The effectiveness of the pedagogical conditions for organizing the educational process using distance educational technologies at the university

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Abstract. This article solves such a significant scientific problem as the identification of effective pedagogical conditions for organizing the educational process using distance educational technologies at a university. The article discusses three options for organizing the educational process at a university: traditional full-time and part-time education, part-time education with partial use of distance learning technologies, completely distance learning. The study defines the following conditions as pedagogical conditions, grouped into 4 clusters: training content, training time, training methodology, training control. The study examines motivation for learning, training level, learning ability, and the strength of learning outcomes (residual knowledge) as criteria that make it possible to compare the effectiveness of certain pedagogical conditions in the implementation of the educational process in traditional and remote forms. To determine the statistical significance of the research results, the Student’s t-test is used. The study was conducted on the basis of the Yelets State University named after I.A. Bunin in the period of 2018-2020. The study involved 3567 students and 440 teachers. The study revealed pedagogical conditions, the effectiveness of which is determined by general pedagogical mechanisms, as well as pedagogical conditions that are effective only for distance education.

1. Introduction

Distance education has been one of the most discussed topics in the field of pedagogical research over the past 30 years. The boundaries of the rhetoric of these studies are quite diverse: from legal to technical, from organizational to didactic spheres. In addition, there are significant differences in terminological terms [1], [2], [3]. Distance education is interpreted both as a variant of extramural or part-time education, and as a learning technology (in this case, the term “distance educational technologies” is used), and as open education, which is an alternative to intramural and extramural forms of education [4], [5]. Obviously, terminological diversity is due to the “degree of distance” of specific educational practices [6], [7].

In the regulatory legal educational space of the Russian Federation, the concepts of “e-learning” and “distance learning technologies” have been legitimized since 2012 by the Federal Law “On Education in the Russian Federation” dated December 29, 2012 N 273-FZ [8], and the “degree of distance” in the implementation of educational programs are defined as “fully distance learning” and “partial use of distance learning technologies” [9], [10].
Nevertheless, in practical terms, the study of the effectiveness of specific conditions for the implementation of educational practices using distance learning technologies is of particular importance. The list of these conditions is also quite extensive: organizational, pedagogical and technical. The purpose of this article is to identify effective pedagogical conditions for organizing the educational process using distance learning technologies at a university.

2. Materials and methods
The study was conducted on the basis of the Yelets State University named after I. A. Bunin in the period 2018-2020. The study involved 3567 students and 440 teachers.

To achieve the goal, within the framework of the study, three options for organizing the educational process at the university were considered: traditional intramural and extramural education, part-time education with partial use of distance learning technologies, and fully distance learning. All forms of distance learning are implemented at the university based on the Moodle platform.

Groups of students studying in these forms formed groups of a pedagogical experiment. So, the control group included students studying in intramural and extramural forms of education, a total of 1216 people. Experimental group No. 1 consisted of students enrolled part-time education with partial use of distance learning technologies (1026 people). Experimental group No. 2 included students studying completely remotely during the quarantine period in 2020 (1325 people). Students of the control and experimental groups master educational bachelor's programs in all areas of training implemented by the university.

As pedagogical conditions, the study identified conditions related to the architecture of pedagogical knowledge, as well as specific conditions that are significant for distance education. These pedagogical conditions were grouped into 4 clusters: learning content, learning time, learning methodology, learning control [11], [12].

The first cluster of pedagogical conditions “Learning Content” includes two conditions: the content of education is developed by teachers and implemented on the university platform of distance learning (in the case of the traditional form of education, we are talking about the author's content of academic disciplines); third-party electronic educational resources are involved in teaching students.

The second cluster of pedagogical conditions “Learning time” also contains two conditions. The first condition is formulated as follows: training is carried out synchronously. In the case of the traditional form of education, synchronicity means offline interaction between the student and the teacher. In distance learning, synchronicity means the use of video lectures and video conferencing in real time (using various platforms such as Zoom, Skype, etc.). The second condition is the implementation of asynchronous learning. As a rule, in asynchronous learning, the student himself chooses the time to complete the training or refer to the training material. Asynchronous learning is most clearly implemented when using case technologies and project-based learning in traditional and distance formats.

The third cluster of pedagogical conditions “Teaching Methods” is represented by two polar conditions: the use of traditional methods and forms of teaching and active methods and forms of learning, which in the context of distance learning include cases, projects, web quests, etc.

The fourth cluster “Control of learning” includes the following pedagogical conditions: the use of test control, detailed answers. These forms of control are successfully used in traditional and distance learning. As criteria allowing to compare the effectiveness of certain pedagogical conditions in the implementation of the educational process in the traditional and remote form, the study considers the following: learning motivation, training level, learning ability, and the strength of learning outcomes (residual knowledge).

To determine the statistical significance of the study results, the Student's t-test was used.

3. Results and discussion
As a result of the study, it was possible to establish that the motivation of students' learning is not influenced by pedagogical conditions from the clusters "Learning content" and "Learning control". This
criterion depends on the clusters of pedagogical conditions "Learning time" and "Teaching methodology" (table 1).

**Table 1.** The influence of the pedagogical conditions of distance education on the motivation of students' learning.

| Cluster of conditions | Control group (t<sub>emp</sub>) | Experimental group №1 (t<sub>emp</sub>) | Experimental group №2 (t<sub>emp</sub>) |
|-----------------------|---------------------------------|----------------------------------------|----------------------------------------|
| Learning content      | 0.38                            | 1.24                                   | 1.16                                   |
| Learning time         | 4.21                            | 6.92                                   | 2.09                                   |
| Teaching methodology  | 5.87                            | 6.99                                   | 2.13                                   |
| Learning control      | 0.59                            | 1.01                                   | 1.19                                   |

Student's t-test showed that asynchronous learning has a positive effect on the motivation of learning both in the traditional form and in part-time form with partial use of distance learning technologies. Moreover, the positive effect is most noticeable in the case of partial use of distance learning technologies. However, with full distance education, asynchronous learning does not provide the required positive effect. Apparently, contact with the teacher in real time in a dosage form is important for the development of student motivation for learning. Complete distance education with an asynchronous approach requires a very high level of motivation and self-organization of students' learning activities.

An almost identical situation is also diagnosed with regard to the influence of active methods and forms of learning on the motivation of learning. With confirmed contact with the teacher (in person or remotely), active teaching methods significantly affect the motivation of learning, while with full distance learning, their overuse can cause a backlash. In particular, there was such a tendency that students with high educational motivation, when actively using case technologies, web quests, project-based learning in teaching, showed even higher results at the motivational level, and students for whom the motives of learning did not dominate the motivational sphere of the individual, subsequently lost interest in learning. The data obtained agree with those presented earlier in the works of Z.W. Abas [13], S. V. Mishina, S. V. Shcherbatykh [14].

The influence of the identified clusters of pedagogical conditions on student learning at the level of trends is somewhat different from the recorded changes according to the criterion “Learning motivation”. In particular, in traditional part-time education, conditions from the clusters “Teaching Methods” and “Control of Learning” proved their effectiveness; in distance learning in any form, all clusters of pedagogical conditions showed a significant impact on student learning (table 2).

**Table 2.** Influence of pedagogical conditions of distance education on student learning.

| Cluster of conditions | Control group (t<sub>emp</sub>) | Experimental group №1 (t<sub>emp</sub>) | Experimental group №2 (t<sub>emp</sub>) |
|-----------------------|---------------------------------|----------------------------------------|----------------------------------------|
| Learning content      | 0.56                            | 3.69                                   | 3.78                                   |
| Learning time         | 0.35                            | 3.14                                   | 2.32                                   |
| Teaching methodology  | 4.22                            | 3.19                                   | 3.36                                   |
| Learning control      | 3.47                            | 4.27                                   | 3.12                                   |

Involvement of third-party content (electronic educational resources) while monitoring their quality and appropriate methodological and informational support significantly increases the level of student learning with full and partial use of distance learning technologies in the educational process. The asynchronous learning process has a positive effect on the level of student learning with partial use of distance learning technologies; with full distance learning, this pedagogical condition does not statistically confirm its effectiveness. Of course, the use of active forms and methods of teaching significantly increases the quality of education, regardless of the form of organization of educational activities. The same effect has regular current, intermediate and final control, and its effectiveness is
confirmed by the use of test control, detailed answers (with mandatory checking for the presence or absence of borrowings), as well as interdisciplinary tasks.

In the course of the study, it was revealed that the learning ability of students in traditional and distance learning depends on both general and different pedagogical conditions (table 3).

Table 3. Influence of pedagogical conditions of distance education on learning ability.

| Cluster of conditions    | Control group (t_emp) | Experimental group №1 (t_emp) | Experimental group №2 (t_emp) |
|--------------------------|-----------------------|-------------------------------|-------------------------------|
| Learning content         | 0.95                  | 0.94                          | 3.06                          |
| Learning time            | 0.45                  | 1.17                          | 4.20                          |
| Teaching methodology     | 3.49                  | 4.11                          | 4.27                          |
| Learning control         | 0.14                  | 0.18                          | 1.02                          |

Thus, the general pedagogical condition for traditional and distance learning, influencing the level of student learning, is the use of active forms and methods of teaching. This conclusion is quite logical due to the fact that these methods and forms are designed to immerse students in the subject of study, to form in them cause-and-effect relationships regarding the subject of study, and also to develop the ability to learn.

At the same time, it was found that the use of third-party content (electronic educational resources) and an asynchronous learning format are effective conditions for the development of students' learning ability in full distance education.

As can be seen from table 4, among the pedagogical conditions that determine the strength of student learning outcomes, the most effective are the use of forms and methods of teaching in the educational process, as well as multi-format control of learning.

Table 4. Influence of pedagogical conditions of distance education on the strength of student learning outcomes.

| Cluster of conditions    | Control group (t_emp) | Experimental group №1 (t_emp) | Experimental group №2 (t_emp) |
|--------------------------|-----------------------|-------------------------------|-------------------------------|
| Learning content         | 0.54                  | 0.37                          | 0.29                          |
| Learning time            | 1.12                  | 0.69                          | 1.36                          |
| Teaching methodology     | 3.94                  | 4.16                          | 3.28                          |
| Learning control         | 5.27                  | 4.11                          | 3.24                          |

It should be noted that the study did not reveal pedagogical conditions specific for distance learning that affect the effectiveness of the formation of the strength of learning outcomes.

4. Conclusion

The study made it possible to establish a complex of pedagogical conditions that are system-wide for teaching both in the traditional part-time form and with the use of distance learning technologies. In particular, the use of active methods and forms of teaching in the educational process has a positive effect on the level of training level, learning ability, and the strength of learning outcomes. The same effect is exerted by regular current, intermediate and final control, which includes test tasks, detailed answers (with a mandatory check for the presence or absence of borrowings), interdisciplinary tasks on the learning and strength of student learning outcomes.

Exclusively in distance learning, such a pedagogical condition as the involvement of third-party content (electronic educational resources) in monitoring their quality and appropriate methodological and informational support has proved its effectiveness for the development of student learning.

The ambiguous influence of a number of pedagogical conditions on the effectiveness of training with partial and full use of distance learning technologies is recorded. Asynchronous learning and the use of active forms and methods of teaching have shown their effectiveness for the development of motivation...
for learning, increasing student learning in the organization of the educational process with partial use of distance learning technologies, for the development of student learning in the organization of the educational process with the full use of distance learning technologies. The obtained data can be used by developers, teachers for effective design of distance learning resources, effective organization of the educational process using distance learning technologies.

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