

## Online Learning Platforms: Reconstructing Modern Higher Education

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**Abstract**—Online learning platforms play an important role in modern education. However, they may not be sufficiently represented in educational institutions. In this regard, the research objectives are set, namely: organize a comparative analysis of several popular distance learning platforms (Moodle, Open edX and NEO LMS) in accordance with the criteria (system features, content support, content creation, user management, reporting system; conduct consultation with university teachers, during which they will highlight the benefits of distance education systems from the point of view of the teacher; and test students, who use the online platform for learning in order to clarify its impact on academic performance. While consulting with 40 teachers of Russian and Chinese universities (Moscow State University, Higher School of Economics, Peking University, Tsinghua University), the following advantages of distance platforms have been highlighted: greater freedom of access, lower education prices, the possibility of dividing the content of the e-course into modules, flexibility of education, the ability to keep up with modern pace of life, and the ability to define criteria for assessing knowledge. According to the results of testing, after working with the Moodle platform, students (300 people in total) with different academic performance have improved their results. The most significant improvement has occurred among students with “unsatisfactory” grades; more than 50% have improved their results. Analysis of distance learning systems, testing of students and consultation with teachers allow saying that such platforms help to make education more accessible and convenient. Besides, information technologies are introduced in the educational process. That is why it is important to implement such platforms in higher education.

**Keywords**—Distance learning, higher education, learning styles, learning systems, LMS, Moodle.

## **1 Introduction**

There is a strong belief that online education in higher education will become more common in the future [1]. This can be seen in the growing number of students enrolling in online courses at universities. For example, since 2002, a study of online courses has been conducted in the United States. It was found that in 2012 there were 1.6 million students who studied at least one online course, and in 2013 and 2014 there were 5.5 million and 7.1 million students, respectively [2].

The quality of online education has become more consistent and sustainable because online learning is flexible and affordable [3]. An online learning system that encourages all students to attend classes regularly should be well designed from the beginning to the end of the course [4]. It should offer students questions every week and demand their answers before the course starts. This should stimulate students' interest in learning. Various elements of communication with the teacher can be built into the system, so the teacher can subsequently view information from the student's history. Using these tools, the teacher can periodically evaluate students' participation and measure their progress [5]. In addition, the presence of an online forum allows students to conduct a conversation in the form of posted messages, which leads to discussion and feedback. A forum can be designed taking into account the following:

- Social presence in a group
- Types of discussion topics
- Cognitive strategies for discussion (e.g. debate, role play)
- Size of the discussion group
- Intrinsic motivation to participate in discussions [6].

The effectiveness of online learning depends on its proper planning and teaching to improve the quality of learning and the overall student outcome. Online learning can satisfy the needs of both active and passive learning. It aims to provide students with complete knowledge that can be accessed anywhere and anytime. Students and teachers can communicate and interact with each other outside the classroom. This management of learning and teaching goes beyond the classroom, allowing students to practice thinking and research skills, as well as obtaining new knowledge that can be transferred to innovation [7].

Online courses have their own “climatic conditions”. The atmosphere of distance learning can be defined as “the alleged connection with the teacher and students in the context of indirect or close communication with him/her” [8]. One of the disadvantages of distance learning is the “isolation” that many students may encounter when they lack direct interaction with other students in the classroom. Although technical issues are often the focus of distance learning research, previous studies show that the learning environment and interactions with online teachers and students can also influence student education [9].

Namely, distance learning is a set of measures taken by the university for a cohort of students that are geographically separated from teachers. The methodology allows institutions to improve their services both in terms of quantity and quality. It is also a

systematic approach to education, where the organizational form follows the need to provide students (who are rarely, if ever, physically present on campus) with best possible education [10].

One of the main reasons for the emergence of distance education is to ensure equal access to education for citizens, who do not have the opportunity and resources to receive education on campus in an educational institution. Distance education also aims to provide education to minorities and disadvantaged groups so that a wider audience can have equal access to education. For this reason, distance learning is considered a more democratic form of education, as it aims to cover all parts of society [11].

Thus, how institutions establish systems and resources to support teaching and learning when teachers and students are not in the same place at the same time is critical to the success of providing distance learning. The success of the system depends on its design and on the management that ensures the integration of all parts of the system and their compliance with the required quality standards. Due to the separation of teacher and student, and especially in cases where distance learning is large-scale, any position should be carefully planned, piloted, supervised and evaluated [12].

All parts of the system must be combined, and if they are destroyed, the system becomes non-functional. This will take place not only in terms of money and staffing, but also in terms of institutional reputation. Namely, if there are poor learning resources, they are publicly available, and poor student services are quickly identified and distributed around the world using new communication technologies.

Necessary distance learning features should include:

- Creating systems for the design and development of learning resources that are appropriate for students
- Development of operating procedures and administrative mechanisms that are flexible enough for adults studying part-time and distantly (they should be different from those designed for a homogeneous cohort of students studying full-time and on campus) [13]
- Selection and maintenance of appropriate learning and communication technologies so that students and their teachers can communicate
- Creating a well-organized student support system with processes that ensure that interactions with students (including assignment feedback and response to a request) are recorded, relevant and timely [14]

These systems must be reliable because students are not on campus and can live abroad and study in different time zones. It is important not only to provide quality support and experience for all distance learning students registered at the university, but also to comply with any requirements of labor law.

The pedagogical model of distance learning is different from the regular school curriculum in which the teacher is fully responsible for the group of students. Pedagogy in distance learning is based on the division of labor, when different groups of employees make different contributions, working together as a team through the processes of designing, developing and delivering information [15].

It follows that a significant component of the operational management of distance learning includes a conscious consideration of the integration of all components of the

system – the recognition that the work of one part of the system will affect the other part. For example, the role of the tutor (as well as what he/she is paid and taught for) will influence the development of a distance learning course, and this will be related to the budget of the course. This relationship is true for all aspects of the pedagogical model [16].

Thus, it can be said that platforms for distance learning are an important component of modern education. In this regard, the objectives of this study are formed:

- Make a comparative analysis of several popular platforms for distance learning in accordance with the given categories
- Hold a consultation with university teachers, during which they will highlight the benefits of distance education systems from the point of view of the teacher
- Test students who use the online learning platform to determine its impact on academic performance

## 2 Methods

### 2.1 Research design

To conduct the study, it has been decided to organize a comparative analysis of various platforms for distance learning. Three platforms have been chosen for the study, namely Moodle, Open edX and NEO LMS. The decision to choose precisely these platforms has been made because they are translated into many languages and, therefore, will make sense for international practice. They are also among the largest platforms for distance learning. In addition, all of them have at least partially free access, which allows any user to familiarize him/herself with them.

A consultation has also been held with teachers from five universities (in Russia and China) (Table 1).

**Table 1.** Teachers who have participated in the consultation

Educational institution	Number of surveyed teachers
Moscow State University	9
High School of Economics	7
Saint-Petersburg University of State Fire Service of Ministry of Emergency Situations	6
Peking University	10
Tsinghua University	8

Teachers from Moscow State University, the Higher School of Economics, Saint-Petersburg University of State Fire Service of Ministry of Emergency Situations took part in the survey from Russia. Peking University and Tsinghua University – from China. On its basis, the advantages of using remote platforms from the point of view of teachers have been highlighted. During the consultation, a semi-structured interview has been conducted – the teachers have been asked to answer the question of what advantages of distance learning systems they see.

The last step has been to conduct tests with students. 300 people studying in the above universities have participated in the test. English has been selected as the first discipline for tests, as this subject is studied regardless of professional direction. The tests have been passed in two stages – before using Moodle and after. Next, a comparison has been made of the results of both tests. For comparison, using special formulas (see the “Results” section), the quality of knowledge, the level of competence and the average score are calculated. After obtaining data for both tests, the difference in indicators has been calculated, which indicates changes in performance after training on the platform.

A similar test with the participation of 45 people has been carried out in the natural science discipline “Chemistry”, which has made it possible to compare the performance in the Moodle system in various areas.

## **2.2 Research instruments**

To carry out this analysis, several criteria have been identified that may one way or another relate to training platforms. A total of five criteria have been identified:

System features. The characteristics of a system that set this system apart from the rest or can give it an advantage over other platforms.

Content support. The standards and formats of content for online learning that the system supports. This criterion is very important, since the recognition of the platform and the preference of its choice depend on the variety of forms of content.

Content Creation. The presence of a course designer that allows one to make learning more individual and relevant to the requirements of a particular student or group.

User management. The tools for managing the users on the platform, the possibility of interaction, etc.

Reporting system. The availability of forms of reports that the system supports and the access to it, etc.

As for consultations with teachers, they have been all recorded and then analyzed to highlight the most common categories. A detailed explanation has been given for each category.

## **2.3 Participants**

To recruit participants in the consultation, a letter has been sent to these universities asking them to take part in the survey, to which all interested teachers have responded. Participation has been organized on a voluntary basis.

Since remote platforms can be used in teaching any profession, disciplines (that are taught by respondents) have not played a decisive role. That is why consultations have been held with representatives of both humanities and technical sciences. Among the training areas, there have been: “Journalism”, “Linguistics”, “Public Relations”, “IT”, “Nursing”, “Instrumentation”, “Chemical Engineering”, “Chemistry”.

This sample can be considered relevant, since all participants in the consultations are familiar with the concept of distance education and, therefore, can judge the benefits of online learning systems.

## 2.4 Research limitations

One of the main limitations of this study is that the analysis of training platforms has been carried out in isolation from practice, which does not allow the authors to draw conclusions about how they are evaluated by students and teachers. Besides, a small sample can be considered a limitation when consulting with teachers, in which there have been no control and experimental stage.

## 3 Results

Three distance learning systems are considered. For convenience, their comparative analysis by various criteria is presented in the Table 2.

**Table 2.** Comparison of distance learning systems

Comparison criterion	System		
	<i>Moodle</i>	<i>Open edX</i>	<i>NEO LMS</i>
Open source	+	+	-
Completely free	+	+	-
Support for various content formats	+	+	+
Integration with other services	+	-	+
Function extension (using plugins)	+	+	-
Extensive user management system	+	+	+
Availability of testing system	+	-	+
Tracking the academic progress of students	+	+	+

Thus, of all systems, only Moodle meets all the proposed criteria, which indicates a wider range of functions that its users can resort to. In two other systems, teachers and students may encounter some limitations.

To clarify each item, a broader description and analysis of the functions of each system is provided below.

### 3.1 Moodle

Moodle is the first platform that has been reviewed. This is a free open source distance learning system. Over the years of development, a strong community has formed around Moodle, which creates new modules (plugins) for the platform. Currently, the Moodle platform has been translated into more than one hundred languages and supports over 1,500 plugins. Thus, this system is available to students around the world, and can also be customized to meet specific needs.

Platform features include:

**Platform configuration through plugins:** The functionality and design of Moodle are changed using plugins that can be downloaded for free from the Internet or created by oneself. This allows one to customize the system to the needs of a particular student, group or teacher, expanding the learning opportunities.

**Open source system:** Development can be done by anyone. As a rule, plugins are developed by the users themselves, and then they are posted on the Internet for general access. This is a definite plus, as developed by users, plugins are made immediately for practical purposes, and, therefore, will be more convenient to use.

**Integration with other services:** Moodle is easy to combine with other platforms, for example, with those that allow creating online presentations or watch webinars.

As for content support, this platform supports all the most popular formats for distance learning systems (for example, IMS, AICC or SCORM). Support for other formats is also possible when installing the appropriate plugins.

In Moodle, one can create text lectures and polls, as well as add interactive training materials. These features can be expanded by installing plugins.

The Moodle platform offers a wide range of user management capabilities. By default, users can be assigned roles and grouped. All other functions, such as mass assignment of courses and setting registration conditions, are added using plugins. For example, it is possible to configure automatic registration of users and their addition to the course, to remove inactive users from the system.

In Moodle, one can customize the reporting system for oneself – select only the data that is needed to analyze student performance. For example, one can see how much time is spent on studying the course, how often one visits the platform, and what mistakes one makes in the tests. There are over thirty plugins that let one customize his/her reporting system.

### 3.2 Open edX

The next reviewed distance learning platform is Open edX. This system also has an open-source code, translated into more than thirty languages. It has been created on the initiative of the partners of the founders of Harvard University and the Massachusetts Institute of Technology and consists of dozens of leading global institutions.

One of the main features of the Open edX system is its open-source code, which makes it open to communities. Educational institutions can post their own tasks on the platform and offer various courses. Teachers can expand the platform for building learning tools that exactly meet their needs, and developers can add new features to the open platform in real-time.

The Open edX system also supports all the basic formats required for organizing distance learning.

Teachers can publish courses, create discussion boards, manage teams, edit grades, and communicate with students. This system offers the ability to import and export courses and expand opportunities using plugins.

Students can access their profile, check their enrollment status and view courses using the student's personal panel. The system provides access to the course content and supporting infrastructure (schedules, discussion boards, collaboration tools, student administration, certificate generation, messaging, etc.).

To track progress in the Open edX system, there is the possibility of a student's customizable experience, which displays his/her academic performance, working time with the platform, etc.

### **3.3 NEO LMS**

The last distance learning platform the authors have reviewed is NEO LMS. Unlike the two previous systems, this one does not have open-source code, and for use, it is necessary to request a license. However, a fourteen-day trial period is possible.

It is possible to install the system on its own web server, as well as access via a cloud service. A positive feature of this platform is that for educational institutions with less than 400 students, the distance learning system can be ordered for free. Thus, this makes distance education more accessible for small schools and universities.

The NEO LMS has data structures that ensure the compatibility of various test systems. The main purpose of this is to give users the ability to import and export materials with questions and tests, as well as to ensure compatibility of curriculum content with assessment systems.

As for the formats with which one can work in this system, the authors note the support of industry standards such as SCORM, LTI, LDAP and QTI. That is, like the platforms discussed above, NEO LMS supports all formats popular in distance learning. NEO also integrates with a wide range of systems, including Google Docs, Google Drive, Google Apps, and Common Cartridge.

The NEO LMS online platform has a wide range of support and creation of training content. One of the advantages of this system is the ability to conduct webinars. The system also has a wide range of functions for creating test tasks (which is noteworthy, they are equally available in both the paid and free versions). For the convenience of students, the platform involves creating a schedule, posting news, etc., as well as downloading tasks and training materials in different formats.

Interaction with users is semi-automatic – teachers can both add students to the course and automate this activity. Within the framework of the course, it is possible to create groups in which students can communicate and exchange experiences.

In addition to a broad testing system, the teacher can track the overall progress of students, how much time they spend on studying a particular topic, track activity on the site, etc. Thus, the NEO LMS system has ample opportunities for assessing the academic activities of students.

As consultation with educators from two countries has shown, they consider the most obvious advantages of using online platforms for distance learning:

Greater freedom of access. Studying through distance platforms, the student has the ability to access e-courses from anywhere where there is access to the global information network. This is especially true for students living in hard-to-reach places. Access to educational courses via the Internet allows providing more people with education.

Lower tuition fees. In e-learning, the process of education includes only the exchange of information via the Internet when the student does not have to purchase educational materials. In addition, there are a number of free platforms (or supporting the so-called freemium policy, combining paid and free features), which make distance education even more affordable.

The possibility of dividing the content of the e-course into modules. Small blocks of information make it possible to study the subject more flexibly and simplify the search

for the right materials. In addition, the division into modules simplifies the work of the teachers themselves, since in this way it becomes more convenient to monitor students' progress on specific topics or lessons.

**Learning flexibility.** The listener chooses the duration and sequence of studying the materials him/herself, fully adapting the entire learning process to his/her capabilities and needs. If necessary, the teacher him/herself can adjust the volume of materials, starting, for example, from the success of a student's mastery of a certain topic or from the speed of implementing tasks. Subsequently, such an individual approach can bring more positive results than targeting a different group of students.

**The ability to keep up to date.** Users of e-courses, both teachers and students, develop their skills and knowledge in accordance with modern, latest technologies and standards. E-courses also allow timely and efficient updating of teaching materials.

**Ability to define knowledge assessment criteria.** In e-learning, it is possible to set clear criteria by which the knowledge acquired by the student in the learning process is evaluated. This eliminates bias, and also allows students to know in advance what is required of them.

Thus, distance learning systems have many advantages and it is necessary to try to introduce them into the educational process. To do this, it is necessary to provide an understanding of their convenience, for which special seminars can be organized at which teachers and/or university leaders will be told about such platforms. This will help them understand the convenience of distance learning, the variety of distance platforms and their functions, which will allow each educational institution to choose the one that suits them

Since of all the examined systems, only Moodle meets all the criteria, it is decided to use it to compare student performance after working with the online platform. Before using the system, students have passed standard testing, which consists of:

- Working with the tenses of all groups (including passive voice)
- Working with text (supplementing sentences, highlighting true and false judgments) and vocabulary (inserting words into sentences, changing parts of speech by sense).

For convenience, student results have been transformed into a five-point scale. Quantitative test results are presented in the Table 3.

**Table 3.** Student Test Results

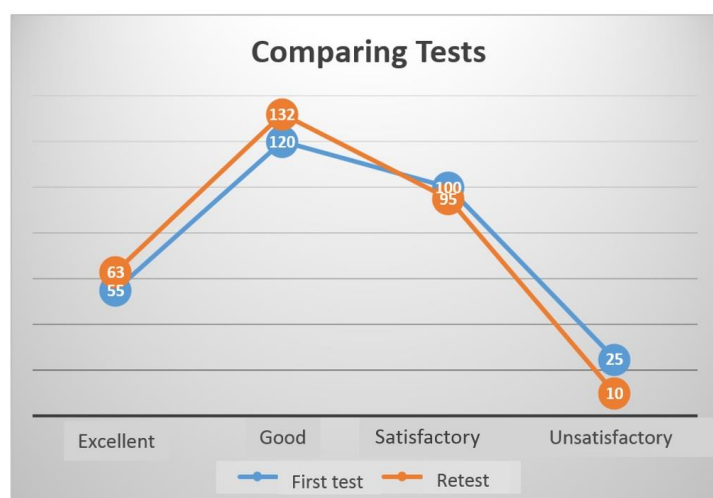
Mark	Number of students who have been assessed
Excellent	55
Good	120
Satisfactory	100
Unsatisfactory	25

After passing the test, students have taken a 3-months course on Moodle, relating to the test tasks. The training has been supported by English teachers. At the end of the course, students have been given a similar test to track progress (Table 4).

**Table 4.** Student Retest Results

Mark	Number of students who have been assessed
Excellent	63
Good	132
Satisfactory	95
Unsatisfactory	10

Further, for clarity, a comparative analysis of two tests is carried out (Figure 1).



**Fig. 1.** Comparing tests

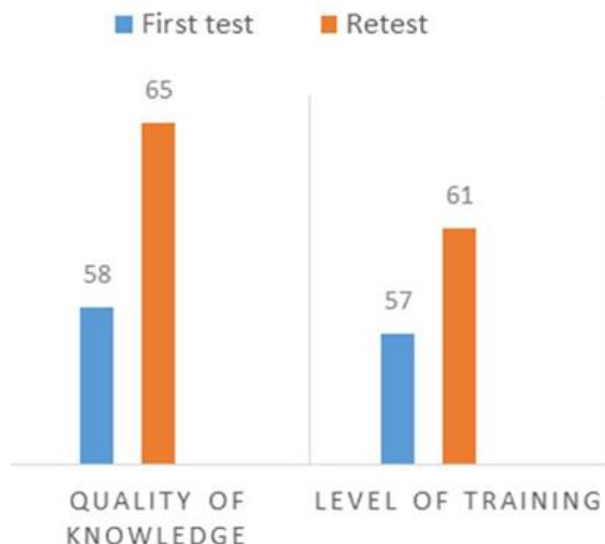
To compare the results, a calculation is made of the quality of knowledge, level of competency, and the average score for each of the two tests (Table 5, Figure 2). The calculations are carried out according to the following formulas:

Quality of knowledge: (number of marks “5”+number of marks “4”)/total number of students;

Level of competency: (number of marks “5”x100 + number of marks “4”x64 + number of marks “3”x36 + number of marks “2”x16)/total number of students.

**Table 5.** Academic indicators of testing

	First test	Retest
Quality of knowledge	58%	65%
Level of training	57%	61%
Grade point average	3.68	3.83



**Fig. 2.** Comparing quality of knowledge and level of training in two tests

The results of the study reveal that after completing the course on Moodle, students' indicators have increased in all categories (quality of knowledge, level of competence and grade point average). The largest increase has occurred in the quality of knowledge (7%), since the number of under-performing has fallen by more than half (from 25 to 10 students). The level of competence has increased by 4%, and the grade point average by 0.15 points. This suggests that the use of online learning platforms has a positive effect on students' performance and can be used as an ongoing learning method.

An open educational resource on the natural science discipline “Chemistry” is successfully functioning at the Saint-Petersburg University of State Fire Service of Ministry of Emergency Situations on the online learning management system – Moodle [17]. Online knowledge control is one of the effective assessment methods. The testing system allows one to generate unique options for each interviewee; this is achieved thanks to the bank of tasks and individual test settings at each stage. The student can get more than one attempt in a certain test; he/she can also get the relevant comments if he/she answers incorrectly. The student receives points while performing tasks. The parameters of the task are determined by the teacher, who enters them in the settings for all types of such tasks or for each task separately.

It is of interest to evaluate the effectiveness of online testing and compare the results with the traditional test forms of the chemistry course and then compare these data with the results of testing in the humanities (English). To solve the tasks, two experimental E (40 people in total) and two control groups K (45 people) are identified, which, according to the results of the initial survey, have approximately the same level of training. Knowledge assessment has been carried out on two rather complex topics of the chemistry course – Chemical Thermodynamics and Chemical Kinetics. All groups

participating in the experiment have undergone traditional testing in the classroom, and two experimental groups have had the additional opportunity to work with tests online.

The developed tests relate to the so-called “learning tests”, which are used at all stages of the didactic process. With the help of such tests, as a rule, preliminary, current, thematic and final control of knowledge and accounting of performance are effectively provided. It is important to reveal gaps in knowledge for self-control. The work with students on the prevention of academic failure is also based on current testing.

The test results are presented in Tables 6, 7.

**Table 6.** Test results on the topic “Chemical thermodynamics”

Groups	Number of students	Test 1		Test 2	
		Quality of knowledge (%)			
		<i>classroom-based</i>	<i>online</i>	<i>classroom-based</i>	<i>online</i>
K	45	69.8		74.6	
E	40	70.1	68.6	81.3	88.6

**Table 7.** Test results for the topic “Chemical kinetics”

Groups	Number of students	Test 1		Test 2	
		Quality of knowledge (%)			
		<i>classroom-based</i>	<i>online</i>	<i>classroom-based</i>	<i>online</i>
K	45	63.6		66.9	
E	40	64.3	58.7	79.1	82.7

The first test shows approximately the same level of knowledge in the control and experimental groups. It is worth noting that the initial online testing has yielded about the same result. This suggests that the proposed tests are characterized by objectivity, reliability, validity and accuracy of the results. Further, according to the experimental conditions, in the control and experimental groups, an analysis of the errors has been carried out in the classroom. Thus, the students of the experimental group have additionally performed training tests online, after which retest has been performed (test 2). The results are expected and convincingly show that the implementation of training tests with the ability to analyze errors significantly improves the quality of learning. The participants of the experimental group at the final stage have shown much higher results, and not only during testing, but in other types of tasks (e.g. colloquium).

## 4 Discussion

Since at the moment distance learning is becoming more and more in demand, various studies are being conducted on this topic. One of them took place in 2015 and related to the attitude to the Moodle distance learning system. To conduct the study, a web survey was organized to measure the perception of marketing students of the Moodle distance learning system. The data were collected using a convenient sampling method using questionnaires among marketing students. The survey involved 255

respondents from six marketing classes at two universities in the northeastern and southwestern United States. Samples consisted of 58% of women and 42% of men. All respondents were between 18 and 28 years old. Respondents noted that in addition to Moodle, they used platforms such as CMS Blackboard (30%), WebCT (29%) and others (16%). For all questions, the answer options consisted of a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (completely agree) [18].

Thus, it can be seen that this study differs from the current study in the method of conducting (survey), as well as in the age group (students). However, it also addresses the Moodle platform.

According to the results of the study, the most important aspect of a distance learning system is the control that it gives students over their academic performance. Depending on how this is implemented by the instructor, the learning platform offers students the flexibility to choose the time and amount of work they perform [19]. Students can also see their progress online. Such flexibility can help students who might otherwise feel that they are dependent on the teacher or department schedule. The point for instructors is that they must set up the system so that students can better control their progress. The schedule, including assignments and lectures, should be built into the platform as much as possible so that students know in advance the pace of work and how much they need to complete in order to move further in the course [20].

A positive association has also been noted between the difficulty and satisfaction or functional benefits of the course software. Perhaps, to some extent, students have felt that the more complex the management of the software, the more effective it is. To some extent, complexity can be a problem that is perceived as contributing to the achievement of a goal [21]. In this case, a certain degree of complexity can also give students a sense of accomplishment that they have studied the software system. The meaning of this for instructors is that they can push students a bit, challenge them using the online platform. Perhaps instructors can develop a more complex and enriching Moodle curriculum with videos and exercises for motivation. In addition, learning the system itself can be useful [22].

These results suggest that communication benefits are an important tangible advantage of distance learning systems for students. Moodle helps facilitate communication between student and teacher, as well as between students themselves. Students may be reluctant to chat with classmates who are not friends on social networks to do group work. On the other hand, software like Moodle is a strict workspace. To the extent that the distance learning platform can facilitate communication regarding classroom activities and activities between students and teachers, it will be perceived as useful. Teachers can help in this process, perhaps by setting a time when extra-curricular discussions can take place. Other teachers encourage and give points for student comments in chat rooms, which is an external reward that can encourage the use of online platforms as a means of learning and communication [23].

Thus, despite the fact that the mentioned study differs from the current study in terms of the method, it confirms the characteristics of the Moodle system that this study highlights in the analysis.

Another study on distance learning systems took place in 2016. According to the methodology, it was like the current study, since it also examined various platforms for

online learning. That study also examined several distance learning systems, both paid and commercial. Among them were open and closed source platforms [24].

The first open-source platform to be reviewed is Moodle. Moodle is an abbreviation for Modular Object-Oriented Dynamic Learning Environment. Moodle platform features are usability, accessibility and flexibility. Each course also has a list of students, allowing the lecturer to find out when each student last visited the platform. Moodle can be integrated into other systems. Moodle provides the opportunity to interact synchronously and asynchronously. There is also a personal area for rough recording and journaling, as well as managing personal and private information, as well as content that is developed based on the needs of teaching and learning and which can be reused.

Next, the Sakai platform is reviewed. Sakai was developed under an open-source license. The features of this platform are usability, ease of use, flexibility and compatibility with Web 2.0 tools. Sakai tools are enhanced by a design tool for training and an electronic portfolio. In addition, this software has been translated into more than 20 languages. It provides synchronous and asynchronous interaction and offers a personal area for rough recording and journaling, as well as for managing personal information. Users can also send and receive private messages from other users [25].

One of the investigated commercial platforms is Blackboard. Blackboard is a system that supports the needs of students, teachers and the university. This platform is a licensed system, and institutions using it must pay for annual license renewal. Although this system is a bit complicated and expensive, it is fully equipped and has many tools and services [26].

Other platforms (SumTotal, ATutor, SuccessFactors) are also considered. A comparative analysis has revealed that not all platforms can be integrated with other systems. The only three platforms that can be integrated with other systems are Moodle, Sakai, and SumTotal. Integration of e-learning systems with other systems can allow users to access and use the provided e-learning tools. There are four platforms that provide synchronous and asynchronous interactions: Moodle, Sakai, ATutor, and Blackboard. Meanwhile, only two platforms have a private area for writing drafts and journaling and managing personal information: Moodle and Sakai [27].

The common functions for all platforms are flexibility, ease of use, accessibility and user-friendliness, while all platforms lack integration with other systems, and only Moodle and Sakai have a personal area for writing drafts, journaling and managing personal information [28]. Meanwhile, only ATutor allows lecturers and students to coordinate and manage courses, and also gives each user their own file storage utility, which can be shared with other users, and allows one to save the content and structure of courses and back them up in software. Enabling an administrator to restrict access to specific users is only available on SuccessFactors. SumTotal provides contextual training, talent assessments and tools to increase the efficiency and effectiveness of personnel management. These features are less visible on the platform, since each platform has its own advantages and goals when developing software for use by certain parties [29].

## **5 Conclusion**

The introduction of distance learning systems will improve the quality of education through the use of modern means. To conduct the study, an analysis of several platforms for distance learning is organized according to certain criteria (system features, content support, content creation, user management and reporting system). Each of the proposed systems to a greater or lesser extent meets these criteria. It is revealed that only the Moodle platform matches all of them.

The next step has been a consultation with 34 teachers from major universities in Russia and China. For the consultation, a semi-structured interview method has been used, in which respondents have been asked to highlight the benefits of distance learning systems. The teachers have highlighted such characteristics as:

- Greater freedom of access
- Lower prices of training
- The possibility of dividing the content of the e-course into modules
- The flexibility of training
- The ability to keep up-to-date
- The ability to determine criteria for assessing knowledge.

The study has also included testing of 300 students, which has consisted of two parts (before learning with the help of the online platform and after). According to the results of repeated testing, it turned out that the use of a remote platform had a positive effect on academic performance. The quality of knowledge increased by 7%, the level of competence by 4% and the grade point average by 0.15 points.

It can be concluded that distance learning systems have many advantages and it is necessary to try to introduce them into the educational process to ensure the convenience and dissemination of higher education. For this, it is necessary to provide an understanding of their advantages, for which special seminars can be organized at which teachers or university leaders will be told about such platforms. They will understand the convenience of such platforms, the variety of remote systems and their functions, which will allow each educational institution to choose the more suitable one.

Further research can be conducted among students to determine their relationship to distance learning systems. To this end, one can organize a survey or semi-structured interviews. One can also continue to consider the systems themselves according to various criteria, expanding the number of systems and conducting a comparative analysis.

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