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USING CLOUD TECHNOLOGIES TO OPTIMIZE THE EDUCATIONAL PROCESS AT SCHOOL

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Abstract. The article is devoted to the study of the use of cloud technologies in the educational process of schools, focusing on innovative approaches such as the «Flipped classroom» model. Cloud technologies provide ample opportunities for students and teachers to work together, providing access to educational materials at anytime from anywhere, which contributes to the development of cognitive independence of students. The article discusses the types of cloud technologies, their advantages, including cost-effectiveness, accessibility and convenience, as well as didactically the features of their use. Special attention is paid to the technology of mixed learning in the form of an «Flipped classroom «. Its advantages in comparison with the traditional approach are shown, including the activation of cognitive activity of students, increasing the level of their involvement, the development of critical thinking and cooperation skills. The experiment demonstrates the advantages of this technology in teaching computer science, including increasing the interest of schoolchildren in educational material and improving the quality of mastering the topic. The hypothesis of the study is that the use of cloud technologies in combination with the «Flipped classroom» model contributes to increasing the cognitive activity of students, developing their independence and improving the assimilation of educational material. The conclusions confirm the effectiveness of the proposed methodology, which is reflected in the increase in student engagement and quality indicators of their learning. It is concluded that the introduction of cloud technologies in school education contributes to the creation of a personalized and accessible educational process, stimulating the use of modern digital tools to

improve the quality of education. The expediency of the adaptive application of the technology of the « Flipped classroom» in educational practice is substantiated.

Key words: Cloud technologies, education system, educational process, flipped classroom, school.

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МЕКТЕПТІҢ БІЛІМ БЕРУ ПРОЦЕСІН ОҢТАЙЛАНДЫРУДА БҰЛТТЫҚ ТЕХНОЛОГИЯЛАРДЫ ҚОЛДАНУ

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Аннотация. Мақала мектептің білім беру процесінде бұлттық технологияларды қолдануды зерттеуге арналған, мұнда «Төңкерілген сынып» моделі сияқты инновациялық тәсілдерге ерекше назар аударылған. Бұлттық технологиялар оқушылар мен мұғалімдердің бірлескен жұмысын ұйымдастыру үшін кең мүмкіндіктер береді, оқыту материалдарына кез келген уақытта және кез келген жерден қол жеткізуге мүмкіндік жасап, оқушылардың танымдық дербестігін дамытуға ықпал етеді. Мақалада бұлттық технологиялардың түрлері, олардың артықшылықтары, соның ішінде үнемділік, қолжетімділік және ыңғайлылық, сондай-ақ оларды қолданудың дидактикалық ерекшеліктері қарастырылған. Ерекше назар «Төңкерілген сынып» түріндегі аралас оқыту технологиясына аударылған. Бұл технологияның дәстүрлі тәсілмен салыстырғанда артықшылықтары көрсетілген, олар оқушылардың танымдық белсенділігін арттыруды, олардың сабаққа қатысу деңгейін жоғарылатуды, сыни ойлау және ынтымақтастық дағдыларын дамытуды қамтиды. Жүргізілген эксперимент нәтижесінде бұл технологияның информатиканы оқытуда артықшылықтары, соның ішінде оқушылардың оқу материалына деген қызығушылығының арттыру және тақырыпты меңгеру сапасын жақсарту көрсетілген. Зерттеу гипотезасы бұлттық технологияларды «Төңкерілген сынып» моделімен бірге қолдану оқушылардың танымдық белсенділігін арттыруға, олардың дербестігін дамытуға және оқу материалын меңгеруін жақсартуға ықпал ететінін болжайды. Қорытындылар ұсынылған әдістеменің тиімділігін дәлелдейді, бұл оқушылардың қатысу деңгейі мен оқу сапасының көрсеткіштерінің өсуінен көрінеді. Мектеп білім беруіне бұлттық

технологияларды енгізу жеке тұлғаға бағытталған және қолжетімді оқу процесін құруға, білім сапасын арттыру үшін заманауи цифрлық құралдарды пайдалануды ынталандыруға ықпал ететіні анықталды. «Төңкерілген сынып» технологиясын білім беру тәжірибесінде белсенді қолданудың тиімділігі негізделді.

Түйін сөздер: бұлтты технологиялар, оқыту жүйесі, білім беру процесі, төңкерілген сынып, мектеп.

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ИСПОЛЬЗОВАНИЕ ОБЛАЧНЫХ ТЕХНОЛОГИЙ ДЛЯ ОПТИМИЗАЦИИ УЧЕБНОГО ПРОЦЕССА В ШКОЛЕ

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Аннотация. Статья посвящена исследованию применения облачных технологий в образовательном процессе школы с акцентом на инновационных подходах, таких как модель «Перевернутый класс». Облачные технологии предоставляют широкие возможности для организации совместной работы учащихся и учителей, обеспечивая доступ к учебным материалам в любое время и из любого места, что способствует развитию познавательной самостоятельности обучающихся.

В статье рассматриваются виды облачных технологий, их преимущества, включая экономичность, доступность и удобство, а также дидактические особенности их использования. Особое внимание уделено технологии смешанного обучения в форме «Перевернутого класса». Показаны её преимущества по сравнению с традиционным подходом, включая активизацию познавательной деятельности учащихся, повышение уровня их вовлечённости, развитие навыков критического мышления и сотрудничества.

В основе проведённого эксперимента продемонстрированы преимущества данной технологии в обучении информатике, включая повышение интереса

школьников к учебному материалу и улучшение качества освоения темы. Гипотеза исследования состоит в том, что использование облачных технологий в сочетании с моделью «Перевернутого класса» способствует повышению познавательной активности учащихся, развитию их самостоятельности и улучшению усвоения учебного материала.

Выводы подтверждают эффективность предложенной методики, что отражено в увеличении вовлечённости учеников и улучшении качественных показателей их обучения. Сделан вывод, что внедрение облачных технологий в школьное образование способствует созданию персонализированного и доступного учебного процесса, стимулируя использование современных цифровых инструментов для повышения качества образования. Обоснована целесообразность активного применения технологии «Перевернутого класса» в образовательной практике.

Ключевые слова: облачные технологии, система обучения, образовательный процесс, перевёрнутый класс, школа.

Introduction. In connection with the development of information technology, it became necessary to quickly access large amounts of information, store large amounts of data from any device, which led to the emergence of «cloud technologies». The improvement of information technology occupies an important place among many new directions in the development of education. Modern learning conditions require educational organizations to use innovative high-tech teaching aids, as well as interactive sensors, multimedia technologies. One of the effective technologies for organizing training is cloud computing, which provides opportunities for storing, processing and sharing data over the Internet. Cloud technologies are understood as technologies of distributed data processing, in which computer resources and capacities are provided to the user as an Internet service (Hewwit, 2008). With cloud technologies, data is permanently stored on virtual servers located in the cloud, and is also temporarily cached on the client side on various digital (computers, laptops, netbooks, mobile) devices, etc.

The National Institute of Standards and Technology (NIST) defined cloud computing in the NIST Definition of Cloud Computing (Mell, et al., 2011) as a model for providing ubiquitous and convenient network access on an as-needed basis to a shared pool of configurable computing resources that can be quickly provisioned and released with minimal management effort and the need to interact with the service provider.

Cloud computing is a network of computing resources located anywhere that can be shared to bring many opportunities to education that are not found in traditional IT models, as well as provide answers to many of the problems that educational institutions face (Chandra, et al., 2012; Yadav, 2014; Saini, et al., 2017).

However, despite the deep theoretical study of the problem, pedagogical practice proves that the effectiveness of the use of cloud technologies in the educational

process by school teachers is extremely low and, as a result, students have a low level of desire for independent knowledge.

Consequently, there is a contradiction between the social need of society to use cloud technologies in the educational process and the insufficient development of pedagogical conditions that ensure the effectiveness of the process of developing cognitive independence in students with the help of cloud technologies. Therefore, in order to increase the demand for cloud technologies in educational activities by teachers, it is necessary to choose effective models for its organization and formulate pedagogical conditions.

The authors of the article set themselves the following research question: «What form of learning should be applied in the educational process when using cloud technology?»

Materials and methods. To analyze the possibilities of cloud technologies, methods of theoretical analysis of literature, pedagogical modeling, as well as experimental verification in school practice were used. The main focus was on the "inverted classroom" model of mixed learning.

Cloud technologies have a number of advantages. Firstly, they eliminate the boundaries between the subjects of the educational process: geographical, technological, social. Cloud technologies in modern conditions, along with the traditional form, are one of the alternative forms of organizing training. The use of cloud technologies allows expanding the scope of interaction between students on the Internet while personalizing the educational process and expanding the boundaries of interaction. These technologies are reliable, economical, simple and upgradable. Currently, cloud technologies are divided into the following types: software as a service; equipment as a service; communication as a service; monitoring as a service necessary to ensure security; infrastructure as a service; platform as a service, which provides tools for developing, testing and supporting various applications; a virtual computer that allows you to perform individual user tasks; working environment as a service (Seydametova, et al., 2011).

Currently, there are four deployment models of cloud systems in the world practice, such as private cloud, public cloud, hybrid cloud, community cloud. For educational institutions, public and community cloud systems are the most suitable. Another use case for cloud services that is beginning to take hold in education is moving to the Learning Management Systems cloud. Analyzing cloud models and the experience of their application in foreign countries, we came to the conclusion that most often educational institutions use the cloud model «software as a service». Using this model does not require the educational institution to create and maintain its own server, it eliminates economic and organizational costs, and allows you to install your own applications on a platform provided by the service provider.

Educational organizations can use cloud technologies as software, hardware, platform and virtual computer. The introduction of cloud technologies in the educational process has a number of advantages (Figure 1).

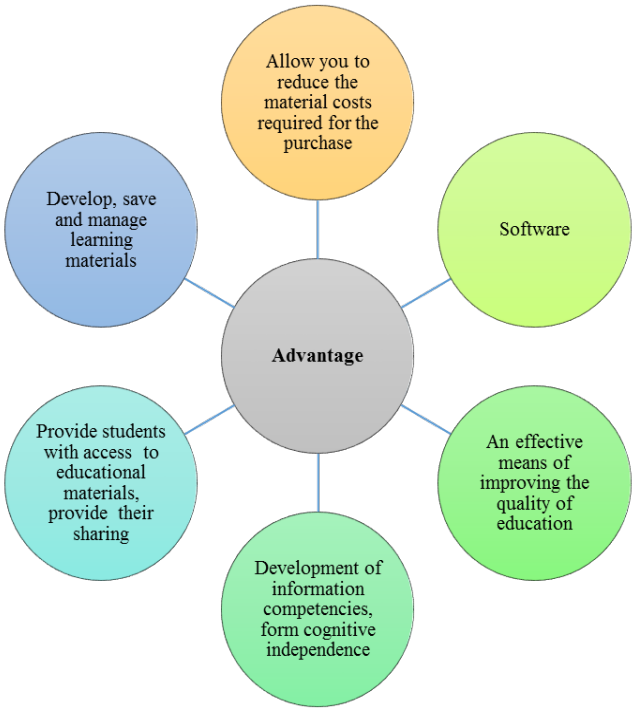

Figure 1 – Benefits of using cloud technologies

Therefore, cloud technologies are a collective image that allows you to process information and transfer it to the user through an online service.

In the educational process, the possibilities of cloud technologies are effectively used. First of all, this is due to their technical capabilities. To train the subjects of the educational process, it is enough to have access to the Internet and any browser. In economic terms, cloud technologies are very beneficial for educational organizations, as they are provided with free licensed support. The methodological possibilities of cloud technologies allow organizing the educational process not only in the classroom, but also in extracurricular activities. The teacher uses cloud technologies to transfer knowledge to students in the form of text materials, presentations. He gets the opportunity to answer questions in real time, give recommendations on the implementation of practical work, and evaluate the results of the work of students.

In turn, students get the opportunity to exchange information with their peers in real time, discuss controversial issues that arise in the joint solution of problem-search tasks.

Cloud technologies have a number of didactic possibilities that confirm the expediency of their use in the educational process of a modern school (Figure 2) (Krechetnikov, et al., 2010).

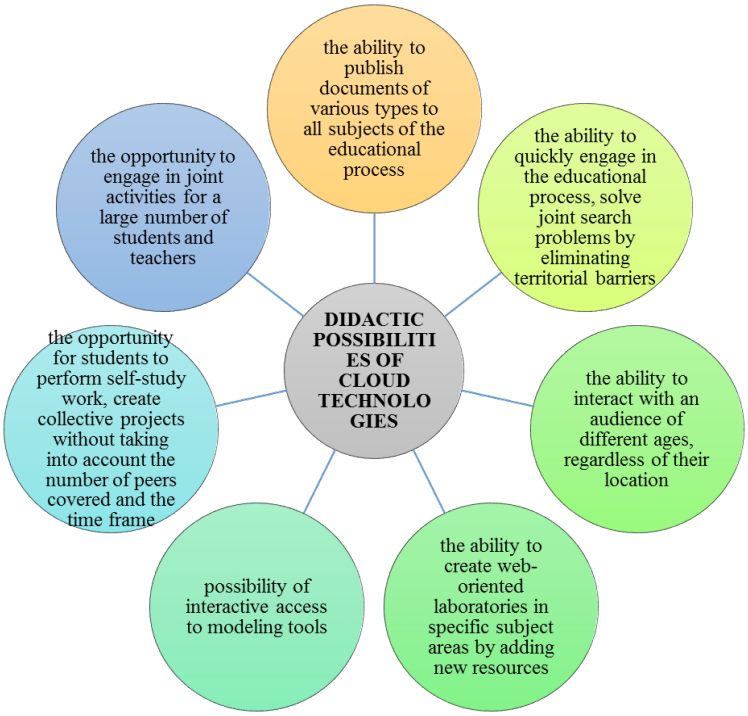

Figure 2 – Didactic possibilities of cloud technologies

In the educational process, cloud technologies can be implemented using various learning technologies, namely problem-based learning, blended learning, group work, collaboration technology, Bring Your Dev Device technology, and flipped classroom technology. Traditionally, all of the above technologies are used in the pedagogical process, but least of all, blended learning technology, which combines full-time and electronic forms of education, which leads to a mixture of the traditional classroom system and modern digital education. The most popular form of blended learning is the flipped classroom model (Yartsev, 2021).

Let's consider the features and compare the technologies of «flipped» and traditional learning (Table 1).

Table 1 - Comparison of technologies

Educational process	Technology Flipped classroom	The traditional approach
Preparing for the lesson	Viewing answers to tests, identifying difficult questions from students, selecting training and development tasks	Writing a lesson summary, preparing training and developmental tasks
Technology of the lesson	The teacher directs students to solve difficult questions and develop their skills	The teacher explains the new material, the students consolidate their skills

Learning Technology	Students watch the video on their own and prepare questions. The teacher directs students to solve difficult questions and develop skills	The teacher explains the new material, the students consolidate the acquired skills.They do homework on their own
Knowledge transfer	Knowledge is acquired independently with interactive elements	Educational material is passed from teacher to student in a passive form
Technologies	Communication, cooperation, cooperation	Interactive technologies
Approaches	Personalized	Differentiated
ICT	Office, Google, Web 2, Moodle, etc.	Multimedia, web technologies
Learner	Takes responsibility for their own learning. Interacts with all participants in the educational process	He studies according to the “listen - remember -” activity scheme of the mentor. Transfers and controls knowledge, maintains discipline and order in the classroom
Teacher	Carries out the design of educational activities, acts as a mentor	Transfers and controls knowledge, maintains discipline and order in the classroom

We can draw the following conclusions, «Flipped classroom» is the basis for the implementation of personalized learning; conditions for active learning are created; new technologies and various gadgets are used; the educational process is organized taking into account the needs of each student; conditions for team and joint work are created; the leadership qualities of students develop within the framework of academic disciplines; conditions are created for diagnosing the quality of knowledge with the help of computer technologies (Kopeyev, 2020).

Such learning can be done both in traditional classrooms and online, which is one of the most accessible models for students in grades three through five. In 2007, the Flipped Classroom model was created by Jonathan Bergman and Aaron Sams, chemistry teachers at Woodland Park American High School. Later, other subject teachers also began to use it (Bergmann, et al., 2004).

Technical requirements for implementation: this is the presence of electronic devices at home by students with access to the Internet, electronic resources through which the teacher provides material for self-study.

The main plus is the opportunity that allows the teacher to carry out interactive forms of work in the lesson, freeing the entire class from the need to frontally introduce new material.

The requirements for the teacher are the ability to conduct classes in an interactive format, the teacher must prepare test tasks for children.

By the end of the lesson, we are used to the teacher giving students homework to reinforce the topic, and this is where the turnaround happens as homework is given to students with a new topic to study. That is, students watch videos at home, work in an online learning environment, get acquainted with new materials, and show in class how well they have learned a topic. The lesson can take the form of a seminar, role-playing game, project activity and other interactive forms (Khasanova, 2022).

At first, the structure of flipped learning seems very simple - give students the task of watching video lectures at home, and spend the time in the lesson on practicing what they have learned and discussing. However, if you look closely, it becomes clear that the flipped class has many unique and interesting forms (Figure 3) (Irdubayeva, 2022).

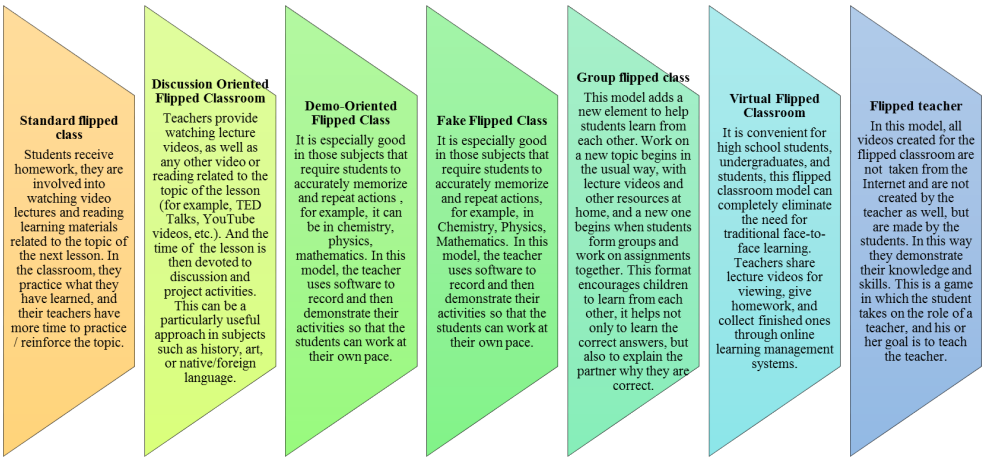

Figure 3. Flipped Class Forms

Computer science as a school subject is filled with many important theoretical materials, but is also of practical value. The latter becomes even more relevant in the modern world. Such theory and practice cannot be accommodated in the classroom. The Flipped Classroom technology can help here, which allows you to transfer the main part of the theory to independent research. Within the framework of this technology, we present in the next section an inverted lesson on the topic «History and Prospects of Robotics».

Results and discussion. The basis for the implementation of the «Flipped Classroom» technology was the computer science lessons in the 5th grade on the topic «History and Prospects of Robotics».

The following material such as videos «Prospects for the development of robots» and «Movies and cartoons about robots», puzzle cards, presentations, games developed and compiled in the Kahoot program, Poster presentation was selected for the students. There were also tasks for the self-study work at home, which included answers to questions.

The main resource for doing homework was a text document compiled in MS Word. It includes step-by-step instructions and links to all the necessary materials.

The students received a layer of theory by watching video materials and presentations, and then completed the «Generation of Robots» puzzle cards, in which students had to find their halves of the codes.

In the lesson, while playing in the Kahoot! program, questions were provided

where everyone could choose the correct answer from their device. At the end, together with the teacher, they analyzed the correct and incorrect answers, which were accompanied by explanations and illustrations.

To analyze the three laws of the American science fiction writer Isaac Asimov, the students were asked to work in pairs, where, as a result, they had to explain these laws to each other.

In addition, at the end of the lesson, the Poster presentation technique «Draw your brain» was applied. Students in groups draw a brain on posters and fill it with the knowledge and skills learned at the lesson.

The first and one of the most important stages on which the whole idea of the described technology is built is self-study work at home. Before asking students to learn everything at home on their own, they need to be introduced to all the resources that you want to use in your work, so that at home the student knows what and how to do (Nemchaninova, 2017).

The second stage takes place already in the classroom and is called actualization. At this very stage the teacher reveals the degree of the readiness of the students to work. This control can be carried out in any manner ranging from a quick test in Kahoot! to the frontal interview. To actively involve students in the process, it is necessary to formulate the goal and objectives of the lesson together with them, ask questions about what was learned at home. It should be noted that the students of the ninth grade really liked the live communication at the lesson.

Summing up this stage, it can be noted that all the activities of the teacher come down to checking the completion of homework, as well as determining the level of assimilation of the acquired knowledge.

The final stage of any lesson is always reflection, organized for introspection and active reflection by students of their activities in the lesson. Any reflective technique can be used here. The teacher's role is to stimulate introspection, perhaps through the use of leading questions or keywords. Students independently analyze the activity and note the necessary points for more detailed consideration.

Education based on the «Flipped Classroom» technology contributed to the implementation of both an individual approach and a group form of work, including conditions for the development of project and creative activities.

Thus, teaching using the «Flipped Classroom» technology really helps to change the attitude of students to the subject. What in its turn makes it possible to interest and even captivate them, as well as increase their cognitive activity, stimulate the development of critical thinking (Zhernossek, 2017).

The purpose of the experiment is to prove the effectiveness of the «Flipped Classroom» technology in teaching computer science in the 5th grade.

The objective is to determine the level of effectiveness of conducting Computer Science lessons using the Flipped Classroom technology;

To achieve the set goal and complete the task, the 5th grade of the CSI (communal state institution) secondary school No. 26 of the city of Pavlodar was taken. There are 26 students in the class. In the Computer Science lesson during the experiment,

the class was divided into two groups. Computer Science is not a major subject, lessons in this discipline are held once a week. The classrooms are equipped with the necessary equipment and desks.

After the experimental lesson, we conducted the test (Figure 4), the results of which showed that the students of both groups (Group 1 as regular, Group 2 as an experimental one) have approximately the same idea in respect to the topic «History and Prospects of Robots».

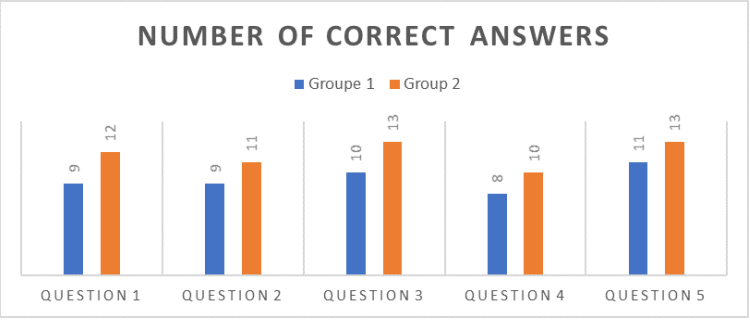

Figure 4 – Results of testing two groups

A survey was also conducted (Figure 5), when the students of the experimental group were asked to tell if they liked this form of education, if they would like to study like this further, etc. The diagrams show some of the questions and answers of the students.

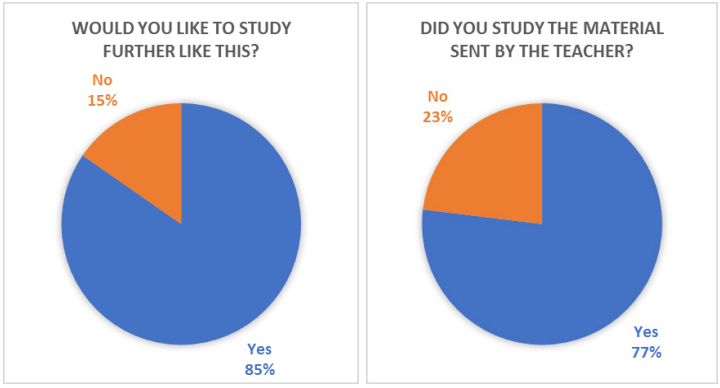

Figure 5 – Survey of students in the experimental group

According to the results of the experiment, one can see that the use of the «Flipped Classroom» technology in the lesson increases the level of interest of students, they have a desire to study the material again.

The given quantitative and qualitative assessments of the effectiveness of

the developed methodology allow us to say that the active use of the «Flipped Classroom» technology makes it possible to level the difficulties of implementing this technology, to make education more qualitative, up-to-date, and accessible.

Conclusion. The educational process based on cloud technologies makes it possible to individualize learning and develop cooperation. Cloud technology allows us to access our work anywhere, anytime and share it with anyone. Sharing the resources of cloud technologies allows students not only to show cognitive independence, but also to develop the skills of search, creative and research activities. The «Flipped Classroom» will certainly be very different from the traditional one. Instead of students sitting and listening to a lecture given to them by a teacher, they actively work in pairs or independently. Each teacher, using Flipped Classroom, gets the opportunity not only to transform their classes, but also to improve the quality of teaching.

Based on the above analysis, the use of cloud technologies in education will certainly help to significantly increase the level of informatization of education. Thus, the advantages of cloud technologies, such as availability, mobility, cost-effectiveness, high manufacturability, reliability, are obvious. Cloud technologies help to increase the efficiency of the educational process, optimize it, and thanks to them it is very convenient to apply various methods and technologies in the classroom. The use of cloud technologies in the educational process makes the educational space more open. Thanks to the variety of technologies, we have the opportunity to improve the quality of educational services.

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