modern teaching aids is observed simultaneously with the development of new information technologies. This is due to the fact that at each stage in the development of psychological-pedagogical science, the means of training are also adequately developed. They accumulate and reproduce scientific, technical, psychological, educational and socio-economic achievements of their time. The evolution of the use of teaching aids is determined by the needs of pedagogical practice, and their development is directed towards meeting these needs. Teaching tools are always characterized by a variety of forms of their implementation and methods of their application, they are subject to the current paradigm of education.

The effectiveness of the use of teaching aids is not determined by the fact of their use, but by how much they contribute to the solution of pedagogical problems. The greatest efficiency in the use of teaching aids is manifested when visual material acts not as an object of contemplation, but as a means of solving professional and practical tasks.

In our study, we rely on such a definition of teaching aids: these naturally and artificially (specially and not specially created) material and information objects that are used for the material, technical, and procedural support of the educational process are important components of the learning environment. participants of the educational process to achieve pedagogical goals in accordance with state standards [5].

The existing level of science and technology forms the technological and information space that a person uses, influences a person's being in the natural and social environment that surrounds him, determines the level of human capabilities at a particular stage of scientific and technological progress, and the socio-economic devel-

opment of society. Analysis of the state and trends of scientific and technological progress allows us to predict the further development of learning tools, should be formed and developed in educational institutions, and be the basis of such a learning environment that meets the scientific, technological and social conditions of social development and the needs of education. In connection with the development of science and technology, the world is changing around the student, his needs for knowledge are changing, the means of teaching are changing. One of the modern teaching tools is special tools with a cloud orientation (based on the use of cloud technologies and services) in education.

Electronic educational resources are educational, scientific, informational, reference materials and tools developed in electronic form, presented on any type of media or placed on computer networks, are reproduced using electronic digital technical means and are necessary for the effective organization of the educational process, the part concerning its filling with high-quality teaching materials.

In the context of our research, under cloud-oriented electronic educational resources (CO EER) we understand the type of electronic educational resources used in the cloud access model, namely, educational, scientific, informational, reference materials and tools developed in electronic form that are used in the cloud model access, reproduced using appropriate electronic digital technical means and are necessary for the effective organization of the educational process, in part, yuscheysya its filling quality teaching materials. Then, the cloud-oriented electronic educational resource includes both appropriate ICT tools (software component) and educational data (information component) [6].

Based on the above, we define cloud-oriented electronic resources for teaching the basics of discrete mathematics (cloud technology tools for teaching the basics of discrete mathematics) as a set of CO EER used for informational-procedural support, solving didactic tasks or their fragments and aimed at realizing the goals of teaching discrete mathematics.

4 Results

Professional and pedagogical training of future teachers of mathematics by teachers of the department of mathematics, theory and methods of teaching mathematics is based on the principles of personal orientation and professional pedagogical orientation (A. Mordkovich). The use of cloud technologies in the process of studying fundamental and methodical disciplines helps the implementation of these principles: personal orientation is realized through the possibility of individualizing learning with the help of these tools. The vocational pedagogical orientation is realized through the inclusion of future teachers in educational, research and project activities that use cloud technology and allow future teachers to illustrate the possibilities of using them in their own professional activities. Consider the classification of cloud technology, on which we rely in the organization of the study of disciplines in the curriculum training of future teachers of mathematics.

Means of cloud technologies of learning the basics of discrete mathematics are divided into basic and auxiliary.

Let us list the main means of cloud learning technologies: cloud-oriented educational and methodological complexes (a structured set of CO EER containing training materials intended for sharing in the learning process); cloud-oriented learning support systems; cloud oriented learning laboratories; cloud-oriented subject environments (a set of interrelated software CO EER for solving problems of a certain class of the subject area of the subject is intended to automate actions arising in this area).

The aids to cloud learning technologies include: cloud-oriented supplementary scientific and educational materials; cloud-oriented communications; cloud-oriented operating systems; cloud-oriented storage; cloudy oriented office suites. We are explain the content of the items considered in the classification in the table 1.

Table 1. General structure of cloud technologies for learning the basics of discrete mathematics

Group name	Specific content
The main means of cloud learning technologies	
Cloud-oriented educational and methodical complexes	a) cloud-oriented program-methodological materials (curricula, plans, lesson plans); b) cloud-oriented tutorials (e-learning publications that complement the textbook and are intended for distribution in the cloud access model); c) cloud-oriented educational materials (e-learning publications on the cloud access model, containing materials on the methodology for studying a particular discipline (its section, parts): cloud-oriented textbooks, guidelines, cloud-oriented electronic reference books (e-books cloud access model with brief scientific and applied information for reference content), cloud-oriented didactic demonstration materials (CO EER, designed to visualize the objects and processes under study)); d) cloud-oriented means of evaluating educational achievements (cloud-oriented tools that provide the ability to automate students 'knowledge determination processes, designed to support assessment and self-assessment processes in training): cloud-oriented simulators — software of the CO EER, designed to build and consolidate skills and practical skills, mastering methods, procedures for performing certain types of educational or professional activities, as well as for self-study and; cloud-oriented test systems (CO EER, containing standardized test tasks and designed to assess the level of educational achievements of students)); e) cloud-oriented workshops (program CO EER, designed to form and consolidate skills and practical skills, the use of theoretical knowledge to solve practical problems and exercises).
Cloud-oriented learning support systems	a) CO EER system to support all stages and components of the learning process, provide an opportunity to automate the organization of the educational process due to the conservation and delivery of training resources and the organization of training activities, management of the training process, accounting and control of various types of educational work, monitoring the use of educational resources, administration of individual students and groups, organization of interaction with the teacher, reporting, etc.

Cloud-oriented educational laboratories	a) directly cloud-oriented educational laboratories (software CO EER, which can be used in laboratory and practical classes for the implementation of experimental studies of ready-made computer models); b) cloud-oriented modeling environments (cloud-oriented learning laboratories designed to simulate objects, phenomena, and processes that are the subject of study, or to provide tools for building and researching models);
Cloud-oriented subject environments	a) cloud-oriented computer mathematics systems (software complex CO EER to automate the execution of numerous and analytical calculations); b) cloud-oriented programming environments (a set of interconnected software CO EER for software development)
Auxiliary means of cloud learning technologies	
Cloud-oriented Additional materials	a) information resources on the cloud access model that contribute to the expansion and expansion of ideas about objects and processes that are the subject of study
Cloud-oriented communication media	a) software cloud technologies for organizing data exchange in voice, text, graphic and other forms
Cloud-oriented Operating Systems	a) a set of hardware and software for automating self-deployment of the operating environment for models at various levels IaaS (Infrastructure-as-a-Service) and PaaS (Platform-as-a-Service) through the virtualization of the computer and the operating system in accordance with all the necessary components of the environment for access by model DaaS (Desktop-as-a-Service) and SaaS (Software-as-a-Service)
Cloud-oriented data carrier	a) a set of software and specialized hardware designed for storing and transmitting large amounts of information, the main feature of which is the optimal allocation of resources for storing information that meets the standards and requirements of information and physical security
Cloud-oriented office packages	a) cloud-oriented word processors; b) cloud-oriented table processors; c) cloud-oriented means of preparing presentations; d) cloud-oriented database management systems

In order to increase the didactic efficiency, the means of cloud technologies of teaching the basics of discrete mathematics are used in the educational process together with other educational and methodological materials (traditional textbooks, teaching aids, methodical recommendations for teachers and students, etc.), forming cloud-oriented program-methodical complexes.

5 Discussion

The discipline "Discrete Mathematics" is included in the disciplines section of the compulsory part of the "Disciplines of the curriculum focus in the direction of training 44.03.01" Pedagogical education "orientation" Mathematics ". The work program provides for the study of four main sections: relations, correspondences; combinatorial elements; axiomatic construction of a set of nonnegative integers; number systems, divisibility of numbers.

The method of using cloud technologies as a means of teaching discrete mathematics to future teachers consists of three main blocks: target (formation of competences), substantive (learning the basics of discrete mathematics) and technological (cloud-oriented ICT tools, methods and forms of their use in teaching discrete mathematics). The technological block of the methodology determines the leading content of the activity (individual and group educational research), the form of the organization of training, the types of activities for the formation of competencies in discrete mathematics and the corresponding ICT tools

For the placement of cloud-oriented program-methodical materials, we use the site, which can be created using the package Google Apps for Education. To receive a free subscription, you must register the domain of the educational institution and submit the appropriate application. Site development is carried out in component Google Apps for Education – Google Sites. This enables the placement, editing and storage of up to 10 GB of software and methodological materials on cloud servers. Google. For the convenience of accessing the site, it must be linked to the educational domain, using records CNAME. The site of the discipline "Discrete Mathematics" standardly contains pages of program-methodical materials, tools for evaluating educational achievements, an integrated Sage-window.

Cloud-oriented means of evaluating educational achievements are presented primarily by cloud-oriented test systems. The page "Tools for evaluating educational achievements" of the site of the discipline "Discrete Mathematics" contains links to some of them. For example, tests are created in the system http://www.onlinequizcreator.com. Also, based on the fact that the development of the site of the discipline is conducted in a cloudy environment Google Apps, It is advisable to integrate cloud-oriented test systems with the site. To this end, it is proposed that the users of the educational domain provide the opportunity to use the tools for developing tests available in Google Apps Marketplace by selecting them for use by domain users.

Among the tools available in the Google Apps Marketplace that are successfully used in the educational process and have a significant amount of positive feedback, we note Flubaroo – cloud-oriented test system, provides an opportunity to examine a test created using Google Forms. Flubaroo provides an opportunity to send assessment results with explanations via e-mail or Google Drive, analyze the average score, build a histogram of the distribution of answers and perform a number of other actions; in general, provide an opportunity to identify students who need additional help, quickly identify issues that require additional attention from the teacher.

The created form must contain a required field to identify the student and be associated with a table in Google Sheets, for which Flubaroo becomes an add-on after installation. To conduct an assessment, it is necessary to have a form with all reference answers (as a rule, the teacher fills it).

Evaluation is performed for data with test results that have been saved to Google Sheets by selecting Addition - Flubaroo - Grade Assignment. At the first stage, an assessment scale (automatic - Normal Grading, manual - Grade by Hand or no rating - Skip Grading) is selected for each question and the number of points assigned for the correct answer is established; questions identifies the student, denoted as Identifies

Student; at the second stage, the letter row of the Student Submissions table with the correct answers (Answer Key) is selected, which is further excluded by assessment; The last step is the automatic creation of a new Grades letter containing formatted assessment results for each student and statistics for passing the test. Super Quiz is another cloud-oriented test system that allows you to test in a game form (quiz). Quiz questions are presented in a form created in the Google Form. After the end of the quiz, all answers are compared with the verification keys and automatically classified into correct and incorrect. You can use test systems embedded in the Moodle distance learning system.

It is also possible to use the testing system INDIGO (https://indigotech.ru), which is a universal program. You can create any tests in it. The system has its own built-in web server, and can work both in the local network as an internal site, and over the Internet. The use of cloud access in this system is an additional service for placing a testing system in a data center. In fact, it will be the same as if the program worked on your computer, only this computer will be accessible via the Internet, have a fixed IP address and work around the clock. It will be possible to bind the address of the testing interface to the domain name (name_site.ru), or if you have your own website, you can make it on its subdomain (name_subdomain.name_site.ru) or as a link name_site.ru/word. If you do not want to communicate with the network settings, and you want a turnkey solution, you can place the program in the INDIGO cloud. In addition to testing systems, we use cloud-oriented simulators. By simulators, we traditionally understand programs, the main purpose of which is to represent all stages of solving a mathematical problem. In the process of independent work, simulators act as a means of shaping and improving practical skills, verifying the results achieved, and are designed to repeat and consolidate educational material. Cloud-oriented simulators may contain elements of testing, but their main purpose is to practice certain skills in a cloud-oriented training environment. Given that this process can be quite long, the developers of simulators often use elements of gamification.

One of the most powerful tools of cloud technologies, provides the opportunity to implement cloud-oriented workshops, is CoCalc (formerly known as SageMathCloud) - a cloud-oriented version of the Sage computer math system hosted by Google servers. CoCalc is not just a cloud-oriented version of the computer mathematics system, but also a support system for teaching mathematical and computer science disciplines. The main components of CoCalc are:

1) Sage Worksheets - Sage worksheets providing the ability to interactively execute Sage commands or programming languages and documentation, such as C ++ and HTML;

2) IPython notebooks (from 2016 - Jupyter Notebook) - synchronization of the session in the Python programming language, which is part of the library for scientific and engineering computing SciPy. CoCalc allows multiple users to interact through IPython's notebooks in synchronous and asynchronous modes;

3) LaTeX language document management system with full support for sagetex, bibtex and the like;

4) backup system - full saving of all modified user project files every 2 minutes;

5) the replication system provides for the preservation of each project in three physically separate data centers [7].

CoCalc provides opportunities for: interactive study of mathematics, natural and computer sciences; cooperation with other users in real time; organization of training courses: adding students, creating your own projects, monitoring their development, etc. using cloud-oriented educational materials; creating and editing educational and scientific texts using LaTeX, Markdown or HTML; add your own files, process data, make public the results, etc.

The presence of the Besides Sage Worksheets tool in Jupyter Notebooks provides users with full access to the classic Linux terminal (https://cocalc.com).

Cloud-oriented electronic reference books on the basics of discrete mathematics should be built on the basis of Sage worksheets, providing the opportunity to combine the presentation of theoretical materials with practical examples.

Cloud-oriented teaching materials can be created using any appropriate means of cloud technology, however, given that the materials for the basics of discrete mathematics must contain an appropriate computational (software) component, it is advisable to use specialized cloud technologies to create them. oriented subject environments: cloud-oriented computer math systems and cloud-oriented programming environments. As one of the options we use a cloud-oriented subject environment, CoCalc includes both computer mathematics systems and programming environments. The main work in CoCalc takes place in the project. The user can create any number of independent projects - personal workspaces in which the user saves resources of various types. The user can also invite other participants to cooperate in a joint project and provide open access to files or folders.

Each project runs on the CoCalc server, where it shares disk space, CPU, and RAM with other projects. The free plan includes the use of only those server resources that are currently free. In addition, if a free user plan's project is not used for several weeks, it moves to the secondary storage in order to release server resources and restarting it will take significantly more time than the paid plan user has. Project participants can combine their own computing and savings resources in order to improve the capabilities of the project as a whole and the redistribution of resources among themselves. Collaboration with the CoCalc project resources can be organized either at the level of a single resource, in particular a worksheet, or at the project level as a whole.

The opening of sharing at the level of a single resource is the web-publication of the content of the resource in read-only mode for all Internet users who have links to the source. The disadvantages of such a publication are that the "reader" user is not able to manage the calculations on the worksheet, even if the author used standard controls in it. However, if necessary, the published worksheet can be copied or downloaded.

Organization of joint work at the project level as a whole is possible both without using the course resource and with its help. The first method involves the participation in the project of participants who will have the opportunity to work together with the existing project training resources or add new ones, invite other participants, communicate using text and / or video chat as part of a joint project. The contribution

of each participant of a joint project to the solution of his tasks can be reviewed on the pages of the history of work with the project or on the pages of its backup copies.

In learning the basics of discrete mathematics, you can use different cloud-oriented learning support systems. One option is to use Google Classroom - a cloud service that provides teachers with the opportunity to create and post tasks electronically, and students - to choose the necessary task and perform it [8].

Google Classroom allows you to combine many Google products in one system for organizing teacher and student work: creating tasks, organizing communication, storing and distributing tasks created by a teacher and solved by a student. The work of the teacher and the student is carried out through Google Drive, a Google file hosting service; Gmail is used to provide communication. The tasks page contains tasks for students to do independently (students simply click on the task to begin its implementation). The information about the submitted works is updated in real time, and the teacher can quickly check all the works, give marks and add their comments. The advantages of using Google Classroom are: simple setup: teachers can add students themselves to work in the environment or provide them with a code to register as students of the course; saving time: the creation, verification and evaluation of tasks are carried out in one service; effective organization of the learning process: in Google Classroom, teachers can send out announcements and start a discussion, and students can share educational materials with each other and answer questions posed by the teacher; Organization of work with educational materials: students see on the tasks page what works have not yet been submitted, and all course materials are automatically added to their folders on Google Drive; availability and security: Google Classroom is a free and reliable resource for educational institutions.

Another cloud-oriented learning support system that can be used in learning the basics of Discrete Mathematics is MoodleCloud (https://moodlecloud.com). MoodleCloud provides a service — a full-featured Moodle website where you can create courses, provide learning resources, allow students to complete tasks, etc. The user can choose one of three service packages that scale according to their needs: Moodle for free access, Starter and Moodle - for corporate.

In our university, we rely on significant experience in the use of distance learning systems (DLS) and computer mathematics systems (SCM). The problem of organizing the interaction of these systems is very relevant. The implementation of the integration of Moodle and Sage at the frame integration level makes it possible, while working on solving mathematical problems in the Sage environment, to access other information resources of the course. To implement frame integration, it is sufficient during debugging of the opening parameters of the Sage work window when selecting the appropriate link to set its presentation mode in the current browser window. As a result of the modular integration of SCM Sage and LMS Moodle, the user gets powerful tools for working with materials of a mathematical nature. In this case, it is possible to calculate expressions of algebraic type by means of SCM Sage, without leaving the environment of the LMS Moodle [9].

The cloud-oriented communication tools used in teaching the basics of discrete mathematics are primarily tools built into CoCalc. By the leading means of exchanging text and graphic messages, according to M. Popel [10], is a file resource of sage-

chat type - text chat. Message text can be formatted using HTML tags and wiki markup commands. The mathematical content message can be submitted in the usual mathematical notation with the help of LaTeX commands.

Google Hangouts is an instant messaging and video conferencing software developed by Google. Hangouts allows you to chat with up to 10 users in the form of group video conferencing. With this service you can conduct webinars and chat in video chats. Chat history stored on Google servers, allows you to synchronize them between devices. Photos shared by participants during the webinar are automatically uploaded to a special Google+ album. Participants can also share Google Drive files, write notes to a meeting together, and write ideas on a common virtual whiteboard. Hangouts is integrated with Google's calendar, so users can schedule Hangouts using the calendar.

An example of e-mail that can be used in teaching the basics of discrete mathematics is Gmail in Google Apps. The main advantages are the availability of unlimited data storage space, corporate access, and advanced email capabilities (search, email conversations, built-in chat).

You can use Dropbox, OneDrive, Google Drive, iCloud, and others as cloud storage.

The method of using cloud-oriented office suites (in particular, their components such as cloud-oriented word processors, cloud-oriented tabular processors, cloud-oriented means of preparing presentations) as a means of organizing joint work on educational research projects. So, cloud-oriented office suite Office 365 includes a cloud-oriented word processor Word Online, cloud-oriented Excel Online, a cloud-oriented presentation tool for PowerPoint Online, and additional cloud-oriented components - a cloud-oriented tool for organizing collaborative design activities of Microsoft Teams, cloud-oriented OneNote Online Notepad (https://www.microsoft.com/en-US/education/products/office/default.aspx) and others.

6 Conclusion

The conducted work allows to draw the following conclusions:

1. We consider the means of cloud technologies of teaching the basics of discrete mathematics as a set of cloud-oriented electronic educational resources used for information and procedural support for the performance of didactic tasks or their fragments.
2. The main means of cloud technologies for teaching the basics of discrete mathematics are cloud-oriented educational and methodological complexes (program-methodical materials, means of evaluating educational achievements - test systems and simulators, workshops, educational-methodical materials - didactic demonstration materials, textbooks and textbooks, electronic reference books), cloud-oriented learning support systems, cloud-oriented learning laboratories (in particular, modeling environments) and cloudy oriented subject environments (computer mathematics systems and programming environments).

3. The auxiliary means of cloud technologies for teaching the basics of discrete mathematics are cloud-oriented supplementary scientific and educational materials, cloud-oriented communication tools (e-mail, audio and video communication tools), cloud-oriented operating systems, cloud-oriented data storage and cloud-oriented office packages (text and tabular processors, presentation tools, database management systems and additional cloud-oriented components).
4. To improve the didactic efficiency, cloud technologies for teaching the basics of discrete mathematics are used in conjunction with other teaching materials (with traditional textbooks and teaching aids, guidelines for teachers and students, etc.), forming cloud-oriented software and methodical complexes.
5. The developed method of using cloud technologies as a means of teaching the basics of discrete mathematics of future math teachers consists of three main blocks: target (building competencies in discrete mathematics), meaningful (learning the basics of discrete mathematics) and technology (cloud-oriented means of information and communication technologies, methods and forms of their use in teaching discrete mathematics). The technological block of the methodology determines the leading content of the activity (individual and group educational research), the form of the organization of training, the types of activities for the formation of competencies in discrete mathematics and the corresponding means of cloud information and communication technologies.
6. The use of cloud-oriented learning technologies allows students to increase interest in the subject, including discrete mathematics. The work carried out allows activating the educational and cognitive activity of future math teachers, improves the quality of their knowledge, and increases interest in studying mathematical disciplines. Given the methodological and professional-pedagogical orientation of training future math teachers, the use of cloud technology tools in their training allows us to illustrate the possibilities of using these tools in future professional activities.
7. In the future, we plan to consider an example of using a cloud-oriented operating system based on the Amazon AWC infrastructure in the professional and pedagogical training of a future math teacher.

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