

USING MODERN METHODS IN TEACHING PHYSICS IN TECHNICAL FIELDS

Nurolliyev Novruz Shoymardon ugli

Senior teacher at Shahrissabz branch of Tashkent Institute of Chemical Technology

<https://doi.org/10.5281/zenodo.7930578>

Abstract. *In this article, the technologies of working with modern methods of teaching physics in higher and secondary educational institutions are studied and analyzed, as well as students and teachers are experimented with for each lecture, practical and laboratory work, methods with good results are recommended.*

New teaching methods of science: teaching through information technologies, teaching through the project method, teaching through the interdisciplinary method and other methods were taken as the object of research in this scientific work and dedicated to the research of their results. Teaching methods were studied in this research work.

In the study, the origin and meaning of physical quantities, how they are related to other sciences, the synchronized topics of physical terms with other sciences, as well as the coherence of solving physical problems with other sciences, are presented in the research.

Keywords: *physics, problem situation, foreign languages, physical problems, project, information technology, geometric optics, angle.*

Introduction

In modern pedagogy, the problem of interest in the specific sciences is relevant. Students face a number of difficulties in mastering these disciplines. The sciences of physics and astronomy are also among the sciences that are difficult to master. In front of educators, students should increase their interest in science from the beginning of the first departments of physics and astronomy. Students' active participation in the learning process plays a key role. Below we will look at the technologies that serve to increase students' interest in the lessons.

References and methodology

Modern methods of teaching presented in this article were tested by teachers during the lesson as a test for school students. Here are the methods that gave a satisfactory result in the experimental test.

Discussion and results

Teaching through a problem situation. This form of education increases students' independent thinking. At the same time, the class will ask problematic questions about any physical phenomena, each student will express their opinion on the situation, and at the end the information will be summarized to determine the solution to the situation. This method is very useful, especially in physics classes, because physics is a science of nature and there are many types of problem situations. The use of a problem-based learning element creates conditions for students to think creatively. The study of the problem is an important part of this technology. Exploring the problem in the process shows what the student is capable of and motivates them. The principle of correcting the views expressed in this technology is to differentiate their levels and to see how much students are learning in accordance with educational standards.

Teaching through foreign languages.

Young physics students make many mistakes when solving problems. The reason for this is not fully understanding the condition of the problem and not being able to determine the physical quantities correctly. Most physical quantities are designated by the initial letter of the English or Latin translation of this quantity.

Physical size determination	Uzbek meaning of bigness	The meaning of language (in foreign language)
v	The speed	In English – velocity
Q	Quantity of heat	In English – quantity of heat
E	Energy	In Latin – energia
t	Time	In English – time
F	Force	In English - force

The main part of this technology is explained in physics lessons together with the definitions of quantities and their translation in a foreign language. Pupils will memorize the definition of size by connecting it to these words. The advantage of this method is that students quickly remember physical quantities and strengthen their knowledge of foreign languages. In order to use technology, pedagogues need high knowledge and knowledge of foreign languages.

Project method.

This method is a comprehensive method of education. Students are given the opportunity to organize the learning process based on their interests. Study plans are planned by students. Experts check whether this plan is directed to a specific goal and meets educational standards. On the basis of the method of projects, it forms the creative ability of students, increases the ability to make independent decisions, and forms the ability to receive and sort information in the information world. The project method allows to involve high school students in scientific research.

Method of using information technology.

Information technologies help to increase the information content of lessons and the quality of education. Video clips, unique pictures, graphics, formulas, graphic animations of the studied processes, technical tools, and the operation of experimental devices can be demonstrated through the use of information technologies in the lessons. It makes it possible to conduct lecture classes interactively. Teaching using media technologies expands students' imaginations. Today, it is taught using media technologies all over the world. It mainly uses programs such as Stellarium, Star Walk, Star Map, Home Planet, Celestia.

Stellarium is an astronomical software for Windows and Linux. The Stellarium program is a program in 3D format that mainly includes several topics such as constellations, elements of the celestial sphere, coordinates of stars, determining the distance to stars, and the annual and daily appearance of the Sun. Using the program, you can do the following:

- Observe more than 600 stars;
- see attractive images of constellations in the sky;
- observing the sky from all travelers and their companions;
- defining past and future tenses;
- see eclipse simulations;
- determining the sizes of celestial bodies and others.

The use of the above program is used to improve and strengthen students' knowledge of astronomy.

Interdisciplinary approach.

There are 4 didactic functions of interdisciplinarity in school education:

- methodological;
- educational;
- grower
- constructive;

As a result of a complete study of educational standards, the degree of connection of physics with other sciences was developed. (Table 1)

№	Subject	Physics
1	Mother tongue	+ -
2	Literature	+ -
3	History	+
4	Foreign language	+ -
5	Biology	++
6	Chemistry	++
7	Geography	++
8	Informatics	++
9	Mathematics	++
10	Music	+ -
11	Physical education	+ -
12	Technology	+
13	Astronomy	++
14	Fine art	+

Table 1

++ **high level of dependence**

+ **middle level of the relationship**

+ - **small level of dependence**

According to Table 1, many sciences have a sufficient interdisciplinary connection with physics. Mathematics is a science formed before physics. In the development of physics and the development of physics research, mathematical methods play a great role. Mathematics is a science that fully reflects the laws of physical processes, physical laws. Physics puts the tasks to humanity through the mathematical method, which leads to the emergence of new mathematical concepts. Math provides a lot for physics. Using differential and integral calculations, it serves to fully express many laws (Newton's Law 2, the laws of electromagnetic induction).

Using the concepts of geometric optics, let us consider the interdisciplinary connection of physics and mathematics. (Table 2)

№	The concept in geometric optics	Mathematical concept	Application of dependence in lessons

1	The return of light. Laws of return	Light, shadow, equal angles, perpendicular	In studying the laws of return, in problems solving
2	flat-mirror	Symmetry of axes	Studying the formation of an image in a flat mirror
3	Refraction of light. Laws of refraction	Light, shadow, equal angles, sine of an angle in a right triangle.	Learning the laws of refraction
4	Image formation in lenses	Form parallel straight lines to be Convergence of 3 straight lines at 1 point.	Learning to create an image in a lens. Solving problems
5	Huygens principle	Connection of angles in a triangle. Triangles similarity	Prove the laws of return
6	Full return	Connection of angles in a triangle. Angular sine	Making a full return. Solving problems
7	The law of refraction of light	Connection of angles in a triangle. Angle sine, tangent, at small angles ratio of sines and tangents.	Prove the laws of refraction. Solving problems

Table 2.

More than 60% of geometric optics problems are directly interdisciplinary. We will consider the integration of physics and mathematics in the problems.

Matter. A 50 cm part of a 3 m long log is sticking out of the water. If the sun is at an angle of 300 from the horizon, determine the length of the shadow of the tree above the water and at the bottom of the water. Refractive index of water $n=1.33$

Given:

$a = 3 \text{ m}$

$b = 0.5 \text{ m}$

$\varphi = 30^\circ$

$n = 1.33$

Need to find:

L_1 and L_2 -?

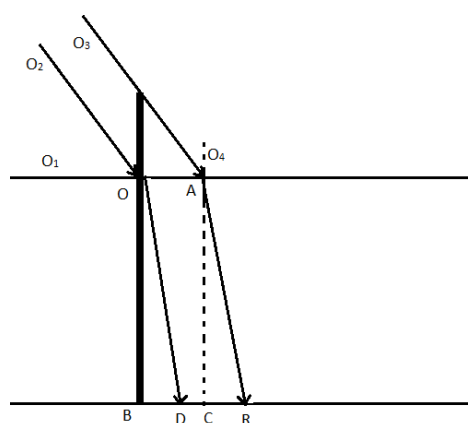


Figure 1

Solution	Subject
The angle $O_1OO_2 = 30^\circ$ and the angle of incidence $\alpha = 90^\circ - 30^\circ = 60^\circ$. $L_1 = OA$ $L_2 = BR$.	Physics

<p>The angle OAO_3 from this $\text{OO}_3=b$ $A=\varphi$, an angle $\text{O}=90^\circ$</p> $\text{tg } \varphi = \frac{b}{L_1}, L_1 = \frac{b}{\text{tg } \varphi}$ $L_1 = 0.5 * \sqrt{3} = 0.85m$	Mathematics
$\frac{\sin \alpha}{\sin \beta} = n, \sin \beta = \frac{\sin \alpha}{n}$ $\beta = \arcsin \frac{\sin \alpha}{n}$ $\beta = \arcsin 0.64 = 40^\circ$	Physics
<p>$L_2=BC+CR$, $BC=OA= L_1$, triangle CAR $CA=a$, angle $C=90^\circ$, the angle $A= \beta$</p> $\tan \beta = \frac{CR}{a-b} CR = (a-b) \tan \beta$ $CR=(3-0.5) * \tan 40^\circ = 2.5 * 0.83 = 2.1 \text{ (m)}$ $L_2=BC+CR=0.85+2.1=2.95 \text{ (m)}$	Mathematics

It is necessary to take into account the connection between the sciences of physics and mathematics. These dependencies contribute to the development of science. These can open up big news in physics and mathematics. Mathematics is needed to prove the laws of physics and physical phenomena, and physics puts various new problems in front of mathematics.

Conclusion

The use of the methods in the educational process will increase the effectiveness of education. In foreign language teaching, students' language competencies, students' scientific competencies in the project method, and competencies in other disciplines in the method of interdisciplinary interdependence increase. All of these methods help to ensure the quality of the lesson.

REFERENCES

1. Israilov, A. A. (2021). The role of electronic software in independent education in physics. *Academic Research in Educational Sciences*, 2(4), 769-775.
2. Decree of the President of the Republic of Uzbekistan dated April 29, 2019 No. PF-5712 "On approval of the concept of development of the public education system of the Republic of Uzbekistan until 2030.
3. Tillaboev, K. T., & Adzhibae, I. U. Basics of teaching photometry in astronomy classes. *Fundamental-innovative research in the development of physics and its prospects*, 144-146.
4. Nurolliyev, N.Sh. Yosh olimlar, doktorantlar va tadqiqotchilarning onlayn ilmiy forumi. *Microsoft exceldasturida dinamik sistemalarni modellashtirish*, (2023). 182-184. TATUFF-EPAI.
5. Nurolliyev, N.Sh. Methods and analysis of operating with scientific laboratories to investigate the optical properties of zinc oxide nanorods, scientific reports of Bukhara state university 2022/6, (94) 41-49.