The use of Computer Technology in the Study of Physics

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Abstract. The rapid development of computer technology and the expansion of its functionality allows the widespread use of computers at all stages of the educational process. Great opportunities are contained in the use of computers in teaching physics. The effectiveness of the use of computers in the educational process depends on many factors, it depends on the "hardware", and on the quality of the training programs used, and on the teaching methodology used by the teacher.

Key words: methods of teaching physics, physics, teaching efficiency, physical experiments, computer programs, solving physical problems using a computer, using computer models, physics lessons.

Physics is an experimental science, it is always taught, accompanied by a demonstration experiment. The methodology of teaching physics has always been more complex than the methods of teaching other subjects. The use of computers in teaching physics deforms the teaching methods both in the direction of increasing the effectiveness of teaching and in the direction of facilitating the teacher's work. Presentation of new material can be carried out using one computer located next to the demonstration table. All physical experiments can be accompanied by the use of the "Physics in Pictures" computer program, which contains and conducts demonstrations of experiments with simultaneously constructed graphs, explanations of the processes and phenomena occurring are attached. This approach in a computer program is applied to all the main topics of the school physics course, which allows you to quickly and better explain the educational material, increases the clarity and accessibility of teaching, makes it possible to repeatedly demonstrate phenomena and processes in both discrete and animation modes. View the studied phenomena simultaneously with the graphs under construction, change the parameters of the factors that create the phenomena in the computer program. Allows you to demonstrate the course of experiments in a versatile way, and students to master the educational material deeper. The use of this program is effective at the stages of consolidation and repetition of educational material, both in individual and group training.

In terms of consolidating the material studied and in the independent work of students, you can use electronic textbooks. These textbooks are divided into lessons according to the main topics of the physics course. Has a clear soundtrack. Good selection of control tests. The necessary topic is set in advance and after the explanation of the new material, the necessary voiced points of the educational material are launched. This allows you to quickly and briefly once again scroll the topic under study in the minds of students. Sometimes, for repetition, they use the creation of crosswords on the topics covered in physics. They are performed in Microsoft Excel. Organizationally, this is done in a computer room, where students sit for 3-5 people at a computer. In groups, students are recruited independently. The process of creating crosswords in a group of students is more intense, more reckless and more interesting than when one student is sitting at the computer.

In addition, you can use computers to draw a general view of a graph of a law or phenomenon using Paint, and more accurate graphing is carried out in Microsoft Excel, and the graphs are very beautiful, which causes a feeling of satisfaction with the work. Plotting in Microsoft Excel allows you to observe the process of changing the schedule when changing any parameters of the ongoing process.

Knowledge control, more precisely, feedback is established on the basis of self-control and self-assessment of students' knowledge: before the start of the lesson, they receive information from each student about the degree of their homework, in the form of self-assessment for each part of the homework, and then in the lesson they confirm their grades, or in the traditional way in a physics

classroom, or by testing using computers, based on our own tests. During testing, students sit one person at a computer. The rest at this time are busy either with traditional control, or with solving problems on this topic.

Using a computer to solve physical problems.

It must be said that solving physical problems with the help of a computer gives little to the educational process, since in this case the computer is mainly used as a calculator and nothing more. But, nevertheless, the use of a computer in solving physical problems can have a great educational effect, provided that by the seventh grade students will own Microsoft Excel, then functions, graphics, and many others can be used at full capacity when solving problems. etc. In addition, it is necessary to create a special selection of problems and a methodology for their solution.

The method of using computer models in the classroom.

First of all, it is extremely convenient to use computer models in demo versions when explaining new material or solving problems.

Of course, such demonstrations will be successful if the teacher is working with a small group of students who can be seated near a computer monitor, or if the classroom has projection equipment that allows the computer screen to be displayed on a large wall screen. Otherwise, the teacher can invite students to work with the models on their own in a computer class or at home, which is sometimes more realistic.

It should be noted that in individual work, students tinker with the proposed models with great interest, try all the adjustments, as a rule, without delving into the physical content of what is happening on the screen. As practical experience shows, an ordinary schoolchild can be interested in a particular model for 3-5 minutes, and then the question inevitably arises: "What to do next?"

What needs to be done to make a lesson in a computer class not only interesting in form, but also give the maximum educational effect?

The teacher needs to prepare in advance a work plan with the computer model chosen for study, formulate questions and tasks consistent with the functionality of the model, it is also advisable to warn students that at the end of the lesson they will need to answer questions or write a short report on the work done. Ideally, the teacher at the beginning of the lesson distributes individual assignments to students in a printed form.

What types of tasks and learning activities can be offered to students when working with computer models and how to organize this activity?

Types of tasks for computer models

1. An introductory task

This activity is intended to help the student understand the purpose of the model and master its adjustments. The assignment contains instructions for operating the model and test questions.

2. Computer experiments

After the computer model is mastered, it makes sense to offer students 1 - 2 experiments. Such experiments allow students to delve deeper into the meaning of what is happening on the screen.

3. Experimental tasks

Further, you can offer students experimental problems, that is, problems for the solution of which it is necessary to think over and put up an appropriate computer experiment. As a rule, students take on such problems with particular enthusiasm. Despite the apparent simplicity, such tasks are very useful, since they allow students to see a live connection between a computer experiment and the physics of the studied phenomena.

4. Design tasks with subsequent computer verification

At this stage, students can already be offered 2 - 3 problems, which first need to be solved without using a computer, and then check the answer received by setting up a computer experiment. When drawing up such tasks, it is necessary to take into account both the functionality of the model and the ranges of variation of numerical parameters. It should be noted that if these tasks are solved in a

computer class, then the time allotted for solving any of these tasks should not exceed 5-8 minutes. Otherwise, the use of the computer becomes ineffective. Tasks that require a longer time to solve, it makes sense to offer students for preliminary study in the form of homework and / or discuss these tasks in a regular lesson in a physics classroom, and only then use them in a computer class.

5. Ambiguous tasks

Within the framework of this task, students are invited to solve problems in which it is necessary to determine the values of two dependent parameters, for example, in the case of throwing the body at an angle to the horizon, the initial speed and angle of the throw in order for the body to fly a given distance. When solving such a problem, the student must first independently choose the value of one of the parameters, taking into account the range specified by the authors of the model, and then solve the problem to find the value of the second parameter, and only then set up a computer experiment to verify the answer received. It is clear that such problems have many solutions.

6. Tasks with missing data.

When solving such problems, the student must first figure out which parameter is missing to solve the problem, independently choose its value, and then act as in the previous task.

7. Creative tasks.

As part of this assignment, the student is asked to compose one or more problems, solve them independently (in the classroom or at home), and then, using a computer model, check the correctness of the results. At first, these can be tasks compiled by the type solved in the lesson, and then a new type, if the model allows it.

8. Research tasks.

The most capable students can be offered a research task, that is, a task during which they need to plan and conduct a series of computer experiments that would allow them to confirm or deny certain patterns. The strongest students can be asked to formulate such patterns on their own. Note that in especially difficult cases, students can be helped in drawing up a plan for the necessary experiments or offer a plan prepared in advance by the teacher.

9. Problem tasks.

With the help of a number of models, it is possible to demonstrate so-called problem situations, that is, situations that lead students to an apparent or real contradiction, and then invite them to understand the reasons for such situations using a computer model.

10. Qualitative tasks.

Some models may well be used for solving high-quality problems. Of course, it is better to formulate such tasks or questions after working with the model in advance.

With regular work with a computer course, it makes sense to compose computer laboratory works from the invented tasks, in which questions and tasks are located as their complexity increases. This lesson is quite time consuming, but it is precisely such work that gives the greatest educational effect.

Recently, one can often hear questions: "Do you need a computer in physics lessons? Will computer simulations displace a real experiment from the educational process?" Most often, such questions are asked by teachers who do not know information technologies and do not really understand how these technologies can be useful in teaching.

Let's try to answer the question: "When is it justified to use computer programs in physics lessons?" We believe that, first of all, in those cases in which there is a significant advantage over traditional forms of education. One of such cases is the use of computer models in the educational process. It should be noted that computer programs are understood as computer programs that allow simulating physical phenomena, experiments, or idealized situations encountered in problems.

What is the advantage of computer modeling over a natural experiment? First of all, computer modeling makes it possible to obtain visual dynamic illustrations of physical experiments and phenomena, to reproduce their subtle details, which often elude the observation of real phenomena and experiments. When using models, the computer provides a unique, not achievable in a real physical

experiment, the ability to visualize not a real natural phenomenon, but its simplified model. In this case, it is possible to gradually include in the consideration additional factors that gradually complicate the model and bring it closer to a real physical phenomenon. In addition, computer modeling makes it possible to vary the time scale of events, as well as simulate situations that are not realized in physical experiments.

The work of students with computer models is extremely useful, since computer models allow changing the initial conditions of physical experiments in a wide range, which allows them to perform numerous virtual experiments. Such interactivity opens up enormous cognitive opportunities for students, making them not only observers, but also active participants in the experiments being conducted. Some models allow, simultaneously with the course of experiments, to observe the construction of the corresponding graphical dependencies, which increases their clarity. Models like these are of particular value because students usually have significant difficulty drawing and reading graphs.

Of course, a computer laboratory cannot replace a real physics laboratory. Nevertheless, the implementation of computer laboratory work requires certain skills that are characteristic of a real experiment - the choice of initial conditions, setting the parameters of the experiment, etc.

A large number of computer models throughout the school physics course are contained in the multimedia courses developed by Fizikon: Physics in Pictures, Open Physics 1.1, Open Physics 2.0, and Open Astronomy 2.0. The main distinguishing feature of these computer courses are numerous computer models - unique and original developments, a significant number of which are located on the Open College website at: http://www.college.ru/).

Computer models developed by the Physicon company easily fit into the lesson and allow the teacher to organize new, non-traditional types of student learning activities.

1. A lesson in problem solving with subsequent computer verification.

The teacher offers students, for independent solution in the classroom or as homework, individual tasks, the correctness of the solution of which they can check by setting up computer experiments. Self-verification of the results obtained, using a computer experiment, enhances the cognitive interest of students, and also makes their work creative, and often brings it closer in character to scientific research. As a result, many students begin to come up with their own problems, solve them, and then check the correctness of their reasoning using computer models. The teacher can deliberately encourage students to such activities, without fear that he will have to solve a heap of problems invented by the students, which is usually not enough time. Moreover, the tasks compiled by students can be used in class work or offered to other students for independent study in the form of homework.

2. Lesson - Research.

Students are encouraged to independently conduct a small study using a computer model and get the necessary results. Moreover, many models allow such a study to be carried out literally in a matter of minutes. Of course, the teacher assists students in the planning and experimentation phases.

3. Lesson - computer laboratory work.

For such a lesson, it is necessary to develop appropriate handouts. Tasks in the laboratory work forms should be arranged as their complexity increases. At first, it makes sense to offer simple introductory tasks and experimental problems, then computational problems and, finally, tasks of a creative and research nature. When answering a question or solving a problem, the student can set up the necessary computer experiment and check his ideas. It is recommended to first solve the computational problems in the traditional way on paper, and then set up a computer experiment to check the correctness of the answer.

I would like to note that tasks of a creative and research nature significantly increase the interest of students in studying physics and are an additional motivating factor. For this reason, the lessons of the last two types approach the ideal, since students gain knowledge in the process of independent creative work, because they need knowledge to obtain a specific result visible on a computer screen.

The teacher in these cases is only an assistant in the creative process of mastering knowledge.

References:

1. Eshchanov B.Kh., Arzikulov Z.K. Using information technology in the teaching of Atomic physics in higher educational institutions // International Journal of Scientific & Technology Research, Volume 9 - Issue 2, February 2020, pp 6218-6222.
2. Eshchanov B. Kh, Gaipov Dj. N., Egamberganov I. Sh. Using distance learning in colloboration With social networks in teaching photonics and Optoinformatics// International Journal of Scientific & Technology Research, Volume 9 - Issue 2, February 2020, pp 3809-3815
3. Eshchanov B., Otajonov Sh., Isamatov A. On Possible Models of Thermal Motion of Molecules and Temperature Effect on Relaxation of Optical Anisotropy in Bromine Benzene //Ukraine Journal of Physics, 2011, Vol.56, No.11, pp.1178–1181 (01.00.00; №51).
4. Eshchanov B., Otajonov Sh., Isamatov A. Studyof Molecular Dynamics of Condensed States of a Substance by Spectroscopy //Ukraine Journal of Physics, 2014, vol.9, No.3, pp.254–256 (01.00.00; №51).
5. Eshchanov B., Otajonov Sh., Isamatov A. Babajanov D. Dynamics of relaxation processes in liquids: Analysis of oscillation and orientation spectra//Journal of Molecular Liquids. Vol. 202, P. 148–152, (2015).
6. Mukhamedov G.I., Makhmudova D.M. On the Application of Information -Communication Technologies in the Development of Independent Creative Thinking of Youth // International Journal of Psychosocial Rehabilitation, Vol.24, Issue 09, 2020 ISSN: 1475-7192 – P. 468-478. https://www.psychosocial.com/article/PR290055/21298/
7. 7.Makhmudova D.M. Using Information Technology Tools In Mathematics Lessons For Teaching Future Teachers // International Journal of Scientific & Technology Research Volume 9, Issue 03, march 2020. – P. 4168-4171. ((3) Scopus) http://www.ijstr.org/final-print/mar2020/Using-Information-Technology-Tools-In-Mathematics-Lessons-For-Teaching-Future-Teachers.pdf
8. L.M.Karaxanova. Development of students' knowledge based on the use of 3d educational technologies in the Biology education // Таълим ва инновацион тадқиқотлар. –Бухоро. 2020 йил №2. –Б. 55-59. http://interscience.uz/index.php/home
9. Р.Х.Джураев, Л.М.Караханова. Модель организации исследовательской деятельности учащихся 10 классов при преподавании физики и биологии // International journal of discourse on Innovation, integration and education. Volume: 02 Issue: 01 | January 2021. –P. 296-300. http://www.interscience.uz