

25

METHODOLOGICAL ISSUES OF THE USE OF GOOGLE CLASSROOM TO PREPARE STUDENTS FOR THE UNIFIED STATE EXAM IN PHYSICS IN THE DISTANCE LEARNING FORMAT

CUESTIONES METODOLÓGICAS DEL USO DE GOOGLE CLASSROOM PARA PREPARAR A LOS ESTUDIANTES PARA EL EXAMEN ESTATAL UNIFICADO DE FÍSICA EN LA FORMA A DISTANCIA

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Suggested citation (APA, seventh edition)

Abushkin, H., Kharitonova, A., Mumryayeva, S., & Savina, A. (2022). Methodological issues of the use of google classroom to prepare students for the Unified State Exam in Physics in the distance form. *Revista Conrado*, 18(88), 214-221.

ABSTRACT

In the context of the coronavirus pandemic, educational institutions around the world are faced with the need to quickly adapt to the distance learning format. The study aims to identify the methodological problems of using the Google Classroom platform in preparing students of Russian general education schools for the Unified State Exam in Physics in the distance format and to develop methodological recommendations for working with the platform. The article presents recommendations for the content of a course on the Google Classroom platform and analyzes the results of testing the course. Based on the results of testing at the end of the training by the developed program, the method is concluded to be effective in preparing high school students for the Unified State Exam in Physics.

Keywords:

Teaching methods, information and communication technologies, Unified State Exam (USE), Universal learning activities (ULA), educational technology.

RESUMEN

En el contexto de la pandemia del coronavirus, las instituciones educativas de todo el mundo se enfrentan a la necesidad de adaptarse rápidamente al formato de educación a distancia. El estudio tiene como objetivo identificar los problemas metodológicos del uso de la plataforma Google Classroom en la preparación de estudiantes de escuelas de educación general rusas para el Examen Estatal Unificado de Física en formato a distancia y desarrollar recomendaciones metodológicas para trabajar con la plataforma. El artículo presenta recomendaciones para el contenido de un curso en la plataforma Google Classroom y analiza los resultados de la prueba del curso. Con base en los resultados de las pruebas al final de la capacitación del programa desarrollado, se concluye que el método es efectivo para preparar a los estudiantes de secundaria para el Examen Estatal Unificado de Física.

Palabras clave:

Métodos de enseñanza, tecnologías de la información y la comunicación, Examen de Estado Unificado (USE), Actividades de aprendizaje universal (ULA), tecnología educativa

INTRODUCTION

The term “distance education” is now encountered quite frequently. The Concept of the creation and development of a unified system of distance education in Russia offers the following definition of distance education: *“a complex of educational services provided to the general public in the country and abroad by means of a specialized informational and educational environment at any distance from educational institutions. The information-educational environment of distance education is a systematically organized set of data transmission means, information resources, interaction protocols, hardware-software and organizational-methodological support, intended for the satisfaction of the educational needs of users”*. (German, 2001)

Distance learning technologies are commonly understood as *“educational technologies that are implemented using information and telecommunications networks as a result of interaction between students and teachers”*. (Gromova, 2006, p. 153)

Based on analysis of a large number of definitions available in the literature, this paper considers distance learning as *“a set of technologies that ensure the delivery of the main volume of educational material to students and the interactive communication between students and teachers in the learning process, providing students with opportunities for mastering the studied material in independent work, as well as in the learning process”*. (Andreev, 1999, p. 21)

At present, pedagogical theory and teaching practice have a great variety of methods, tools, and forms of organization of the learning process, which allow activating students' learning and are described in Russian and foreign literature available to a wide range of readers (Abushkin et al., 2018ab; Mumryayeva et al., 2018; Yakunchev et al., 2018; Abushkin, 2020). Distance learning occupies a special place among other forms of organization. Its effectiveness in improving the educational level of the population is beyond doubt. On the agenda is the issue of finding the means and developing the methods of their use to ensure high learning outcomes (Glazkov, 2011).

For this reason, the purpose of the present study is to explore the capabilities of one of the modern cloud platforms, Google Classroom, in organizing distance learning for students of general education institutions and to develop a methodology for its use. The Google Classroom platform provides opportunities to organize effective learning activities based on mutual cooperation of a teacher and a student. It allows updating the content of education, expanding teaching methods, implementing differentiated

learning technologies, and organizing distance learning, including preparation for the Unified State Exam.

MATERIALS AND METHODS

Google Classroom combines the useful services offered by Google, which are necessary for learning itself. With this platform, each teacher is able to: create a large number of their own courses simultaneously, both to work with the highly motivated children and to help the ones who fall behind.

The methodological capabilities of Google Classroom are exercised on the basis of services incorporated in it: Google Docs (creating, editing, and viewing text documents, presentations, PDF files, spreadsheets); Google Calendar (creating notifications and setting deadlines for assignments); Google Forms (creating online tests and surveys); YouTube (posting videos and integrating them into the theoretical material); Google Drive (cloud storage, 15 GB of space available); Gmail (receiving email notifications).

RESULTS AND DISCUSSION

First, let us examine the technology of working with Google Classroom.

Creating a course on the website.

Open the browser and go to services (applications). Click on the “+” located in the upper right corner of the screen. In the dialog box that opens, write the course name, section, subject, and audience for that course. (Only the first two items will be displayed to students). Here it is possible to use the user's last name, the number of the class (group) of students.

There are four main tabs available to the teacher when creating and organizing a course: feed; assignments; users; grades.

The “Feed” section displays relevant information on the course: educational materials, lectures, summaries, announcements, assignments, comments of the teacher and students.

This section displays what happens on the Course in the exact order in which the teacher adds information to the course:

- the teacher's announcements, as well as real-time information about assignments, notes, and information about webinars;
- information about learning materials for course participants;
- information on assignments for course participants;

- announcements from course participants themselves (available with certain settings).

When adding information, the teacher can add various materials aside from text:

- attach a file (upload from a computer),
- add a file from Google Drive,
- post a link to a Youtube video,
- give a link to an external site,
- leave their remarks (requests) to be taken into account when completing the assignment,
- remind course participants about assigned tasks and the allocated time,
- schedule a webinar time with the course attendees and add the information to the course calendar.

Students will see new information and announcements, as well as be able to comment and ask their own questions.

A new announcement is created by selecting the “Add New Entry” tab.

Storing materials on the platform.

All of the material the teacher uploads is automatically saved in the course folder on Google Drive. This folder can be accessed via the “Assignments” tab.

The “Assignments” tab allows the teacher to add the necessary learning materials, distribute the assignments by topic, and publish them in the desired sequence. To do this, select the icon “+ Create”, and: create tests, add learning materials and combine them by topic, create questions, and group them by topic, organize topics and materials in them (material without a topic is located at the top of the page). The teacher can post assignments of various types: any document from a PC or Google Drive; provide a link to material from the Internet, including videos; add a quiz to be completed. The material is added by using the provided set of icons.

When creating an assignment, it is necessary to specify the number of points (on a 100-point scale) for the completed assignment, as well as the deadline for the assignment. In this, the point of reference is the number of assignments per week. Finally, after specifying the deadline, press the “Create assignment” button.

In this section, it is also possible to give individual assignments, as well as assignments for a subgroup of students. This division is necessary when differentiating assignments by difficulty by the middle of the course because, by that time, each student will have a rough idea of what grade they are reaching for. This feature helps the teacher

to implement an individualized approach and differentiate assignments by the level of difficulty.

When several students are working on the same project, it is possible to give them access to editing one document. The students’ work is then graded as one, with each student receiving the same grade as a result.

When a student completes an assignment, the teacher is automatically notified of the results. To see the assignments that students have turned in, go to the “Feed” section and select “All assignments”.

Here the teacher can check students’ answers, assign marks, and comment on their answers. Students’ assignments will be in one of the statuses:

- Assigned (the student is tasked with completing the assignment);
- Turned in (the teacher is tasked with providing feedback);
- Returned or graded (the teacher has given feedback and possibly gave a grade);
- Not turned in or missed the due date (the student did not turn in the assignment on time).

For their convenience, the teacher can create test assignments on the course with auto-checking and automatic grading using the Google Forms platform. To create a test, the teacher needs to select the assignment tab on the test form and click the link to the form. Google Forms provides the following features:

- Completing online registration for an event;
- Completing a test;
- Performing online research;
- Collecting Feedback (a questionnaire, a mini-questionnaire handed out after various learning activities);
- Brief (a small questionnaire of a consensual nature between the teacher and students);
- Taking a vote.

When creating a Google Form, teachers have the ability to change the appearance of their assignments. Here one can choose their favorite monochrome fill of the form or select a theme from the catalog. To open the catalog, left-click on the icon of the illustration. Then choose any available option or load your own. The selected theme is displayed in the form header and in the background of the form.

When preparing for the USE, Google Classroom is a methodological tool in the hands of a teacher that provides for the convenient and fruitful organization of the

process of distance training for the Unified State Exam. However, the methodological content of each lesson, assignments, summaries, and materials to be used in the class should be thought over and prepared by the teacher in advance. Then all the information is transferred to Google Classroom.

3.1 Development of the Methodology of Work on Google Classroom for the Organization of Distance Learning for Students of General Educational Institutions

It is most convenient to create a folder for the course on the computer, assigning each lesson a separate folder the master folder. The number of folders should match the number of lessons. The structure of the folder may include a summary of the lesson, tasks for the webinar, assignments for independent work (homework), links.

Let us more closely consider each of the items that make up a lesson on the Google Classroom platform:

1. Video lesson (brief theory)

A pre-filmed detailed video lesson with the theory of the topic at hand. Naturally, the theoretical material of the lesson can be explained as part of the online lesson. This gives the student the opportunity to revisit the lesson to study the issues that cause difficulties for the student in greater detail. A video lesson on the topic filmed in advance gives an opportunity to refer to the theory an unlimited number of times.

2. Summary.

Further on, a file with the summary of the necessary theoretical material is necessarily attached to each lesson. The summary includes the basic concepts of the topic, formulas, and descriptions of the most challenging phenomena and processes of the studied topic, which should be paid attention to at the USE. The student can refer to this brief information in the process of solving problems. The attached material is in PDF format, which allows students to easily download an undistorted attached summary with correct pictures and formulas.

3. Assignments for collective work posted in ZOOM.

The assignments need to be selected meticulously and responsibly. They need to correspond to the tasks included in the Unified State Exam in Physics and match the tasks published in the Open bank of tasks of the USE in Physics on the website of the Federal Institute of Pedagogical Measurements.

As additional material for the tasks, we use the textbook by Demidova et al. (2018), one of the developers of USE control and assessment materials.

All the tasks are initially picked out and created in Word and then converted into PDF so that the students would be able to print them out for the sake of convenience. This allows the students to perform constructions on paper, as well as to reduce the strain on their eyes.

Once they complete all the tasks, a student can put their answers into a Google Form with an auto-check. After the answers are entered, the student and teacher can see the results of their work. This is necessary so that the students can check themselves and highlight exactly the tasks in which they have difficulties. The teacher, knowing the weaknesses of the student, will be able to draw attention to the challenging topics, explain them, and make a selection of similar problems to reinforce the knowledge.

4. Homework assignment (with auto-check with Google Forms).

Compiled by analogy with the tasks for collective work and is aimed at consolidating the material learned and practicing the developed skills.

3.2 Results of Approbation of the Developed Course

Research for the approbation of the presented course was conducted from 2018 to 2021 academic years. Over three years, 63 students participated in the experiment. In terms of residence demographics, the participants of the experiment come from Moscow and the Moscow region, the Republic of Mordovia, and other regions of the Russian Federation.

To analyze the results of our work in the academic year 2020-2021.

The experiment is conducted among 19 graduating school students who chose the subject Physics for the Unified State Exam. The students recruited for the experiment come from Municipal Budgetary General Education Institution Secondary General Education School (MBGEI SGES) No. 35 of Saransk and MBGEI SGES No. 25 of Khimki, Moscow region; five students are from other regions of the country.

The data from the mock exam in Physics organized by the administrations of the respective schools are taken as a reference point for learning outcomes.

The minimal exam score for the USE in Physics equals 36 points. It is the score that allows a student to pass the threshold value.

Below we present the results of the mock examination of the students who took part in the approbation. The results

of the mock exam are presented in Figure 1. The horizontal line represents the threshold score for the Physics exam (36 points).

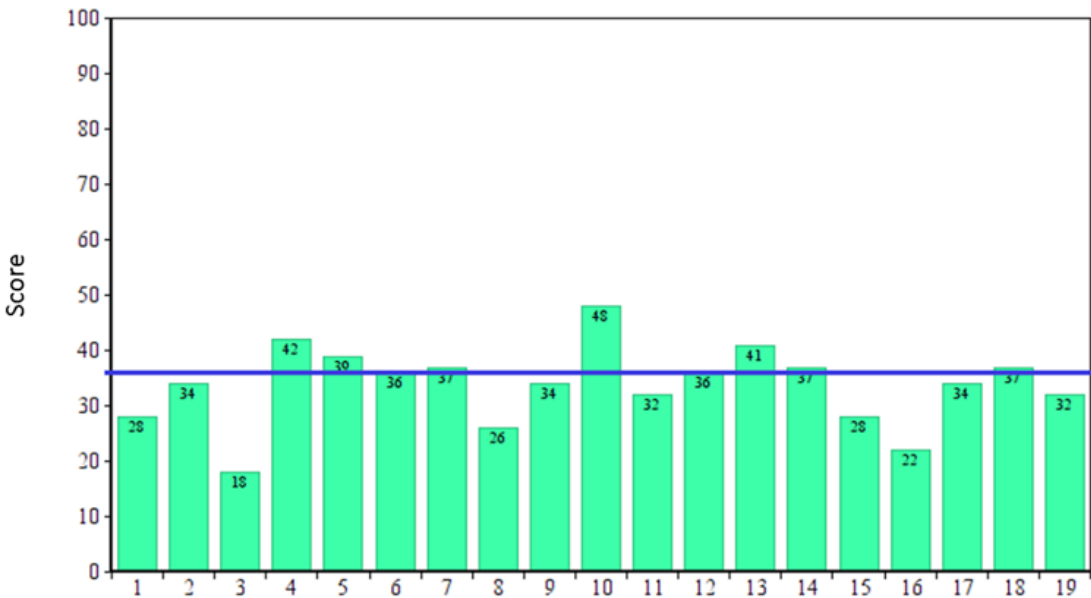


Figure 1. Results of the students who passed the threshold score.

As can be seen in the figure, 5 students passed the threshold score of mock exam 1 with the minimal number of points, 4 reached the threshold value, and 10 did not pass the mock exam. Figure 2 presents these values in percentages.

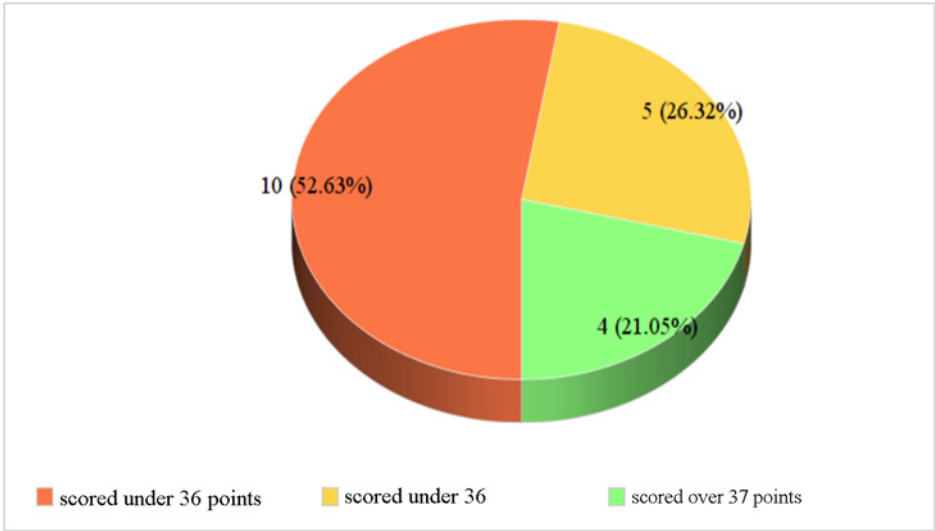


Figure 2. Results of mock exam 1 in percentage ratio.

The provided data show that from all the students who took the exam, over 52% did not pass the threshold value and 26% only scored 1-2 points above the threshold, which is indicative of the students' poor initial training and unpreparedness for the exam, as well as points to their unjustified choice of the Physics discipline. The conducted interviews reveal that the only reason for the students to choose this subject is that it is required by a certain university. The students did not show interest in learning physics before and had an average score in the subject.

After the mock exam, the students analyzed the exam together with the teacher and concluded that their level of knowledge is insufficient to pass the USE in Physics to enroll in the desired Russian universities. As a result, the students were recommended to intensify their training and start preparation with the teacher on the Google Classroom platform. Starting from the “Mechanics” section, the students attended webinars and consultations on preparation for the USE in Physics twice a week and practiced the studied material in their free time in the form of homework assignments. The interim result of the approbation is the second mock exam, the results of which are presented in percentages in the comparative charts (Figure 3).

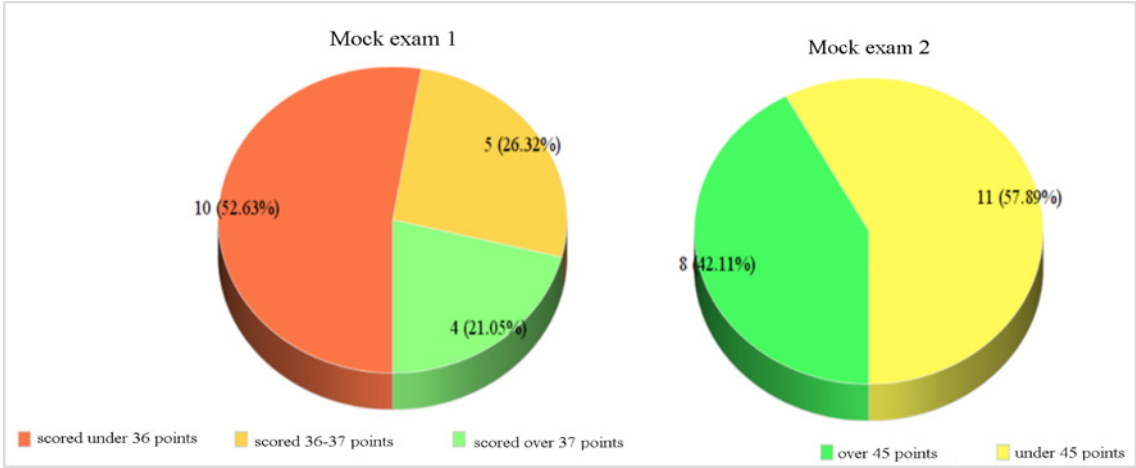


Figure 3. Compared results of mock exams.

Comparison of the results of the two mock exams shows that 100% of the students scored over 36 points on their second try, i.e. passed the minimum threshold. 42% of the students scored over 45 points, which demonstrates improved quality of training and the desire to improve the score in the Physics exam. The results of mock exam 2 give an indication of the effectiveness of the training according to our method, which gave us the right to continue training on the Google Classroom platform without changing the training methodology (Table 1).

Table 1. Results of the USE in Physics.

No.	Student's sex	Grade	Academic year	Score	Passed/Failed
1	male	11 "A"	2018-2019	54	Passed
2	male	11 "B"	2018-2019	65	Passed
3	male	Tutor	2018-2019	51	Passed
4	male	11 "A"	2019-2020	74	Passed
5	male	11 "A"	2019-2020	69	Passed
6	female	11 "A"	2019-2020	62	Passed
7	male	11 "B"	2019-2020	69	Passed
8	male	Tutor	2019-2020	52	Passed
9	male	Tutor	2019-2020	65	Passed
10	male	11 "A"	2020-2021	69	Passed
11	female	11 "A"	2020-2021	57	Passed
12	male	11 "A"	2020-2021	50	Passed
13	female	11 "A"	2020-2021	67	Passed
14	male	11 "A"	2020-2021	52	Passed
15	male	11 "B"	2020-2021	47	Passed
16	male	11 "B"	2020-2021	46	Passed

17	male	11 "B"	2020-2021	51	Passed
18	male	Tutor	2020-2021	59	Passed
19	male	Tutor	2020-2021	57	Passed

The dynamics of the quality of training on the Google Classroom platform is shown in the diagram (Figure 4). The reference value is the score received by the students in the pilot test at school and the final score is the one for the Unified State Exam in Physics.

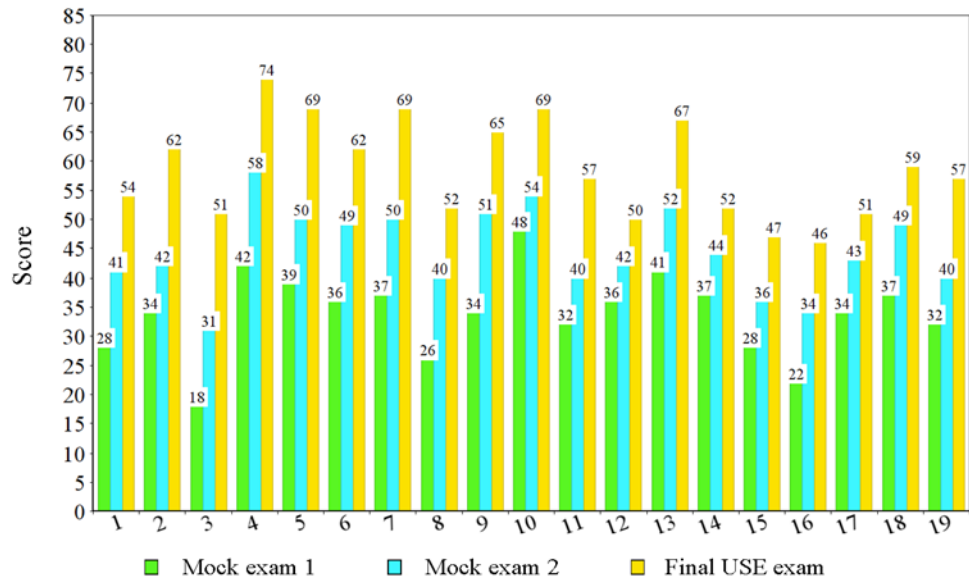


Figure 4. Dynamics of the quality of training on the Google Classroom platform.

Analysis of the diagram suggests that preparation for the Unified State Exam on the Google Classroom platform proves effective. An increase in the quality of training is observed in the results of each student without exception throughout all three stages. Intermediate results in the form of mock exam 2 also show the dynamics of improvement in the quality of preparation.

The results of the three stages of approbation show an uninterrupted dynamic: 100% of the students have passed the USE in Physics, 26% passed with an “A” grade, and another 26% – with a “B” grade, despite that at the first stage of the approbation, only 26% of the students passed the threshold score. We should also note that throughout the experiment, the students were only studying in the classes as part of the developed program and completing assignments on Google Classroom.

CONCLUSIONS

The conducted study meets all the established objectives. The system of distance learning and the known means of distance learning used in preparing students for the USE in Physics are analyzed.

The methodological capabilities of the Google Classroom platform are identified and employed. The “Physics” training course is developed and tested on the Google Classroom platform, its effectiveness in preparing secondary school students for the Unified State Exam in Physics is proven.

The use of distance technologies gives an opportunity to diversify the methods, tools, and forms of preparation for the exam, arouse students’ interest, and facilitate the teacher’s work. The Google Classroom platform, on the basis of which the “Physics” course for the preparation of students for the Unified State Exam is created and tested, has an advantageous position among distance learning tools.

Since the Google Classroom platform is new for the Russian general education system, schoolteachers are in dire need of methodological recommendations for working with the system as part of their programs. In the future, it is planned

to develop methodological recommendations for the organization of distance learning, including preparation for the USE.

The research was carried out within the framework of the grant for research works on the priority areas of research of the partner universities on network interaction (I. Yakovlev Chuvash State Pedagogical University and Mordovia State Pedagogical University named after M. E. Evseyov) on the topic "Methodological conditions and means of preparing students for the Unified State Exam in the distance form"

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