USE OF ICT TOOLS TO INCREASE THE EFFECTIVENESS OF TEACHING PHYSICS IN GENERAL SECONDARY SCHOOLS

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Abstract. *Currently underway in all areas. In turn, great work is being done in Uzbekistan to develop the education sector. There is a lot of money being spent on educating the next generation. Take general education classes as an example, Presidential schools are organized in Tashkent, all regions of Uzbekistan, and pupils are admitted for a two-stage exam. The pupils who pass the exam are educated in every modern state-of-the-art school. This, in turn, will push students' knowledge to higher levels. This article is about digital learning opportunities in general secondary schools. Using opportunities of digital technology increases students' interest in science, in the teaching of physics. It develops practical skills. It shows that physics is so important in daily life. The number of students interested in physics will increase. As the number of students interested in physics increases, so it will be the period of new discoveries and the puzzle that has not yet been identified in new physics. It takes deep knowledge and hard work to find a solution to this problem. To do this, of course, we will need well-equipped laboratory rooms, information and communication technology for conducting experiments. In this article, a 7 th grade physics lesson in general education schools was organized using an information communication system. The force and velocity in Newton's law given in the Grade 7 Physics Curriculum are all graphical depictions of mass and acceleration processes. The topic covered by this method was experimented in 2 schools of Fergana city: 8th secondary school of Fergana city and 21st secondary school of Besharik district of Fergana region, all of which reached good agreement, the efficiency of lessons increased by 27%.*

Keywords: *digital education, traditional education, cognitive, experimental, computer modeling.*

Introduction

The most important task of a school, which includes the teaching of physics, is to form a person capable of managing the flow of information in a continuous learning environment. Throughout school activities, students develop a positive attitude towards science, especially physics, and develop an interest in life. Physics is the basis of natural science and modern scientific and technological progress, which defines the following specific goals of education: the role of physics in science and industry, the education of environmental culture, understanding the ethical problems associated with physics.

At the current stage of development of general secondary schools, the task is to transform the traditional education system into a qualitatively new education system. The task is to bring up a well-rounded, effective-minded person, adapted to the new conditions of society. In this regard, special attention is paid to the individual approach to teaching students, teaching students different ways of learning and mastering independently, creating conditions for the development of creative potential. One of the most important ways to solve this problem is to introduce digital education into the educational process [1].

The purpose of this article is to summarize the experience of using information and communication technologies in physics lessons. My mission is to help students develop general education skills, knowledge of science, and interest in physics using information and communication technologies. As a result of the organization of this activity, I believe that the role of digital education in improving the quality of teaching physics is great.

The current problem of education is the practical application of the knowledge acquired by schoolchildren in science. This is what develops the student's personality based on his or her individual characteristics. To do this, it is possible to form a positive attitude to education in schoolchildren, to develop active, independent creative thinking through such organization of education, but for this it is necessary to pay attention to the organization of the learning process to enhance the independent work of students [2] .

The maximum role in the activities of the teacher should be played not by informing them, but by organizing the cognitive (cognitive) activities of students. In turn, the teacher may not always be able to combine his or her work in providing the learning material with the necessary contribution to organizing the students' independent work on the material. It is known from the basics of didactics that only independent individual educational activity leads to the formation of solid and deep knowledge, sustainable skills.

Let us dwell on one of the solutions to the difficulties that have arisen. In order to overcome the existing difficulties, the teacher, in many respects, achieves this with the help of a computer whose operational capabilities have a great didactic potential [7,10].

The rapid development of computer technology and the expansion of its functional capabilities allow it to be widely used at all stages of the educational process: during lectures, practical and laboratory classes, at the level of self-preparation, monitoring and mastery of educational material. will give. The use of computer technology has significantly expanded the possibilities of speech experimentation, allowing the study of various processes and events that are technically very difficult or simply impossible in a laboratory setting.

Method and methodology

There are great opportunities to use computers in teaching physics. The effectiveness of the use of computers in the learning process depends on many factors, including the level of technology, the quality of the curricula used, and the teaching methodology used by the teacher.

Physics is an experimental science that comes with demonstration experience. In a modern physics room, it is necessary to use not only various devices and devices to conduct demonstration experiments, but also computers with a multimedia projector or display screen.

Let's look at some ways to use information and communication technologies in physics lessons. These are:

- Computer modeling;
- Computer demonstrations;
- Computer control.

The main advantage of this technology is that it can be adapted to any lesson and can effectively help teachers and students. Another important point is that there are processes or events that cannot be visually observed in the laboratory, for example, in the study of isothermal processes in molecular physics, internal processes cannot be seen visually, but can be seen virtually. In this case, computer demonstrations are invaluable because they save time and allow you to draw realistic conclusions and results. On the other hand, the advantage of this technology is that it does

not require a large number of computers. One computer, a video projector or a complex - a computer and a TV - are enough to start working with technology.

Computer modeling

Computer simulation is a powerful scientific field that has evolved over decades. The use of computer technology in general secondary schools has a great future, as computer modeling is a powerful tool for understanding the world[5].

The following types of information and communication technologies are used in physics lessons:

- presentations to state or reinforce a new topic;
- educational films, animations, multimedia, each lasting 5-10 minutes to cover a new topic;
- game multimedia for various exercises, practical tasks.

In addition, e-textbooks will be created for students to study independently. The e-textbook contains a description of some important topics or almost all topics, exercises, assignments, tests in multimedia. It includes various exercises, assignments and tests should be in-game multimedia.

Electronic tools motivate students to learn, work independently, and make their free time meaningful and useful.

The use of ICT in the teaching of physics requires the teacher:

- demonstration in the classroom;
- explain complex topics in physics and astronomy;
- visualize processes and events that are difficult for students to imagine;
- animating experiences and exhibitions that are difficult to conduct in the classroom;
- one-off topics taught in the form of traditional teaching, independent use of laboratory work;
- have additional information to deepen their knowledge;
- creating a framework for teacher-student collaboration;
- use of platforms that allow online observation and mastering of theoretical and practical lessons, as well as uploading them to electronic media;
- allows you to quickly monitor a student’s knowledge, skills, and abilities.

Using ICT in Physics Teaching Students:

- increase motivation for science;
- comprehension of complex topics in physics;
- be able to imagine and imagine complex physical processes and events;
- conduct independent experiments, exhibitions and laboratory work in electronic form;
- quick access to encyclopedic information;
- control and consolidate their knowledge;
- choose a pace and level of mastery that is convenient for you to study the topic;
- involvement in modern information and communication technologies, its acquisition and the formation of the need for its continuous operation.

Below I graphically describe the relationship between force and acceleration and mass and acceleration in Newton’s 2nd law, given in the 7th grade curriculum of general secondary physics [8].

Theory

We know that an object moves at a constant speed if no force acts on it, or if the vector sum of the forces acting is zero. In order to change its speed, that is, to accelerate, some force must act on the body. How does this force affect the body to accelerate? With no acceleration a at the initial velocity a, the path traversed by a body moving in a straight line at time t is given by $S = \frac{at^2}{2}$.

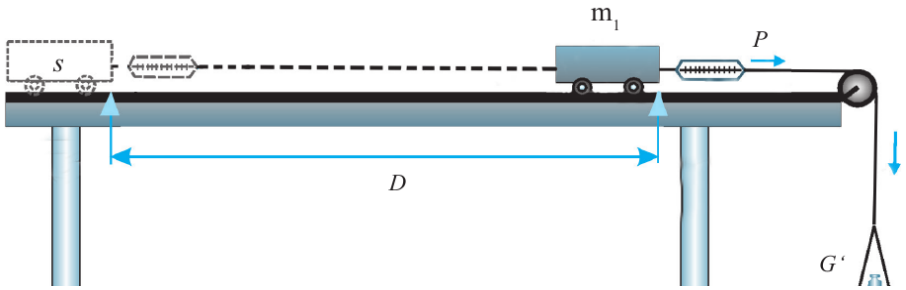
The acceleration of the body can be found from the formula:

$$a = \frac{2s}{t^2}$$

Let's try the following experiment.

Let us take a wheelchair of mass m moving on a horizontal table. Attach the dynamometer to the wheelchair and hang it on the other end of the dynamometer with a spool of thread. The dynamometer readings determine the force F acting on the wheelchair[3].

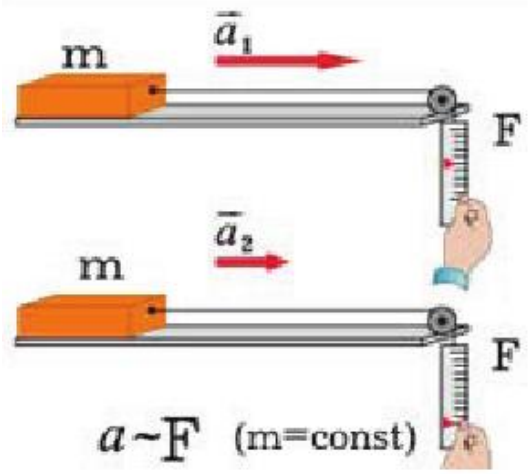
Let's put a load on the stage so that the dynamometer reading when the wheelchair is held is, say, $F_1 = 0.1\ N$. When we release the wheelchair, let it travel the distance $s = 1\ m$ at $t_1 = 4.5\ s$. In this case, we find from the formula that the acceleration obtained by the carriage is $a_1 \approx 0.1\ m/s^2$ (pic1).



Pic.1. Experimental device

2. By increasing the mass of the load on the wheel, we obtain the force acting on the wheelchair as $F_2 = 0.2\ N$. In this case, it can be determined that the cart traveled $1\ m$ at $t_2 = 3s$. The acceleration of the wheelchair is $a_2 \approx 0.2\ m/s^2$.

3. Assuming a force $F_3 = 0.3\ N$, the trolley travels $1\ m$ at $t_3 = 2.5\ s$. Its acceleration is $a_3 \approx 0.3\ m/s^2$.



Pic. 2. Dependence on acceleration force

The results of the experiment show that the more times the force F acting on the wheelchair, the greater the acceleration a received by the wheelchair, ie(pic 2):

$$a \sim F \qquad (2)$$

I will now use mathematical modeling to graphically show this physical experiment, that is, the force acting on a wheelchair is directly proportional to the acceleration received by the wheelchair. For this I used Excel.

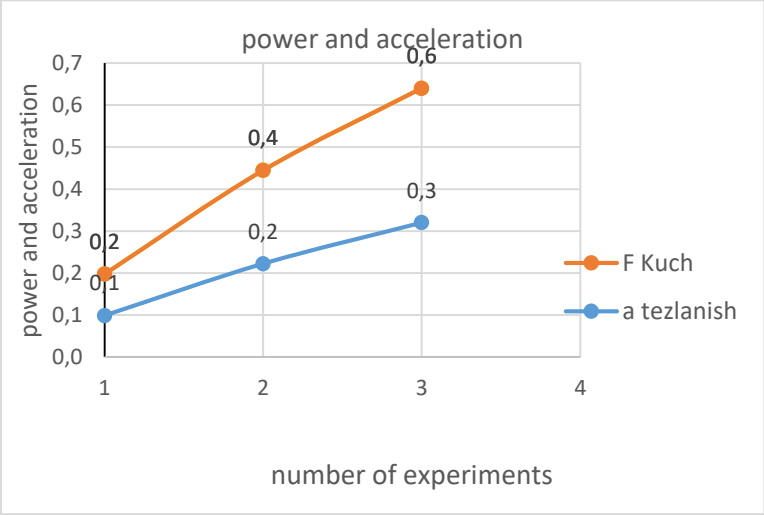
To do this, we run Excel, open a new window and enter the necessary parameters, namely distance, mass, dynamometer readings F_1, F_2, F_3 forces and t_1, t_2, t_3 times determined by our experiment and using the formula (1) above we enter the accelerations a_1, a_2, a_3 found (pic. 3).

	A	B	C	D	E	F
1						
2	S=	1	m			
3	m=	2	kg			
4						
5			F	t	a tezlanish	F Kuch
6		1		4,5	0,1	0,2
7		2		3	0,2	0,4
8		3		2,5	0,3	0,6

Pic. 3.

Once we have entered the parameters, to create graphs of mass m and acceleration a, go to the Insert menu, select “diagrams” and create graphs of force and acceleration (*Diagram* 1)

Diagram 1



From the graph above, we can see that the acceleration of a body of constant mass is directly proportional to the force acting on it.

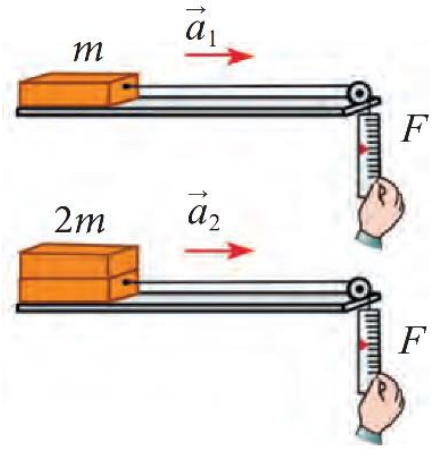
Let's look at the second experiment.

In this experiment, we change the mass of the wheelchair, leaving the force acting on the wheelchair constant (*F1 = 0.1N).*

1. The mass of the cart is m1 = 0.5 kg. The trolley travels $s = 1\ m$ at $t_1 = 4.5\ s$.

In this case, the acceleration of the wheelchair is $a_1 \approx 0.1\ m/s^2$, as in.

2. Put another similar wheelchair upside down on the wheelchair. Now the weight of the wheelchair is $m_2 = 0.55\ kg$. The trolley travels $1\ m$ at $t_2 = 6.5\ s$, and the calculations show that the acceleration is $a_2 \approx 0.05\ m/s^2$.



Pic. 4.

3. Place two trolleys on top of the trolley and increase its mass to $m_3 = 0.6\ kg$. In this case, I found that the wheel traveled $1\ m$ at $t_3 = 7.8\ s$, and the acceleration $a_3 = 0.033\ m/s^2$.

The results of the experiment show that the more times the mass m of the wheelchair increases, the more times the acceleration α decreases (pic. 4), so

$$a \sim 1/m \qquad (3)$$

The acceleration of a body under constant force is inversely proportional to the mass of the body.

Now I'm going to use a mathematical model like the one above to graphically show this physical experiment, that is, the more times the mass of a wheel increases, the faster it accelerates.

To do this, run Excel, open a new window and enter the required parameters, namely the values of distance, force F, masses m_1, m_2, m_3 and the times t_1, t_2, t_3 determined experimentally and a1 found using the formula (1) above, we introduce the accelerations a_2, a_3 (pic. 5).

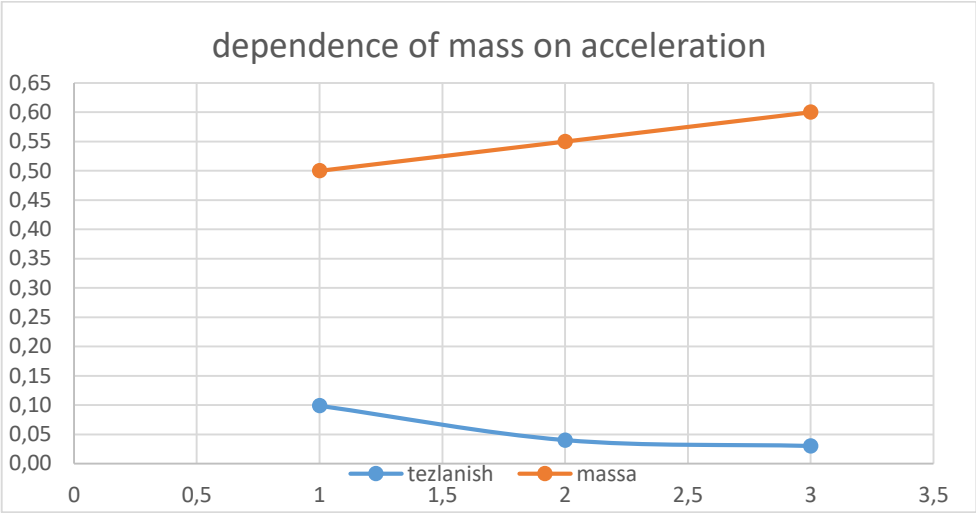
M22

	A	B	C	D	E	F	G	H	I
1	2S=	2	m						
2	F=	0,1	N						
3									
4									
5									
6		1				t	t^2	tezlanish	massa
7		2				4,5	20,3	0,10	0,5
8		3				6,5	42,3	0,04000	0,55
9						7,8	60,8	0,03000	0,6

Pic. 5.

Once we have entered the parameters, to create graphs of mass m and acceleration a, go to the Insert menu, select “diagrams” and create graphs of force and acceleration (Diagram 2).

Diagram 2



From the graph above, we can see that the acceleration of a body under the action of a constant force is inversely proportional to the mass[4, 9].

Experimental method

Experimental work was carried out in the 2020-2021 academic year in the 7th grade of school No. 8 in Fergana, Fergana region of the Republic of Uzbekistan, and in the 7th grade of school No. 21 in Beshariq district of Fergana region.

The main purpose of experimental research is to provide 7th grade students with the opportunity to teach mathematical modeling of the experiments used in the teaching of the subject, as well as the role of mathematical knowledge in the teaching of Newton's laws. Different non-traditional teaching methods and techniques, multimedia teaching aids and opportunities to use new information technologies were demonstrated to increase the effectiveness of knowledge provided to students.

In addition, the formation of integrative knowledge in physics and mathematics, the simplification of calculations based on mathematical modeling of experiments in physics, the graphical description of the obtained values, as well as the use of materials based on mathematical modeling.

Based on the results of the study, it was confirmed that the effectiveness of the knowledge acquired by students during the lessons was formed at a high level. The topic was identified by asking test questions and questions related to the topic in order to test the effectiveness of the mastery. Based on the results of the study, the demonstration experiments were mathematically modeled and applied to the learning process.

Results

The pedagogical experiment aims to determine the effectiveness of the proposed methodology in the selection and application of integrative materials from mathematics in the teaching of physics in 7th grades.

Table 1

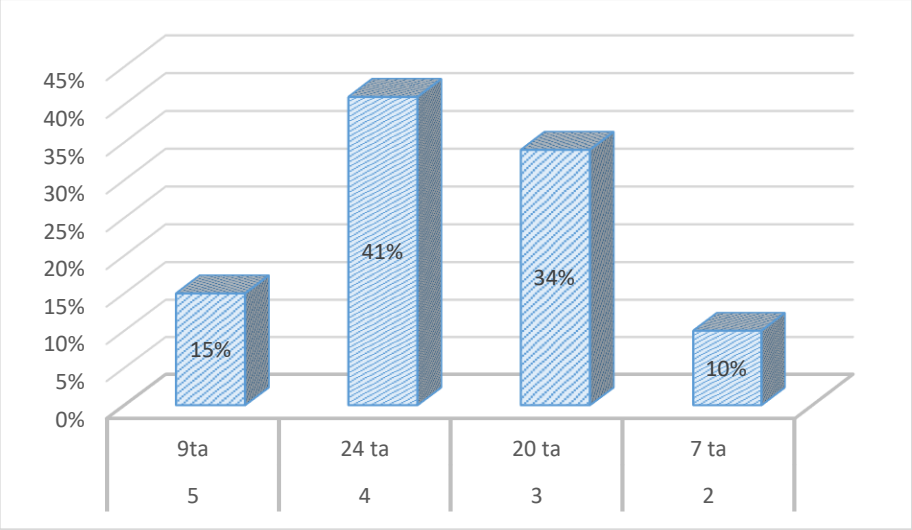
G Grades	Number of pupils	Assimilation indicator							
		“5”		**“4”**		**“3”**		**“2”**	
Experiment	65	20	31%	34	52%	11	17%	0	0%

Control	60	9	15%	24	41%	20	34%	7	10%

According to the results of the work carried out in the experimental control groups, it is clear that the level of reliability of the work carried out by us is much higher.

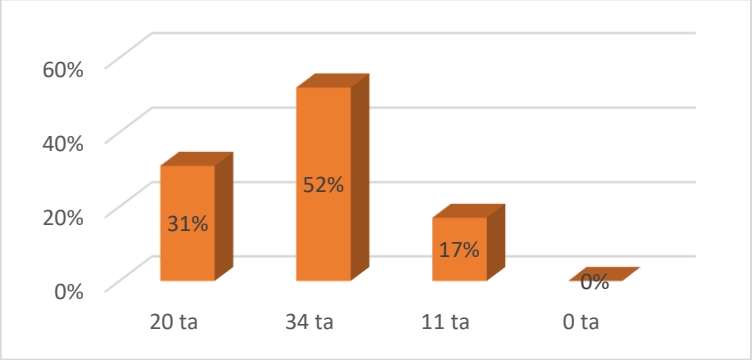
Quality indicators of students in the control group

Diagram 3



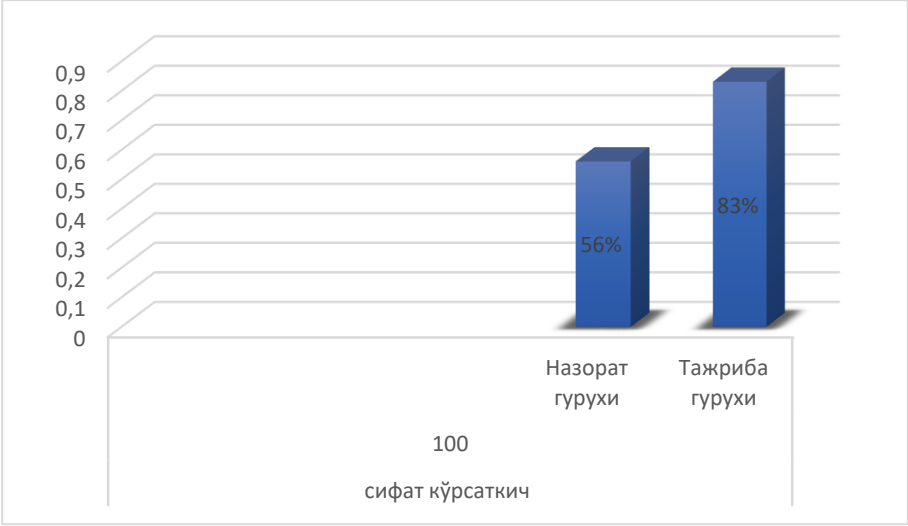
Quality indicators of students in the experimental group

Diagram 4



This is because the grades of the experimental class students are higher than the grades of the control class students.

Diagram 5



Discussion

As can be seen from the graph above, the quality index of the group we experimented with was 27% higher than the quality index of the control group. This shows that the method chosen by us has found a convincing solution.

Conclusion

There are a number of benefits to providing ICT assignments to students. Because the use of information and communication technologies helps students to work independently. Each student will have the opportunity to interact and collaborate with teachers and classmates.

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