The potential of Google Classroom web service for lecturers of higher educational establishments under pandemic conditions

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Abstract

Researches and publications on using Google Classroom web service for lecturers of higher educational establishments under pandemic conditions are analysed. The current state of higher education under pandemic conditions is characterised. Features of Google Classroom web service have been identified. The methodical development for lecturers of higher educational establishments "Potential of using Google Classroom web service" is described. Criteria and levels of using Google Classroom web service are defined. Initial diagnostic of the levels of using Google Classroom web service was conducted. During the diagnostic was revealed that most respondents have insufficient levels of theoretical knowledge and practical skills. In order to increase the level of using Google Classroom web service, the methodological development was implemented. As a result, positive dynamics in the levels of theoretical knowledge and practical skills of using Google Classroom web service was revealed. The effectiveness of the obtained results was confirmed by Fisher's criterion.

Keywords

Google Classroom web service, cloud technologies, educational process, distance education, higher educational establishment, pandemic, COVID-19, lecturers of higher educational establishments

1. Introduction

The pandemic of 2020 is a global phenomenon of the 21st century caused by the COVID-19 viral spreading [1]. The pandemic of 2020 has affected absolutely all forms of human interaction and cooperation [2, 3, 4, 5, 6], including higher education [7, 8, 9, 10, 11]. On the one hand, higher education is facing new challenges, and on the other, new opportunities have emerged. Due to introduction of quarantine in Ukraine, the educational process in higher educational establishments is carried out remotely [12, 13]. Some higher educational establishments have successfully practiced distance learning before quarantine [14, 15, 16, 17]. However, most of the main activities were carried out in full-time and/or part-time study mode. Under such conditions of the extreme mode of the higher education system operation during the first months of the pandemic web services for education became especially relevant.

The relevance of using web services in higher education lies in the fact that information technologies not only serve as a tool used to solve specific pedagogical issues, but also add variety to the forms of organization of the educational process, promote the formation of skills of independent learning, stimulate the development of the educational process itself.

A free web service for distance learning Google Classroom combines the following services: Drive, Docs, Gmail, Calendar, etc. and is one of the effective means of solving educational issues [18, 19, 20, 21].

The purpose of the research is to substantiate theoretically and prove experimentally the effectiveness of the methodological development for lecturers of higher educational establishments "Potential of using Google Classroom web service".

According to the purpose of the research the following objectives are defined:

1. To analyse researches and publications on the defined issue.
2. To describe the current state of higher education under pandemic conditions.
3. To identify the features of Google Classroom web service.
4. To describe the methodological development for lecturers of higher educational establishments "Potential of using Google Classroom web service".
5. To define the criteria and levels of using Google Classroom web service.
6. To prove experimentally the effectiveness of the suggested methodological development.

Research methods:

- general scientific methods: analysis, synthesis, comparison, systematization and generalization for studying the works of foreign and domestic scientists, legislative support, etc.;
- specific scientific methods: interpretations to determine the basic concepts of the study, prognostic analysis to determine the prospects for further researches;
- empirical methods: a conversation was used to identify problems in work of lecturers of higher educational establishments related to using Google Classroom web service under pandemic conditions; a survey was used to identify levels of using Google Classroom web service; method of pedagogical experiment was used to study the effectiveness of the described and implemented methodological development for teachers of higher educational establishments "Potential of using Google Classroom web service";

- statistical methods: Fisher's criterion is used in order to prove the reliability of the obtained results.

2. Theoretical background

2.1. Analysis of researches and publications on the issue

In order to substantiate the relevance of the study, the authors studied scientific papers that reveal general aspects of using information environments in education, building a single public environment for providing electronic educational services, creating a system of electronic monitoring of the educational process, etc.

The conceptual principles of the cloud-oriented environment at different levels of education are reflected in the researches of Olga V. Bondarenko [22, 23, 24, 25, 26, 27, 28, 29], Valerii Yu. Bykov [30], Olena H. Kuzminska [31, 32, 33], Maiia V. Marienko [34, 35, 36], Oksana M. Markova [37, 38, 39, 40, 41, 42], Nataliia V. Morze [43, 44, 45, 46, 47, 48, 49], Yurii V. Tryus [50], Mariia P. Shyshkina [51, 52, 53], whose works are devoted to the theoretical foundations of designing and using cloud technologies in education. The authors pay considerable attention to the trends of web services and identify advantages and disadvantages of their use in education.

Thus, Mariia Shyshkina and Maiia Popel [54, 55] defined the concept of "cloud-oriented environment" of an educational establishment, identified the main stages of its formation, analysed the content of educational and scientific components of the cloud-oriented educational and scientific environment. Under cloud technologies, most scientists consider an available way to access external computing information resources in the form of services provided through the Internet. A network of interconnected remote servers is a so-called "cloud".

Tetiana A. Vakaliuk [56] and Kateryna P. Osadcha [57] developed methods of teaching with the use of cloud technologies; prospects for introduction of cloud computing into educational establishments are reflected in the works of Lesya V. Bulatetska [58], Ihor V. Hevko [59], Nataliia V. Valko [60], Hanna B. Varina [61]; Nataliia V. Soroko [62, 63] researched a foreign experience in using cloud computing for teachers' professional development; Nadiia P. Kozachenko [64], Iryna S. Mintii [65, 66, 67] and Pavlo P. Nechypurenko [68] consider the issues of creating training courses in the Moodle environment on the basis of cloud computing technology and the possibility of their implementation in the educational activities of pedagogical universities.

Creating a cloud-oriented learning environment of an educational institution is examined in the works of Svitlana H. Lytvynova [69, 70, 71, 72, 73, 74], who suggested the concept of "cloud-oriented learning environment", identified its components, objects, technologies of interaction, distinguished levels of interaction within such environment, as well as stages, methodological approaches, development principles and developed a methodology for designing a cloud-oriented learning environment.

It is worth noting that most scientists define cloud computing as tools to support learning, i.e. interpret this notion according to the definition suggested by experts from the US National Institute of Standards and Technology, who noted that cloud computing is a model of providing convenient access according to the user's need, regardless of its location and time of access to computing resources (networks, servers, storage systems, databases, services, etc.), which

can be provided quickly and with minimal efforts of management and interaction with the IT services provider.

The expediency and necessity of ICT tools introduction on the basis of cloud technologies in Ukraine is declared at the state level and reflected in the national project "Open World" (2010–2014), in the Strategy of Information Society Development of Ukraine for 2013–2020, which provides the formation of modern information infrastructure based on cloud technologies.

Thus, the attention of both researchers all over the world researchers of web services is focused mainly on the issues of forming cloud-oriented informational and educational, learning, educational and scientific environment of higher educational establishments, creating information space, innovative educational IT environment of educational establishments based on Microsoft Office 365 cloud services as tools for organizing the educational process.

However, the potential of Google Classroom web service for lecturers of higher educational establishments under pandemic conditions has not been explored. Thus, the urgency of the chosen issue, its insufficient theoretical development and inconsistency of practical implementation in higher educational establishments under pandemic conditions determined the choice of the topic of the research.

2.2. Characteristics of the current state of higher education under pandemic conditions

Today education is becoming a continuous process that allows a person to navigate information flow, to feel comfortable in the information society, to adapt easy to continuous technical innovations.

According to Olena Hrashchuk, "education is a strategic resource of socio-economic, cultural and spiritual development of society, improvement of the welfare of population, ensuring national interests, strengthening international prestige, forming a positive image of the country, strengthening its competitiveness on the international stage, creating conditions for human self-realization" [75].

The study "Rethinking Education in the Digital Age", conducted by the European Parliament in 2020, states that the rethinking of education in the digital age should become a central issue for modern politicians for two reasons:

- firstly, only education can form a skilled workforce, ready for future profession and changeable labour market. Therefore, rethinking education in the digital age is a prerequisite for future global competitiveness of Europe;
- secondly, only education can provide the preconditions for social integration and equality; participation of the European citizens in digital democracy [19].

Thus, rethinking education in the digital age is important for protection the European values such as equality, democracy and the rule of law.

In 2019, the staff of Ivan Zyazyun Institute of Pedagogical and Adult Education (Ukraine) conducted an online questionnaire of lecturers concerning the use of network technologies in professional activities. The results of the questionnaire showed that all respondents (185 people (100%)) use a personal computer (PC) and the Internet in their professional activities. However, 7.0% of respondents use mobile devices that do not have the ability to connect to the

Internet, which significantly limits the work with files located in cloud storage. The majority of respondents (85.9%) work on a PC with the Windows operating system, and 14.0% work on two or more PCs with different operating systems. Five applications of the seven listed are used by respondents in professional activities: Word (100%), PowerPoint (78.3%), Excel (71.3%), OneDrive (21.6%), OneNote (7.0%)). Respondents do not use Sway and Outlook applications. 14.3% of respondents use other applications. It should be noted that the questionnaire involved people from 21 and over 60 years. This means that using digital technologies is relevant in professional activities regardless of age.

Digital technologies have become especially relevant during the pandemic, as there were some difficulties with the introduction of distance learning.

The first problem is related to the technical support of both lecturers and students. Lack or improper state of computer equipment, the Internet (for example in rural areas) make it impossible to apply distance education. Another problem is software. Even with necessary technical equipment, software installation for distance education is difficult for users. These problems need to be addressed as a matter of priority. But, as it turned out, these are not the main problems of distance education. In our opinion, the problem of methodical training of lecturers for distance education under pandemic conditions is also important. Distance education requires special training of lecturers because teaching methods that are suitable for full-time education are not suitable for distance one. Therefore, often all classes are held in the form of a monologue by lecturer and independent work by a student. Resolving this issue is an urgent problem.

However, for teachers, distance education has a number of advantages and they are quite significant. This is an opportunity to improve skills online (saving time and money, especially when it comes to foreign internships, training, etc.), an opportunity to reach a larger audience during conferences, webinars, etc., an opportunity to hold joint meetings of departments, councils, etc. and quickly resolve organizational and other issues. In addition, the introduction of cloud technologies into educational process of university provides: efficient use of educational space, as there is no need to allocate separate and specially equipped premises for traditional computer classes; qualitatively different level of gaining modern knowledge, students have an opportunity to be involved in educational process at any time and in any place, where there is the Internet; an ability to create quickly, adapt and replicate educational services during the educational process; an opportunity for students to provide feedback to a lecturer by evaluating and commenting on the offered educational services.

As a result, digital technologies have become an integral part of the higher education system. The technical capabilities of digital technologies together with the creative and intellectual potential of lecturers allow to raise education to a new level that meets the demands of modern society.

2.3. Features of Google Classroom web service

Today, lecturers and students have access to many competing sources: digital educational resources, curricula, online courses and various online services, etc. In our study, we suggest analysing the potential of Google Classroom web service.

Google Classroom is a unique Google application designed specifically for educational pur-

poses. Google Classroom web service performs functions of methodological, software, technical, informational and organizational environment.

The active use of Google Classroom, which has existed since 2014, began at the time, when educational establishments on a nation-wide and world-wide scale were forced to stop the process of face-to-face learning. The statistics on using Google Classroom during coronavirus are quite convincing. According to BBC News, as of March 30, 2020, the number of downloads was more than 50 million, but until March 2000 Google Classroom was not even in the top 100 educational applications.

The main goal of Google Classroom service, which has an interface in 38 languages, is to optimize and ensure the efficiency of the educational process. Google Classroom web service does not require special software. The attractiveness of this service is also its non-commercial basis and lack of advertising.

In Google Classroom, lecturers can easily create and check tasks, mark, comment and organize effective communication in real time or in distance learning mode. In addition, Google Classroom provides a user-friendly interface for creating and managing training courses, organizing project activities and has great educational potential.

We consider that the main advantages of the cloud technology are high speed data processing, availability from any personal device, data storage on the network, including Google Drive, great potential, educational process management, control and correction of results, data accumulation, etc. It is important to have access to our own materials from any place in the world, to keep information up-to-date, and to expand the opportunities for learning at home.

However, for objectivity of valuation of Google Classroom web service capabilities one should notes its disadvantages. The main disadvantage of the service is the constant need to be on the Internet to work as well as inconvenience of creation of test tasks; lack of ability to check oral assignments (in particular, in the process of learning a foreign language, where oral speech is one of the key skills); lack of real-time communication and lack of a webinar room; lack of possibility to join participants of educational process after the beginning of courses; lack of opportunity to create separate groups within one course; lack of electronic gradebook in the open version of Google Classroom (for corporate users this feature is provided); limited number of participants – 250 people.

In general, all available technical capabilities of the service provide the formal side of learning, while the creative and intellectual potential of a lecturer and a student often remains undiscovered.

2.4. Methodical development "Potential of using Google Classroom web service" for lecturers of higher educational establishments under pandemic conditions

The Google Classroom web service is a tool for organizing distance learning, project activities in higher educational establishments. All one needs to work with Google Classroom is to connect to the Internet or a browser. Lecturers and students of higher educational establishments, who have personal Google Accounts can use Classroom for free. The only condition is to register your own mailbox in Gmail and get an access key. Google Classroom supports new versions of major browsers depending on their updating. There are no problems with access from mobile

devices based on Android and Apple iOS that is especially convenient for most students, who actively use smartphones. The service is secure because there is no advertising and students' materials and information are not used for advertising purposes.

With the help of Google Classroom, a lecturer can create training courses and add students, share educational and methodological materials, create tasks, check the level of students' knowledge, organize thematic discussions. After activating a function "create class", a lecturer must set up the basic settings: class name; course description; room, etc. At this stage, each class is given a unique code by which students can find it and gain an access.

The next step is to set the options that will be provided for students. Depending on the form of students' activity provided by a lecturer within the class, one can give them an opportunity to publish posts, make comments, etc. Everyone, who joins the class is displayed in the list of students. However, there is a certain disadvantage, which is that students use nicknames instead of real names in the registration form. That is why sometimes it is difficult to find a student on the list. This disadvantage can be easily corrected by creating a culture of business communication, in which using fictitious names is inappropriate. At the end of the semester, one can delete the list of students and create a new one, the content of the course remains.

When working with a web service, a lecturer should pay attention to the sections "Stream", "Classwork", "People", "Marks". The Stream tab in the Google Classroom app displays tasks and posts related to the course (discipline). To work with the task, a lecturer can give brief instructions on how to work with it, topic, deadline, attach a task template (add from Google Drive) and choose it for students. The algorithm of actions, when "creating a task" is the following one.

On the classroom desktop, we choose "Classwork" section. Users will see a list of tasks, which is marked as "+ Create": assignments, quiz assignments, questions, material, reuse post, topic. It is recommended to group objects in this feed by topic. Also, in the application there is a possibility of their arrangement in a convenient order for lecturers and students. For example, a lecturer plans to add educational content (lecture). He can easily download it. Students will receive a notification in the form of a message about updates and access to educational materials.

When creating a task – select the buttons "Create" "Assignments".

A window will open, in which you need to enter the title of the task, instructions for its performance, add material or create it.

When you click on the button "Add", there is a transition, which suggests a location of the folder for material attachment: from Google Drive, Links, File, YouTube.

The user can select the button "+ Create", which suggests several options for creating a task in the form of: Docs, Slides, Sheets, Drawings, Forms.

After receiving an assignment, a student processes it, selects the section "Perform", adds or creates a document and opens it. The name of the opened file will indicate name, surname of the student and the title of the assignment, which a lecturer has prepared in advance. The student answers the assignments, performs test tasks and clicks the button "Mark as done". If the whole algorithm is performed correctly – the status "Submitted" appears, after checking – "Checked" and "Marked", for example: 4/5, 90/100, 186/200.

At the same time, lecturers have an opportunity to mark, comment and organize effective communication in real time or in distance learning mode. Here is an example of using Google Classroom in classes on the subject "Pedagogical Innovation Studies", which is studied by higher

education students on specialty 013 Primary Education of Vasyl Stefanyk Precarpathian National University. Since the educational course is aimed at forming a creative personality of the future teacher, who is professionally developing within the conditions of new Ukrainian education, it is necessary to teach future professionals to navigate in different systems, technologies, methods, adequately evaluate them, make optimal choices in the way of implementing author's innovative technologies in the educational process of the New Ukrainian School. For example, we suggest students to write argumentative essays on educational topics ("Morning Meetings at the New Ukrainian School: what is it and for what reason?", "Development of critical thinking of students in the context of interactive learning", "In Order to Think Critically, Students Must:...?"; essays ("Educational Establishment of My Dream", "Online Education: Pros and Cons"), prepare scientific reports ("Digital Literacy of Primary School Teachers", "Elements of STEM-Education in Primary School"), make a plan of integrated lessons. Students also receive links to videos (video lessons) posted on YouTube.

Example of assignment with link to videos:

Task: Watch the video. Answer the questions:

- Is the teacher's algorithm effective during explaining new material?
- What forms of work does the teacher use in class?
- Are the used forms of work effective during studying the topic?
- Has the goal of the lesson been achieved?

This allows to visualize a particular material, a student not only processes the content, as when working with the text, he can analyse an information context, an emotional presentation and perception of information.

The described experience of approbation of the suggested methodical development proves that Google Classroom web service allows to use in educational process actual video materials by placing assignments with a link to video. This contributes to the visualization and individualization of the educational process. Communication becomes more productive, because students can view topic materials, videos and photos before the lecture. The most important is the fact that implementation of the development promotes more effective communication between lecturer and students, does not require special conditions for studying (the use of multimedia classrooms, additional equipment), and exchange of comments and questions becomes possible before the meeting and motivates students to classroom activities.

Using Google Classroom web service during practical classes allows a lecturer to make interactive control over tasks performance. A combination of opportunities to comment on tasks and the service "Announcements" simplifies students' work with individual assignments. Google Classroom simplifies task verification. Google Classroom allows one to make student's gradebook as a separate Google Docs document. An additional convenience of using Google Classroom in the learning process is that a lecturer can specify deadline for task performance, providing higher scores for its timely completion and lower for late one.

It is advisable to pay attention to the fact that working in Google Classroom is an important requirement to place materials on topics, blocks, modules. Experience shows that insufficiently structured information only overloads students and does not produce the proper learning effect. The term of the task is indicated by the lecturer, but the service itself controls timely/untimely performance.

2.5. Criteria and levels of use of Google Classroom web service

The described above methodical development was suggested to lecturers of The National Pedagogical Dragomanov University (Ukraine), National Aviation University (Ukraine) and Vasyl Stefanyk Precarpathian National University (Ukraine) for use in professional activities under pandemic conditions. Since the quality of using Google Classroom web service is an important issue in the professional activities of lecturers, it was considered necessary to determine the criteria for effective using Google Classroom web service.

The criteria determining allows one to obtain qualitative and quantitative indicators of the studied process or phenomenon. A criterion is a feature on the basis of which evaluation, distinguishing or classification are carried out. Only in the presence of criteria it is possible to draw a conclusion about desirable, the best results of pedagogical influence.

Taking into account the features of Google Classroom web service, we have defined the following criteria for its effective use: the level of theoretical knowledge about Google Classroom web service and the level of practical skills of using Google Classroom web service.

Theoretical knowledge about Google Classroom web service. Studying the theoretical foundations of using Google Classroom web service will help to form a holistic view of the essence of this web service and determine necessary conceptual and categorical apparatus. Theoretical knowledge of Google Classroom web service is the basis for effective professional practice that can be properly directed, updated, and improved. Thus, in order to involve use of Google Classroom web service in professional activity of lecturers, it is necessary to comprehend it in theoretical categories.

The basic knowledge that a lecturer must gain in the process of mastering Google Classroom web service can be combined into two groups: knowledge of the essence of Google Classroom web service and knowledge of the specifics of the educational process using Google Classroom web service.

It is appropriate to determine the level of lecturers' mastering theoretical knowledge about Google Classroom web service using a control method. We consider method of written control, which consists in making a questionary, the most convenient one.

Practical skills of using Google Classroom web service. The effectiveness of lecturers' professional activities depends, among other things, on skills and abilities required for successful use of Google Classroom web service.

The level of use of Google Classroom web service depends on availability of the following skills: the ability to create a Gmail Account, create your own class/course, and invite students to the class; provide students with a class/course access code; publish information in the "stream", i.e. in the information line; download assignments (or create a test); check tasks and mark, etc.

The defined criteria of the effectiveness of using Google Classroom web service (theoretical knowledge of Google Classroom web service; practical skills of using Google Classroom web service) made it possible to distinguish their levels.

It should be noted that there are at least two main classifications to determine expressiveness of particular object in pedagogy: by number of features and level of development. The latter classification is characterized by differences not only in components but in their degrees of expression (degrees of formation).

This classification is based on matrix analysis (a method of studying relationships using

matrix models, which is based on the mathematical theory of matrices). The essence of this analysis is that from a set of factors, parameters and other important characteristics of the system, the two most important are selected, and the characteristic of the system that should be determined, is considered as a function of these two variables. Using two variables, one can clearly present the result of the analysis in the form of a table (matrix) or in graphical form.

Thus, the effectiveness of using (EU) the Google Classroom, as we noted, is determined by two criteria: theoretical knowledge of the Google Classroom (TK); practical skills of using Google Classroom web service (PS). Thus, the efficiency of using Google Classroom web service corresponds to formula 1.

$$\text{EU Google Classroom} = \text{TK} + \text{PS} \tag{1}$$

Kindly note that each criterion has the indicators, which are described above. Therefore, these indicators are a priori included in the criteria. Further, for each of these two parameters, we introduce two degrees of expressiveness that are levels of use of the Google Classroom web service (insufficient and sufficient).

Thus, having two criteria for effectiveness of using Google Classroom web service (theoretical knowledge about Google Classroom web service and practical skills of using Google Classroom web service) and two degrees of their expression (insufficient and sufficient) one gets 2×2 matrix and, accordingly, 4 options of effectiveness of using Google Classroom web service:

1. Sufficient level of theoretical knowledge and sufficient level of practical skills.
2. Sufficient level of theoretical knowledge and insufficient level of practical skills.
3. Insufficient level of theoretical knowledge and sufficient level of practical skills.
4. Insufficient level of theoretical knowledge and insufficient level of practical skills.

The matrix simultaneously takes into account all possible options for using Google Classroom web service, which provide the presence of two criteria for possible two levels of each criterion.

This matrix allows one to see the prevailing criterion for using Google Classroom web service.

3. Experimental verifying the effectiveness of the methodological development for lecturers of higher educational establishments under pandemic conditions "Potential of using Google Classroom web service"

To prove the effectiveness of the described and implemented methodological development, we used a pedagogical experiment.

The study was conducted on the basis of the National Pedagogical Dragomanov University (Ukraine), National Aviation University (Ukraine) and Vasyl Stefanyk Precarpathian National University (Ukraine), where the methodological development was introduced, and provided three stages:

The first stage is the initial diagnostic of the levels of using Google Classroom web service.

The second stage is introduction of the methodological development for lecturers of higher educational establishments under pandemic conditions "Potential of using Google Classroom web service".

The third stage is control diagnostic of the levels of using Google Classroom web service.

The experiment covered 87 teachers of higher educational establishments.

In order to determine the levels of using Google Classroom web service, the following have been developed:

- a questionnaire to determine the level of theoretical knowledge about web services (in particular Google Classroom);
- a questionnaire to determine the level of practical skills in using Google Classroom web service.

These uniquely designed questionnaires allowed us to analyse the levels of using Google Classroom web service, describe the state of the problem and describe the methodological development for lecturers of higher educational establishments under pandemic conditions "Potential of using Google Classroom web service". For objectiveness during the questionnaire, a representative sample of respondents was formed, a formalized induction procedure was used, and the anonymity of the answers was ensured.

The author's questionnaire for determining the level of theoretical knowledge about web services (in particular Google Classroom) consisted of 10 questions. All questions had multiple choice answers. Two or more correct answers had to be chosen for certain questions.

For each correct answer 1 point was awarded. Then, the total number of points was calculated (5–10 points made up sufficient level of theoretical knowledge; 0–4 points made up insufficient level of theoretical knowledge).

In order to determine the levels of practical skills of using Google Classroom web service, respondents were asked to perform uniquely developed 5 practical tasks. The level of practical skills was assessed as follows: correctly completed two tasks out of five indicated insufficient level of practical skills; three or more correctly completed tasks indicated sufficient level of practical skills.

At the first stage of pedagogical experiment in March 2020, lecturers of higher educational establishments under pandemic conditions were invited to take online entrance diagnostic of the levels of using Google Classroom web service.

Generalized results of determining levels of theoretical knowledge and practical skills of control and experimental groups are presented in table 1.

The analysis of the answers showed that some questions made difficulties for lecturers.

In particular, the majority of 56 lecturers (64.3%) did not know that Google Classroom service can be used for distance education. Almost all respondents – 81 people (93.1%) do not know about possibility of joint teaching with other lecturers in Google Classroom. 65 people (74.7%) cannot provide a complete list of actions that can be performed in Google Classroom. 69 people (79.3%) were confused in task evaluation system. 73 people (83.9%) do not have knowledge of the algorithm for creating tasks in Google Classroom. 58 people (66.6%) are not familiar with the rubrics.

Table 1

Levels of theoretical knowledge and practical skills at the stage of entrance diagnostic

Criterion	Level	Points	CG (46 people)	EG (41 people)	Total (87 people)
Theoretical knowledge	Sufficient	5-10	18 (39.1%)	16 (39.0%)	34 (39.0%)
Theoretical knowledge	Insufficient	0-4	28 (60.9%)	25 (61.0%)	53 (61.0%)
Practical skills	Sufficient	5-10	11 (23.9%)	8 (19.5%)	19 (21.8%)
Practical skills	Insufficient	0-4	35 (76.1%)	33 (80.5%)	68 (78.2%)

In terms of practical skills, the majority of respondents 82 people (94.2%) are able to create Gmail Account. However, 59 people (67.8%) could not create their own class/course. Accordingly, most respondents were unable to perform other tasks properly.

Thus, the majority of respondents, namely 53 people (61.0%) do not have enough theoretical knowledge to work with Google Classroom service. And only 34 people (39.0%) have sufficient level of theoretical knowledge. A similar situation is with practical skills because 68 people (78.2%) have insufficient level of practical skills and 19 people (21.8%) have sufficient one.

Based on the matrix and the obtained results, you can see minimum and maximum values (figure 1). Thus, we can conclude that only 19 people (minimum value) out of 87 effectively use Google Classroom service and 68 people (maximum value) do not have enough knowledge and skills to use the service effectively.

Figure 1: Matrix of effectiveness of using Google Classroom web service

The next stage of the experiment involved the introduction of the methodological development

for lecturers of higher educational establishments under pandemic conditions "Potential of using Google Classroom web service". To this end, the authors of the publication conducted online webinars for lecturers, where the methodological development was presented. Each participant of the webinar (41 members of the experimental group) received a detailed description of the methodological development in PDF in order to be able to repeatedly return to it in the process of mastering the specified web service. The second stage lasted for several months (April – June 2020).

At the last stage of the experiment (in September 2020), the control diagnosis of the levels of using Google Classroom web service was performed. Diagnosis was carried out using the methodological tools used at the first stage. The questionnaire covered teachers of control and experimental groups.

The results of determining the levels of theoretical knowledge and practical skills of control and experimental groups at the stage of control diagnosis are presented in table 2.

Table 2
Levels of theoretical knowledge and practical skills at the stage of entrance diagnostic

Criterion	Level	Points	CG (46 people)	EG (41 people
Theoretical knowledge	Sufficient	5-10	21 (45.7%)	32 (78.0%)
Theoretical knowledge	Insufficient	0-4	25 (54.3%)	9 (22.0%)
Practical skills	Sufficient	5-10	16 (34.8%)	34 (82.9%)
Practical skills	Insufficient	0-4	30 (65.2%)	7 (17.1%)

The results of the questionnaire at the stage of control diagnosis in the experimental group revealed positive changes in levels of theoretical knowledge and practical skills of using Google Classroom web service. In particular, the number of people with sufficient level of theoretical knowledge increased from 16 to 32 people out of 41. The number of people with sufficient level of practical skills also increased significantly from 8 to 34 people.

However, the results did not change significantly in the control group. The number of people with sufficient level of theoretical knowledge increased from 18 to 21 people. The number of people with sufficient level of practical skills increased from 11 to 16 people. It is assumed that the respondents of the control group had chosen other web services to organize the educational process under pandemic conditions or communicated with students via e-mail.

The dynamics of changes in levels at different stages of diagnosis is summarized in figure 2.

To prove the effectiveness of the obtained results Fisher's criterion was used.

According to the indicators of entrance stage diagnosis, the number of respondents in the experimental group with sufficient level of theoretical knowledge and practical skills in average $(16 + 8) : 2 = 12$ people 29.26% of 41 people (100%). At the control stage of diagnosis, the number of respondents in the experimental group with sufficient level of theoretical knowledge and practical skills was $(32 + 34) : 2 = 33$ people (80.48%) out of 41 people (100%). This dynamics in the levels made it possible to formulate two hypotheses:

H_0 – The number of respondents in the experimental group with sufficient level of theoretical knowledge and practical skills at the entrance stage of diagnosis is less than at the control stage of diagnosis. This allows one to consider that the suggested and implemented methodological
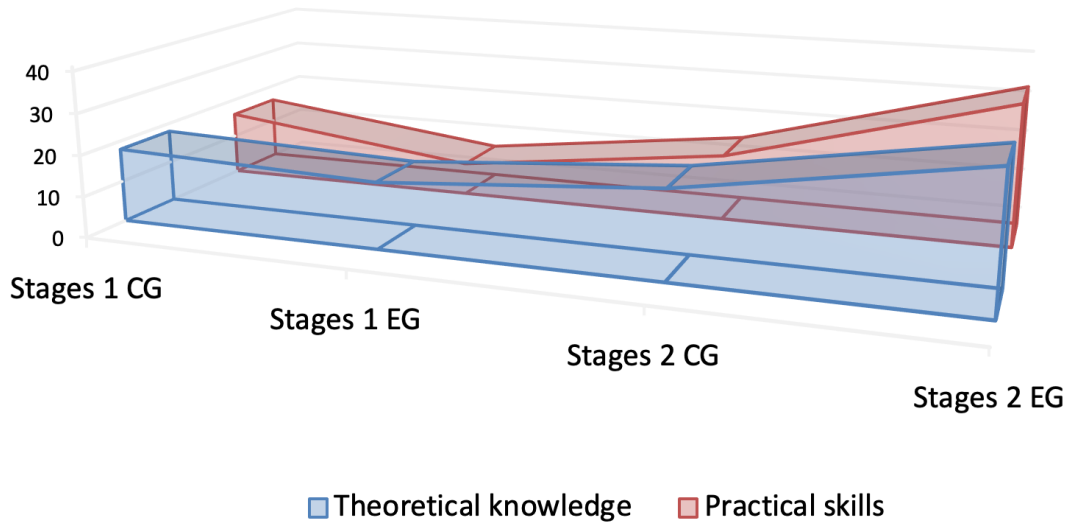
Figure 2: Dynamics of changes in the levels of theoretical knowledge and practical skills of using Google Classroom web service at different stages of diagnosis

development is effective.

H_1 – The number of respondents in the experimental group with sufficient level of theoretical knowledge and practical skills at the entrance stage of diagnosis is the same or more than at the stage of diagnosis. This allows one to consider that the suggested and implemented methodological development is not effective.

Using formula 2 calculate the empirical value φ^*_{emp}:

$$\varphi^*_{emp} = (\varphi_1 - \varphi_2)\sqrt{\frac{n_1 n_2}{n_1 + n_2}},$$

in which: φ_1 – the angle corresponds to the greater % of the part; φ_2 – the angle corresponding to the smaller % of the part; n_1 – quantity of observations in sample 1; n_2 – quantity of observations in sample 2.

Thus, get the empirical value: $\varphi^*_{emp} = 4.89$.

Determine the critical value of φ^*, which corresponds to the accepted in psychology levels of statistical significance:

$$\varphi^*_{cv} = \left\{ \begin{array}{l} 1.64 \ (\rho \leq 0.05) \\ 2.31 \ (\rho \leq 0.01) \end{array} \right.$$

$$\varphi^*_{emp}(4.89) > \varphi^*_{cv}(2.31).$$

Since φ^*_{emp} is in the value range, we can conclude that hypothesis H_0 has been confirmed. The number of respondents in the experimental group with sufficient level of theoretical knowledge and practical skills at the entrance stage of diagnosis is smaller than at the control stage of diagnosis. This allows one to consider that the suggested and implemented methodological development is effective.

4. Conclusion

The COVID-19 pandemic, one way or another, has affected all areas of human life. Higher education is one of the areas that was significantly affected. In an extremely short period of time, higher education establishments were forced to switch to distance or blended learning. As a result of quarantine measures caused by the spread of the COVID-19 pandemic, there was a need for a radical change in forms and methods of learning, methods of interpersonal communication and system of organization of the educational process. Under the conditions of pandemic the following aspects of using cloud technologies in the educational process of the universities became of great importance: information and training portals, which include the joint work of lecturers and students on educational projects; personal account of a teacher and a student; creation of new platforms; webinars conducting.

One of the effective and high-quality means of solving educational issues in quite extreme conditions is Google Classroom web service.

Thus, Google Classroom web service, as any cloud technology used in the educational space, has its advantages and disadvantages. The methodical development "Potential of using Google Classroom web service" described by the authors and implemented in higher education establishments allows one to effectively use Google Classroom web service in the educational process. Google Classroom should be used in conjunction with other applications, for example, Google Meet. In particular, it is recommended to conduct online lectures and online workshops (seminars) in Google Meet and to check students' knowledge (tests, written practice, etc.), upload lectures, educational materials etc. in Google Classroom. Google Classroom web service under pandemic conditions is used as the main environment for education, whereas before the COVID-19 pandemic, Google Classroom web service was only a supplement (one of the teaching methods) to distance education.

Based on the defined criteria (the level of theoretical knowledge about Google Classroom web service and the level of practical skills of using Google Classroom web service) and their levels (insufficient and sufficient), a matrix of efficiency of using Google Classroom web service was built. The matrix allowed us to see the minimum indicators of the criteria, which were further developed with the help of the author's methodological development. The revealed positive dynamics in the levels of theoretical knowledge and practical skills of using Google Classroom web service confirmed the effectiveness of the obtained results.

The research does not cover all aspects of the problem. Further researches should be focused on the following issues: problem of the impact of Google Classroom web service on students' achievements; foreign experience in preparing lecturers to use Google Classroom web service; problem of improving and filling disciplines with the help of Google Classroom web service etc.

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