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THE PRACTICE OF BLENDED LEARNING ON THE EXAMPLE OF TEACHING GENERAL PHYSICS AT HIGHER EDUCATION INSTITUTIONS

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Abstract. The paper describes the experience of integrating the auditory and electronic components of the educational process on the example of teaching the subject of General Physics at a technical university. A scheme for the implementation of the educational process, including electronic content developed by using the LMS Canvas resource is considered. The structure of the resource and the results from the testing are shown.

Keywords: digital educational space; educational technology; information technology; electronic educational resources; blended learning; educational process

Introduction

The concept of blended learning, as an educational technology, was first clearly formulated in the Handbook of Blended Learning (Bonk, 2006) and described as a system combining various methods of learning, both distance and full-time training. Further research in this area led to a modified interpretation of blended learning, as a realization of the possibilities of an educational environment which uses the Internet, electronic media with forms of actual presence of teachers and students in the classrooms (Friesen, 2012). The fast development of technologies in modern society provided a solid foundation for improving the electronic forms of education with a relative increase in their share (referring to the traditional classroom form) and a variety of options. Today, blended learning should be considered a technology that "allows us to use more effectively the advantages of both full-time training and e-learning, and level or mutually compensate for the shortcomings of each of them"[1)], developing conditions and "potential opportunities for more effective learning in the traditional full-time training[2)].

The potential of introducing innovative digital technologies into the educational process of universities is aimed primarily at improving the quality of the learning process through the personification of education with an emphasis on increasing the motivation. The objective can be achieved through more efficient use of the time

allotted for training and improving students' competence in the digital information environment (Bailey, 2013), increasing students' independence and the level of their responsibility (Staker, 2012).

Today, the introduction of digital methods in education is a vector for universities, focused on getting into the top world rankings, and it is aimed at ensuring the intensive use of information technologies, which is also written in the Federal Law "About the Education in the Russian Federation" (Article 16) standards of higher education. The use of blended learning for teaching in higher education institutions allows us to realize such methodological advantages of digital resources as information intensity, a variety of forms of presentation of the material under study – visualization and modeling, as a means of communication between theory and practice[3)], interactivity, allowing to realize a differentiated approach to the level of students' training.

In practice, the transition to a new format of the educational environment implies a gradual introduction of changes, since teachers and students in the traditional form, usually oriented towards the average level of students, are quite difficult to adjust: both in the psychological and technological aspect. For the students, it is advisable to introduce new forms, whenever possible, from the very beginning of their learning period[4)], and when organizing blended learning, to retain the advantages of the traditional classroom form, such as its structure and system, the need for personal communication between the teacher and students. At the moment, the main issue is how to prepare people who can realize the advantages of digital resources, fill them with content, ensuring the effectiveness of the educational process in the implementation of various approaches.

Results and Discussion

The practice of developing electronic content for the educational process at the National University of Science and Technology "MISiS" has existed for more than 10 years. So, in the framework of projects on the instructions of the Moscow Department of Education, electronic educational modules of the natural science direction for schoolchildren were developed and successfully used, projects are being successfully implemented to make resources for the Additional Education system, in particular, on the National Open Education Platform Open Education (https://openedu.ru), etc.

The attempt to integrate auditory and e-components into the educational process was made on the example of teaching basic subjects and, in particular, the subject of General Physics, taught for 2 semesters in the academic year 2017 – 2018 (2 semesters, courses on „Molecular Physics and Thermodynamics" and "Electromagnetism. Optics", respectively in the spring and fall semesters) and in the fall semester of the academic year 2018 – 2019. The scheme for the implementation of the educational process, including classroom and independent work, was supplemented with electronic content developed using the LMS Canvas electronic educational

resource. In the process of creating an electronic educational and methodological complex in the listed subjects, the educational material was divided into didactic units, corresponding to the syllabus of the subjects - educational modules. As part of the structuring of key topics and the development of modules, adapted theoretical materials, videotapes of lectures, teaching materials for seminars, materials on selected issues requiring additional study, textbooks, presentations of lectures, as well as tests on topics of modules were prepared.

Students received access to electronic materials after registering for the course (figure 1) using the personal account of the Unified portal of electronic services of the National University of Science and Technology MISiS (all students from the University have access to the account).

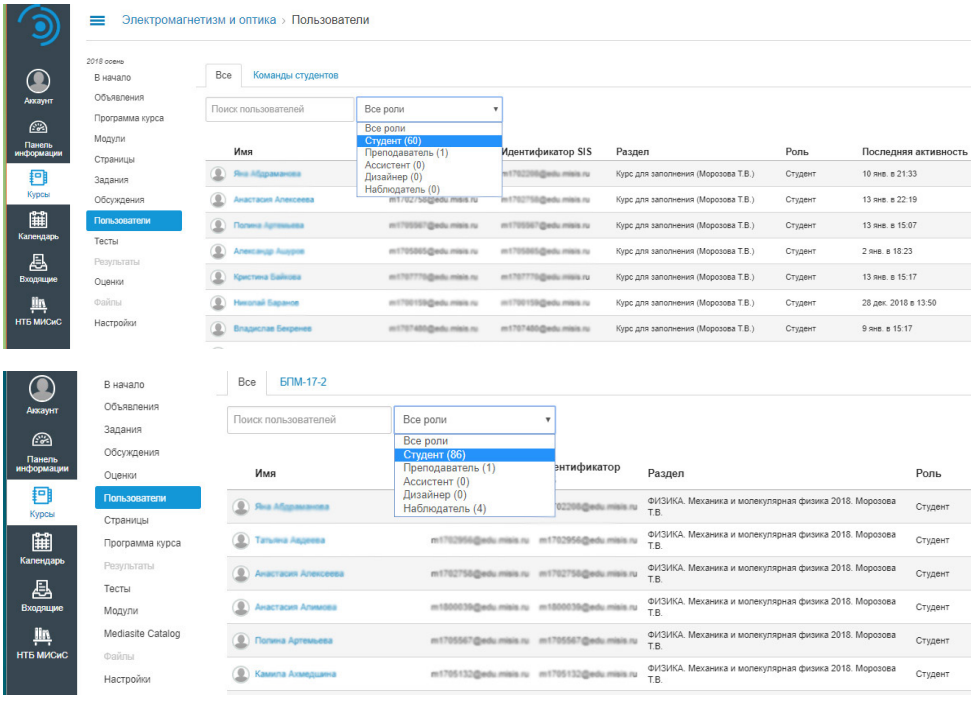


Fig. 1. Users who have registered for the spring and fall semester courses

The access to the resources was set in such a way so that the topic to be discussed was open for students for a few days before its discussion during lectures. The lecture mainly focused on the difficulties in mastering the topic.

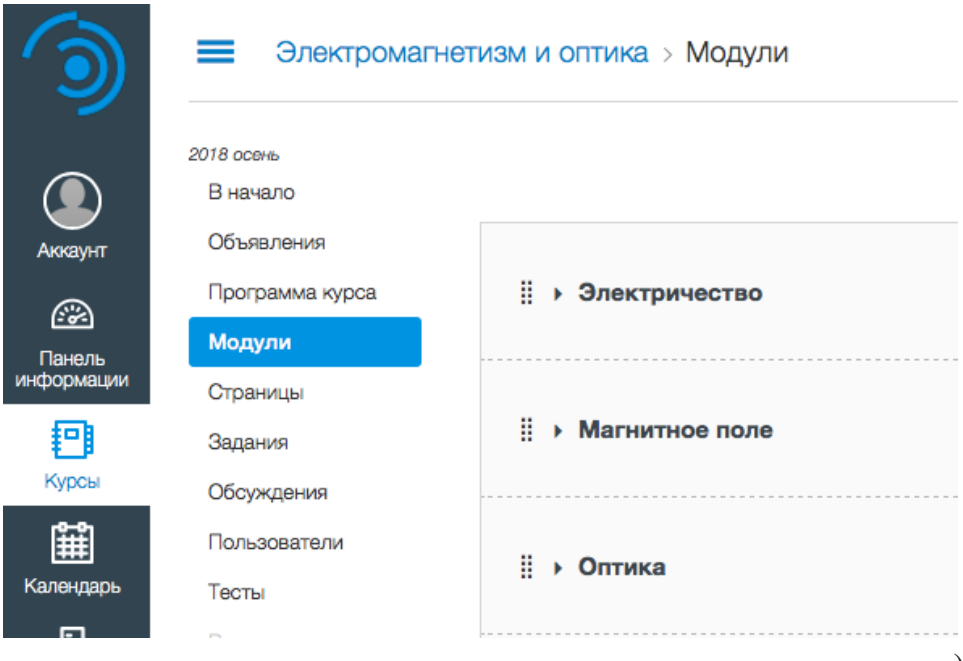
The analysis made on the attendance of lectures showed that the maximum number of students (96%) was present at the first lecture, where they talked about

the use of electronic educational resources, the lesson plans, the way grades were awarded (about project assignments). During the following lectures, the number of attendees was as expected less and averaged 54%. During seminars, most of the time was devoted to problem solving, project assignments, all planned for full-time training mode.

During the semester, the following materials from the electronic resource of the course are available to students:

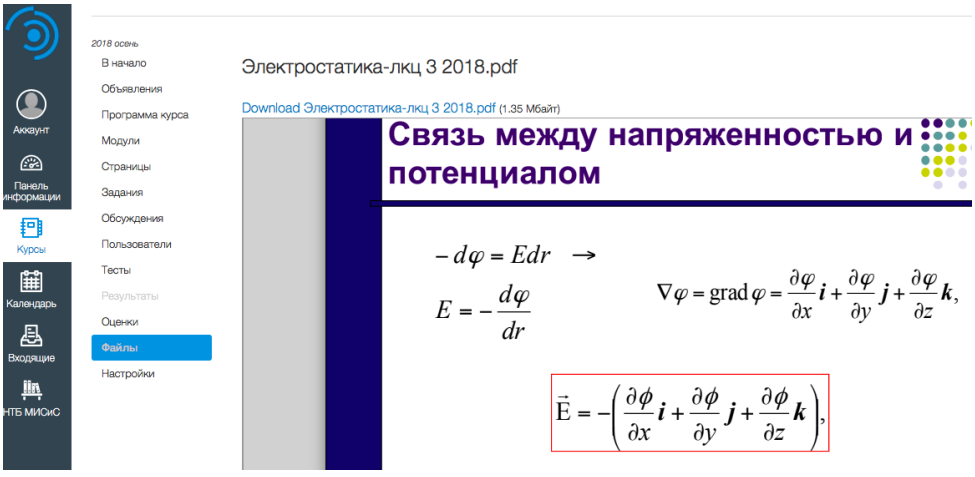
– section "course syllabus", with the list of topics and project assignments, corresponding to the current syllabus of the presented subject;

– section "Modules" listing the modules (figure 2, a) of the course under study (opening each module, users can view presentations of lectures and other materials directly in the electronic resource environment, without using the download procedure on the PC (figure 2, b), in addition, a catalog of video materials is available for each of the topics);



a)

– section "Assignments" with information on the list and deadlines. The deadlines for the assignments are reflected both in the "assignments" section and in the calendar;



b)

Fig. 2. Course module for the fall semester

Testing and result analysis is a key point when making an assessment in the effectiveness of learning based on an electronic resource. When the assignments were developed, we took into account the need to establish a dynamic test base with the use of randomization in the selection of questions and answer choices and with a time limit.

Both the assessment and the result analysis are of importance. Based on the review of general statistical data, as well as the individual responses of each student (Figures 3, 4), an individual correction was made.

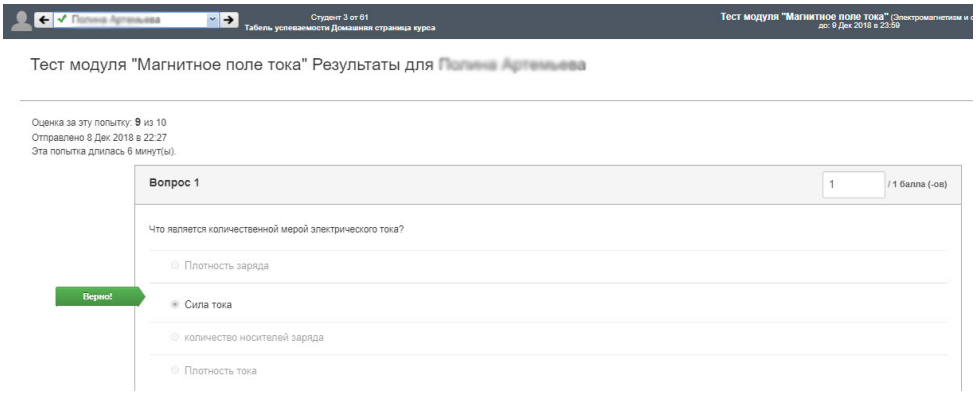


Fig. 3. Student test results if the answer was correct

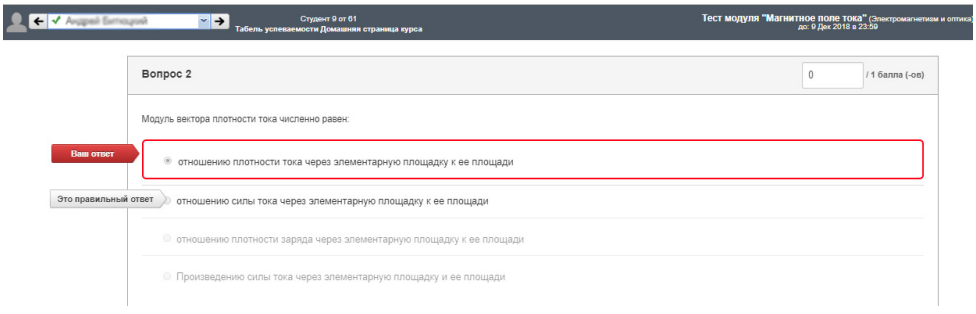


Fig. 4. Student test results if the answer was not correct

The resource allows evaluating the statistics of the answers for each question offered to the students in the tests, in particular, information is displayed for each question, indicating how many students chose a particular answer (figure 5).

Based on the test results, a correction was made focusing on the general presentation of the material, options for additional study and resitting a test was offered to achieve the maximum grade (however, the results from the first test performed were taken into account in the final grade). It should be noted that the opportunity to achieve the maximum grade when tested for the second time and any other times (after additional study of the material) has a positive effect on the average students and practically does not affect students who are not successful.

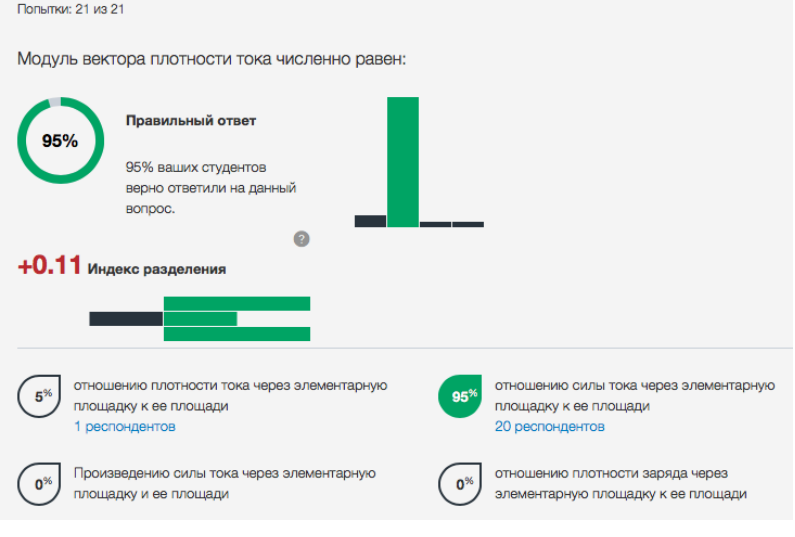


Fig. 5. Statistics of answers to a specific test question

The LMS Canvas resource is always available, so students are tested at a time convenient for them, while having in mind the deadlines set by the teachers. Feedback was maintained during the chat, for example, through comments on the adverts.

All the results from the tests performed by students are automatically entered into the "Evaluation" section, accessible only to the teacher. Each of the students, in turn, has access only to view their own grades. The full-time project assignments are handed to the teacher (tests, independent assignments, the interim certification results, etc.).

The effectiveness of blended learning is confirmed by numerous Russian and foreign authors (Lomonosova & Zolkina, 2018), which is consistent with the results obtained on the basis of the use of such educational technology in the teaching of general subjects at National University of Science and Technology "MISiS". According to the exam results for two semesters in 2016 – 2017 (teaching was done without the use of an electronic resource) and 2017 – 2018 academic years for the same field of study, the relative number of "Satisfactory" grades decreased by 16% while increasing the share of "Good" grades.

The effectiveness of the application can be indirectly judged by the results from our testing of students in the fall course of the 2018 – 2019 academic year on the topic "Efficiency of using the electronic component". So, 87% of the respondents believe that the content we proposed is sufficient for exam preparation, 80% agree that theoretical material should be reviewed before the lecture, 92% used the resource every week before the next lesson. It should be noted that the additional activity of the teacher who creates and supports the electronic educational and methodological resource on a particular subject is of great importance for the success of the training. Despite the fact that a considerable amount of time was spent on the preparation of educational material, working with the resource allows you to take the process of interaction with students to a new level, taking advantage of continuous availability, visualization, ease of use for students.

Conclusions

1. The discussed scheme for the implementation of the educational process, including electronic content developed by using the LMS Canvas resource and the structure of the resource as well as its approbation are successful.

2. The use of educational technology in the blended learning format proves to be highly effective for the students.

NOTES

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