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Improvement of the Learning Process: the Experience of Introducing a Cumulative System in Assessing Student Learning Success in Distance Learning

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Abstract

In today's world, in the context of developing digitalization, difficult epidemiological conditions due to the COVID-19 pandemic, and the recent quarantine restrictions, the educational process has been predominantly distant or independent for students. In this light, there arises the need to research and apply innovative methods for the assessment of learning success in distance learning. The purpose of the article was to develop a system for evaluating the success of students' educational activities in an online learning environment. The paper reviews the current state of online learning under quarantine restrictions due to COVID-19 and the features of this learning process for all its participants. The study proposes a system for the assessment of learning outcomes, the core idea of which is the presence of two primary parts of assessment: compulsory (aimed largely at the assessment of knowledge and skills) and elective (providing for the expression of creativity and the development of a personal development trajectory). The results of a pedagogical experiment support the research hypothesis that the establishment of an assessment system based on students' conscious construction of their total number of points for the academic discipline considerably raises the level of motivation and the quality of learning.

Keywords: online learning, students, teachers, grading system, learning success, learning motivation.

1. Introduction

With the advent of the COVID-19 pandemic, universities in many countries had to considerably reorganize the learning process to minimize the potential negative consequences of

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the pandemic. Higher education institutions were forced to adapt to the conditions that demanded a transition from traditional in-person training to online learning (Engzell et al., 2020). In the period of quarantine restrictions related to COVID-19, online learning using digital technology became the predominant method of organizing university educational activities.

Researchers argue that the new paradigm of online learning relies on the theory of constructivism, which suggests that the learning process assumes the student's active participation in the educational process. Under this approach, the student not merely receives and accumulates knowledge but uses critical thinking, develops their own position, searches for creative ways to solve problems, and constructs knowledge independently or in a team with other students. In addition, this pedagogical approach enables students to decide on the relevance and validity of the data in the flow of information received (Khribi et al., 2009). All these characteristics imply the organization of a learning process the active center of which is the student themselves and their striving for self-development, self-discipline, and self-realization (Joksimović et al., 2015). We proceed from the conviction that before the introduction of online technologies, many students understood their responsibility for their learning outcomes and assumed an active position grounded in the development of social competence and self-organization. However, with the development of the pedagogical approach in which the learning process is centered around the student, the introduction of forms of training that utilize digital technology allows interested students to achieve better learning results. The striving for new achievements and the joint creative work of the teacher and the student in performing learning tasks, as evidenced by research (Picciano, 2017), have majorly changed both in content and outcomes.

For the performance of learning tasks, universities introduce into the educational practice both synchronous and asynchronous online learning courses. Synchronous courses allow students to attend them online in real time in accordance with the schedule provided by their universities. Asynchronous courses, in turn, take a flexible approach, enabling students to create an individual learning schedule and determine their learning hours with consideration of their specific individual needs. With this form of learning, students can develop their sense of responsibility and self-discipline, which are vital components in future professional practice (Keskin, Yurdugül, 2020). Asynchronous learning gives students the opportunity to work with educational materials and complete assignments at their own pace, without the limitations of a fixed schedule (Arthur-Nyarko et al., 2020). For example, this option is suitable for students, who are limited in time due to a busy work schedule or wish to study separately rather than in an academic group (Zaheer, Munir, 2020) if the curriculum allows it. Researchers note that having the opportunity to work in a comfortable environment with free access to the Internet, students consider this type of learning the most appealing and efficient (Ferraro et al., 2021).

In Russia, the quarantine restrictions put in place in 2020–2022 due to the COVID-19 pandemic (Iakobiuk, 2020) necessitated the transformation of the traditional education system. As in most countries, Russian schools and universities quickly switched to online learning platforms to ensure the accessibility of education. As the situation evolved, however, blended learning gained in popularity and became more convenient. The blended learning approach combines online classes with face-to-face classroom instruction, so it was viewed as a balanced and efficient way to mitigate the issues associated with the pandemic while ensuring that students remained engaged and had access to a quality education (Podlesek, Kavcic, 2021). Furthermore, according to students themselves, this form of training gives the opportunity to rationally plan attendance in courses that they cannot attend in full due to the epidemiological circumstances faced (Mohammad AlHamad, 2020). That notwithstanding, students attach great importance to communication with the teacher and the academic group, as this environment gives students the opportunity to actively participate in discussions, ask questions, seek clarification, and collaborate within the team (Cao et al., 2020). This aspect of group activity allows the student to gain greater motivation for self-improvement, although it can also have the opposite effect. Students may experience a decrease in motivation if they consider their own efforts insignificant compared to the achievements of their peers (Zhang, Lin, 2020).

An obvious advantage of blended learning is the ability to divide the learning process into theoretical and practical components. Lectures, seminars, and webinars on certain subjects are held online, while laboratory work, applied research, and practical classes can take place in person, considering all quarantine restrictions and using the necessary personal safety items (Ocak, 2011).

Thus, we come to the conclusions that allow us to identify the key results achieved in the period of active implementation of online learning in universities, the practices that universities should preserve in their educational practice, and the issues that need to be solved to improve the efficiency of online learning.

1. Active introduction of online learning has helped teachers and students to master and apply information competence and be active participants in the virtual educational process (Keengwe, Georgina, 2012). By virtue of online learning, students do not necessarily have to follow or use specific methods or approaches to completing assignments. In this context, teachers can organize the educational process in such a way that students are able to analyze both the intermediary and final results of their work by going beyond simple grading and providing meaningful feedback (Palmer, Holt, 2008).

2. Online learning has revealed the need for the active development of self-grading and self-organization systems on the part of the student. As students acquire greater freedom of action and the opportunity to make their own decisions on the performance of assignments, the teacher must not only teach a subject but also teach students to identify their strengths and weaknesses in the knowledge of it.

3. Teachers have received additional tools for the assessment of students' performance in the form of individual assignments that reveal the creative side of the personality and testing that gives information about the level of thematic knowledge of the discipline (Alvarez, 2021; Firat, 2016). Case studies (real situations that occur in professional practice), group projects (preferably with role distribution), discussions for the purpose of developing alternative solutions to problems (alternative thinking), and virtual presentations can become the types of educational activities that, on the one hand, develop students' ability to critically evaluate their learning outcomes (Lee, 2020). On the other hand, these activities correspond to the principle of teachers assessing the work of students based on the observation of their behavior in the educational environment and the ways they approach tasks of varying difficulty (Arnò et al., 2021).

4. Teachers need to develop an individual strategy for effective learning based on tasks of varying difficulty and the personalization of teacher-student interaction in the educational process. A critical task is to find a balance between the difficulty of tasks and students' interest, as prolonged negative experiences can diminish motivation and interest in the subject. For this reason, when organizing online classes, the teacher must set specific goals for each assignment, help develop strategies for their completion, provide relevant examples of their performance, make students critically evaluate each of them and draw constructive conclusions at each stage of performing the assignment, and support students' interest (Rapanta et al., 2020).

Proceeding from the above and considering the existing requirements for the system of assessment of students' success in educational activity (objectivity, comprehensiveness, systematicity, efficiency, planning, etc.), the purpose of this article is to develop a cumulative system for evaluating the success of students' educational activities in the context of online education. Such an assessment system can be applied not only under quarantine but also under any other circumstances where the use of online learning is possible. In an era when distance learning may become a necessity for a variety of reasons, such as pandemics and geopolitical issues, it is crucial to have an adaptable and reliable assessment system.

The research hypothesis put forward is that as a result of creating an assessment system based on students' conscious construction of the total number of points received as a result of mastering the academic discipline, the level of motivation and quality of learning significantly increase.

2. Methods

For the purpose of achieving the goal of the study, we used several methods, among which we must primarily emphasize the analysis of psychological, pedagogical, scientific, and methodological literature, the survey method, and a pedagogical experiment.

The leading method of research was a pedagogical experiment, which was conducted in the second semester of the 2021–2022 academic year based on three universities: the Peoples' Friendship University of Russia, Financial University under the Government of the Russian Federation, and Moscow State University of Psychology and Education. One experimental (EG) and one control (CG) group were chosen in each university. The study involved a total of 74 2nd-year students. The experimental and control groups were formed based on the existing academic groups.

The experiment was conducted in several stages (Table 1).

Table 1. Stages of the pedagogical experiment

Stage	Content of the stage
Preparatory	determination of the relevance, goal, objectives, object, and subject of the study
Organizational	preparation methodical support for experimental assessment, selection of participants
Practical	introduction of a cumulative system in the assessment of individual academic disciplines
Summarizing	verification of results (determining the dynamics of indicators of students' success in learning)

The experimental study was conducted as part of the teaching of specialized disciplines in the natural conditions of distance learning with the use of the Moodle distance learning system. Being a well-recognized learning management system (LMS), Moodle offers several functions that simplify distance learning, which makes it suitable for conducting educational experiments in a virtual environment. Given that the pedagogical experiment was conducted in three separate universities, it was important to use a reliable and scalable platform able to satisfy a variety of needs. Moodle, with its customizable features, allows faculty to create and manage courses, grades, and communication tools, providing uniformity across institutions. In addition, the system's ability to support a significant number of users simultaneously facilitated the smooth participation of 74 2nd-year students from various academic groups.

Structurally, the disciplines consisted of 10 topics and, according to the working curriculum, had the following distribution of hours: lectures – 20 hours; practical classes – 20 hours; seminars – 20 hours.

Accumulation of points within each topic was carried out by means of the system developed as part of this study, which included two constituent parts of assessment: compulsory and elective. The compulsory component was comprised of the following components (Table 2).

Table 2. Accumulation of points for the compulsory part of the learning assessment system

Task	Maximum score
Results of working with the lecture (Moodle)	3
Express control on the results of the study of a topic	3
Performance of a practical assignment	5
Participation in a seminar class (at least one report)	5

The elective part assumed students chose from the following types of tasks (Table 3).

Table 3. Accumulation of points for the elective part of the learning assessment system

Task	Maximum score	Conditions of completion during the semester
Reports with the use of visual aids (own infographics, presentations)	5	No limitations
Organization and implementation of a practical/seminar class	5	On the topics of the discipline
Execution of a learning project	8	Topics are approved by the teacher
Development of visual aids on the topics of the discipline (creation of video clips)	8	Topics are approved by the teacher
Writing an article/report abstract	10	In accordance with the terms of the conference

Success in learning was determined using the formula: (number of “excellent” grades + number of “good” grades x 0.64 + number of “satisfactory” grades x 0.36 + number of “passing” grades x 0.16 + number of “not passing” grades x 0.08) x 100 %/total number of students.

Subsequent processing of the results of the pedagogical experiment was carried out using mathematical statistical methods. The task was to detect differences in the distribution of a certain attribute (learning success) when comparing two empirical distributions. Pearson's χ^2 criterion was used for this purpose. The scale of measurements had two categories ("successful" and "unsuccessful"), hence, the number of degrees of freedom $\nu = 1$.

Null hypothesis H_0 : there are no differences in learning success between the CG and EG groups.

Alternative hypothesis H_1 : there are significant differences in learning success between the CG and EG.

3. Results

Prior to the introduction of the proposed assessment system, learning success in the EG and CG was analyzed for the previous semester. The results showed that the two groups were almost identical in success indicators (72 and 74 %, respectively). The overall level of quality when compiling the EG and CG scores for the discipline demonstrated results of 85 and 77 %, respectively (Table 4).

Table 4. Comparative analysis of success in learning in the experimental and control groups

No.	Group	Number of students	Learning success, %	
			previous semester	current semester
1	CG	74	74 %	77 %
2	EG	72	72 %	85 %

Table 4 shows that the pedagogical effect in the EG was 13 % in contrast to 3 % in the CG, which proves the pedagogical efficiency of the proposed experimental assessment of learning outcomes.

From the table of χ^2 values for the significance level $\alpha = 0.05$ and the number of degrees of freedom $\nu = 1$ we determined the critical value of the statistic $\chi^2_{crit} = 3.841$. Since the calculated value of $\chi^2 < \chi^2_{crit}$ ($1.494 < 3.841$) before the teaching experiment, i.e., did not fall into the critical region, at the beginning of the experiment the CG and EG were not significantly different in learning success.

Calculation of the χ^2 criterion for the CG and EG after the pedagogical experiment showed that $\chi^2 > \chi^2_{crit}$ ($21.364 > 3.841$). This constituted grounds for rejecting the null hypothesis H_0 . The acceptance of the alternative hypothesis H_1 made it possible to argue that these samples had statistically significant differences.

Given that in the experimental groups student training was performed with the use of the cumulative system of assessment of academic performance under quarantine restrictions, it can be argued to be the factor contributing to higher results. Therefore, the proposed hypothesis can be considered experimentally confirmed.

In addition, we should note the elective tasks chosen by EG students most often (Table 5).

Table 5. The choice of components in the elective part

Indicator	Value
Reports with the use of visual aids (own infographics, presentations)	100 % of EG students
Organization and implementation of a practical/seminar class	20 % of EG students
Execution of a learning project	20 % of EG students
Development of visual aids on the topics of the discipline (creation of video clips)	2 % of EG students
Writing an article/report abstract	30 % of EG students

A survey conducted after the completion of the discipline indicated that 85 % of EG students believed the opportunity to choose disciplines increased the level of motivation. Only 5 % considered this scale too complicated. 90 % agreed that this method of accumulation of points should be actively introduced in the educational process.

Based on the above, it can be concluded that the hypothesis put forward at the beginning of the experiment was confirmed. Survey results demonstrated an increase in students' motivation for educational activity and a positive change in the quality of education.

The proposed compulsory and elective components in the system of assessment are recommended. Their structure is determined by the specifics of the discipline, its goals, etc. However, the general principles of construction of such an assessment system can be applied in teaching both the humanities and exact sciences.

4. Discussion

We would like to emphasize that the proposed assessment system can utilize the cumulative approach to assessing the success of learning.

In particular, with respect to students, this system encourages awareness of the need for systematic work on the implementation of an individual curriculum; for timely evaluation of the quality of one's work in the study of the discipline and completion of all types of academic load before the exam session; for the development of the ability to self-assessment as a means of self-development and self-control; for making adjustments to one's independent work throughout the semester.

However, a considerable part of students in Russian universities are not fully ready for self-education and need a certain degree of control on the part of the teacher, who must explain and demonstrate how to focus on achieving the expected goal and what efforts are needed for it (Weiner, Hurtz, 2017).

Implementation of this cumulative system in the educational process requires particular attention to the increased workload of teachers with respect to grading. This drawback can be compensated for by using an electronic grade book (or, for example, Excel spreadsheets), as well as precise planning and establishing grading criteria (development of a technological map for the discipline).

This raises the need for retraining courses and masterclasses for university research and pedagogical staff to improve their skills and abilities in using online platforms along with their digital literacy (Joksimović et al., 2015), the application of new approaches in learning and teaching (Ferraro et al., 2021), mastery of the skills of working in a digital learning environment, and content and quality-related revision and reorganization of the structure of academic courses and the educational process overall (Keskin, Yurdugül, 2020).

The cumulative system of assessment of academic performance enables research and pedagogical staff to plan the educational process in the discipline and stimulate systematic work of students throughout the academic semester; to increase students' competition in learning to activate the personal factor based on the assessment of the real place the student takes among peers according to their results; to make timely adjustments to the organization of the educational process and the methods and means of teaching used.

The training of research and pedagogical personnel is directly connected to the mastery of new teaching methods that would provide a different perspective on the learning process. Since the beginning of the quarantine restrictions and the transition to online learning, teachers at Russian universities have started teaching in the new format while applying the same methods and tools that are typical for classroom-based learning (Iakobiuk, 2020; Zaheer, Munir, 2020). This resulted in a decline in student interest in the learning process (Podlesek, Kavcic, 2021).

We believe that the content of the discipline taught is a highly important aspect of an online class. In the long run, the teacher must learn to organize the material of the class, define the intermediate and final goal of the course, share with students their expectations (not requirements) for a positive result of joint learning interaction, provide students with all the necessary materials and access to electronic resources and virtual learning environment for students to outline their own perspectives on the study of this discipline, give students information about the list of tasks to be completed by the end of the course and the grading system, and, most importantly, inform students about alternatives for the class in the event of technical problems or other complications that might prevent them from attending the class. The schedule of lessons should be formed in accordance with the needs of the student at a clearly defined time, and the amount of individual work should be monitored and kept at a moderate level.

It is important to note that to simplify online learning, Russian universities have created a virtual learning environment that allows instantly grading students' work and forming informative feedback on the work (Iakobiuk, 2020). This is an interactive online platform that provides

students with information about the content of disciplines, working curricula, plans of practical classes, the list of group and individual assignments, the faculty members teaching the discipline, and the system of assessment of learning outcomes.

Particular attention should be paid to the etiquette of online communication as an inherent component in effective online learning. Online learning forces students to take responsibility for their learning activities. In the absence of direct control from the teacher, students should allocate time to critically analyze each completed task (Mohammad AlHamad, 2020). These efforts will contribute to their concentration, purposefulness, and self-development.

The limitations of the study include the size and age composition of the participants in the pedagogical experiment.

The prospect of further research is the analysis of the prospects of the proposed evaluation system at the present time after the lifting of quarantine restrictions.

5. Conclusion

Blended learning, an educational approach that combines face-to-face classroom methods with online learning, has become a powerful tool in today's educational landscape. This approach is especially relevant in an era marked by technological advances and the need for flexible educational models due to various factors such as pandemics and globalization.

In this light, we conclude that the application of a blended cumulative learning system combines the strengths of both traditional face-to-face and online learning methodologies. Because of its hybrid nature, it caters to a variety of learning preferences and styles, making education more accessible and personalized. Moreover, the application of a cumulative system to a blended learning structure can advance the learning process by providing a more holistic, adaptable, and informed approach to education. This synthesis is likely to lead to better student outcomes and a more efficient educational process.

In addition, blended learning combined with a cumulative assessment system can create a more inclusive learning environment. Some students may excel in face-to-face interactions, while others may thrive in online learning. By using a variety of teaching methods and assessment strategies, teachers can ensure that all students have an equal opportunity to succeed.

As education continues to evolve, it is critical that institutions and educators consider adopting and improving blended learning strategies. Through the adaptation and incorporation of new assessment systems, blended learning can not only deliver better learning outcomes, but also make the learning process more inclusive, dynamic, and effective.

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