Methods of teaching physics in the conditions of online interaction

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Abstract. The article discusses the problems of education caused by the pandemic and the possibilities of electronic educational tools. The challenges of the period that 2020 brought sharply accelerated the development of electronic educational tools, at the same time, revealed the limitations of student control tools. The author of the article worked in the educational system of a school, university and pre-university training in the spring of 2020. This article discusses three options for implementing online classes. All three of these systems have switched to the electronic form of online classes, although this situation was not initially foreseen. The problems that one had to face in the work and the successful moments of the studying in the information educational environment are described. Prospects for the development of online learning are outlined.

Keywords: physics; foreign applicants; teaching; Russian as a foreign language; information technologies, online interaction.

1. Features of the teaching physics to Russian students and pupils in the conditions of online interaction

The year 2020 began with a global pandemic and seriously challenged all the spheres of human activity. Faced with quarantine and temporary restrictions, students, pupils, teachers and professors had to abandon the class-based form of teaching. Then the global information network came to help, the Internet. Holding classes via mobile applications was not new, because such classes had already been practiced before. However, just in quarantine circumstances these mobile forms of education became global and the only, though temporary, way of working in education.

By the outbreak of pandemic, there had been developed different platforms for online interaction; among the best known are Moodle, iSpring, WebTutor, Zoom, MS Teams and many others. The authors of the article used the latter two in their work.

In the spring of 2020, the author taught general physics at the physics department at the National University of Science and Technology “MISiS”, gave there courses at the preparatory department “Professional Navigation and Reception Centre” for the participants from distant foreign countries and also taught physics in HSE Lyceum. That diversity allowed the author to take a closer look at the peculiarities of using online interaction platforms. The author used MS Teams platform in his work. The choice stemmed from the fact that this platform has such features as making student groups, monitoring the learning process and the attendance, using visual teaching methods (show presentations, share one’s screen, use the “blackboard”, etc.). Moreover, this platform was recommended and obligatory for application in all three institutions.
When it comes to full-time students, this transition to distance learning was not new regarding practical classes and solving problems. This form allowed students to work in the same way as they used to in the auditorium. It can be said that the part of the group, which would engage in face-to-face classes, continued working hard during the distance learning. The same goes for poor students – new form did not affect their attendance. It is worth noting that for some students it was even easier to understand the subject remotely. There was a certain “social migration”, which means that some students became more diligent under new conditions, some of them – less. This does not mean technical problems, though they also took place, but it is about several individual manners of perceiving and professor-student interaction. These peculiarities were more or less evident practically in all student groups. It was observed that the more senior the group, the less visible they were.

With regard to school pupils, the attention problem was much more evident for this category of students. Using visual tools and videos, it was possible to involve them in the learning process, but not very effectively.

Figure 1. General view of the program and available visual tools.

The creative tasks with competition elements characterized by division into teams, searching for a solution and missing information turned out to be more effective. It has to be said that students’ creative work is the distinctive feature of HSE Lyceum and it is evaluated separately. Unfortunately, this grade had low weight in the overall ranking at the time, so giving only creative classes was not correctly. Therefore, the creative approach was not much used, though under the circumstances it could have been developed better.

2. Features of the teaching physics to foreign students in the conditions of online interaction

As concerns educating foreign students in circumstances of pandemic, there is a lot to say, so we are going to outline briefly the most striking features.

It is more difficult to break the language barrier by online interaction than having face-to-face classes. Yet it is the Internet, which allows using online translators, dictionaries and visual tools, while as one learns the language, the language barrier becomes less important. It may not disappear completely, but it could have little impact on studying. It is possible to read more about the interaction
between special subject professors and linguists and their work in the article “The methods of teaching the basic concepts of mechanics for preparatory foreign students” [5].

The common problem which can be easily identified and with which all the colleagues were confronted – it is the monitoring of students’ learning achievements during the pandemic. The monitoring could be carried out by information technology equipment and it could be fully realized. Such traditional form of control as written examination could no longer ensure the reliability of checking students’ knowledge, skills and competence. Where possible, the traditional forms were replaced by testing. However, this labor-intensive process of creating tests was mainly left to professors. The development of a good quality test with different types of questions (test tasks of open type, multiple choice, tasks for calculation and so forth) – it is rather laborious work.

In order to describe the situation, which occurred in the field of education in the spring of 2020, it should be noted that there had already been provided conditions for distance learning in Moscow schools and universities. Nevertheless, the forced loss of the class-based form of teaching revealed a number of shortcomings, which distance learning system has.

In the matter of distance learning, it is difficult to say to what extent such education’s quality deteriorates. The tools offered by online interaction platforms allow diversifying the studies. Certainly, it helps to make material more illustrative, to turn to reference information from the Internet. Rather, there are problems connected with quality control of education. The use of all these tools, which are advantageous during classes, results in the fact that during the test and exam the quality of learned material is easily replaced by the ability to quickly find and exchange the information from the global network or, which is very often, to involve highly qualified third parties in control testing.

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