

FACTORS OF ORGANIZING AND PERFORMING PHYSICS LABORATORY LESSONS IN EDUCATION

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Abstract:

The article presents an analytical analysis of traditional (measuring instruments and equipment) and non-traditional (electronic pedagogical programs) methods at all stages of organizing and conducting laboratory classes in physics.

Keywords: laboratory training, traditional and non-traditional methods, measuring device, equipment, information technology tool, software, virtual, animation.

Modern information technology tools are widely used to solve various problems of education. In developing the knowledge and skills of students in physics, it is important to conduct lessons using pedagogical software that provides the opportunity to model physical processes.

Educational methods are conditionally divided into two - traditional and non-traditional types.

Traditional teaching methods of physics consist of a complex of teaching theoretical information based on various innovative pedagogical technologies, problem solving, and organizing and performing laboratory exercises.

In this method, the student studies the theoretical material, solves problems and performs laboratory work in order to develop and strengthen skills and competences from the acquired theoretical knowledge. In this case, it will certainly have its effect on students' learning of physics. But in order to increase the effectiveness of education, teaching physics using non-traditional methods, i.e., using innovative pedagogical methods, teaching physical processes using information technology tools and pedagogical software is becoming more and more powerful.

Since physics is mainly an experimental science, the laws, phenomena, and processes studied in physics are studied more deeply and more fundamentally in the process of organizing and performing laboratory exercises. That is why experience has a special place in physics education. Therefore, it is not an exaggeration to say that teaching physics is conducted on the basis of organizing and conducting laboratory exercises in physics.



WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL ISSN: 2776-0979, Volume 4, Issue 4, April., 2023

However, in recent years, the idea and methodology of organizing and conducting physics laboratory training on the basis of virtual (electronic) laboratory training on the basis of computer equipment has been promoted. Also, electronic software resources for a number of virtual laboratory exercises in physics have been developed and are being implemented in the educational process.

The reason for this is the moral and physical obsolescence or lack of experimental devices in a number of educational institutions, while on the other hand, specialists tend to simplify and intensify the training process. However, the student or students who complete the virtual laboratory training are far from the real measuring technique. Therefore, below is a critical analysis of the teaching of physics laboratory exercises using traditional and non-traditional methods.

Advantages and disadva	intages of the	method of organizi	ng and conduct	ing laborate	ory training:				
Traditional (with tools)					Unconventional (virtual)				
Achievements:	Disadvantages:			Achieve	ements:	Disadvant	Disadvantages:		
- differentiation of tools	- lack of tools	tools and equipment; - stude			t's competence to work with	- students	- students do not know how to use		
and equipment by	- failure of tools and equipment during the experi			t electroni	c pedagogical software tools	electronic	electronic pedagogical software tools		
students;	and the problem of their repair;			(comput	er equipment) is formed;	(computer e	(computer equipment);		
- direct work with tools		impossibility of perform	ming processes an	d - it is	possible to directly perform	electronic	electronic pedagogical software tool		
and equipment;				e processe	s and experiments that cannot	(computer e	(computer equipment).		
- direct acquaintance	difficult to observe;			be seen	in practice or are difficult to	- lack of	- lack of or improperly structured		
with the operation of	- the impossibility of stopping all processes during the			e observe;	observe;		experiment method;		
tools and equipment;	experiment a	and continuing from	the same plac	e - time	- time is saved in carrying out		- illogicality or incomprehensibility of the		
- long-term storage of	(absence of di	rect intervention of the	e student);	experime	ents (saving time);	sequence of	sequence of execution of the experiment;		
experimental techniques	- lack of time	set for the experiment;		- possib	oility of dynamic (animated)	- students v	- students work more than the specified		
in memory;	- regular (stri	ct) monitoring, (indivi	dual) and technica	d executio	execution of experiments;		time on electronic pedagogical software		
- draw a conclusion by	and methodie	cal control of the tea	cher or laborator	y - studer	- student's direct intervention in the		tools (computer equipment);		
directly calculating	technician du	ring the experiment;		experime	ent (temporary stopping and	- complete	- complete lack of understanding of		
absolute and relative	- high (large	e) probability of err	ors in calculatin	g continua	tion);	measureme	nt techniques;		
errors;	experimental	results;		- achiev	es repeating the experiment	- complete	lack of understanding of the		
				several t	imes within the specified time;	calculation	2		
						- not being	stored in memory for a long		
						time;			
1. Theoretical informati	on (obtaining	permission to perf	orm work)						
Traditional:					Unconventional (virtual):				
Achievements:		Disadvantages:			Achievements:		Disadvantages:		
- the student's speech develops;		 lost from time; 			- completes a test task related to		- student's knowledge is		
- communication culture develops and		- waiting for the	teacher's free tin	me for the			evaluated mechanically		
speech grows;		answer to the ques	tion and the limita	ation of this			(shallow);		
 theoretical knowledge is checked; 		time;			- based on the test answer, pe		- the student's speech does		
- the ability to answer questions operatively		 psychological pro 	blems may arise t			ment directly	not develop		
is formed.		teacher and the stu	dent.		through the computer.				
2. The theory of the met	hod:								
Traditional:				Unconven	tional (virtual):				
Achievements:		Disadvantages:		Achievem	ents:	Disadvanta			
- as a result of questions and answers -		- more time is spent and psychological		- answers the test questions operatively		- theoretical concepts may not be fully			
with the teacher, theoretical concepts		problems arise.		through the software;		studied;			
are studied more deeply and widely.				- time is saved.		- the method is not sufficiently comparable			
						with other me	ethods;		
3. Acquaintance with th	e operation o	f the experimental of							
Traditional:			Unconvention	. ,					
			Achievments:				Disadvantages:		
- get acquainted with th					onic device for experiments that		- inability to check the correct or faulty		
· · · · · · · · · · · · · · · · · · ·	5				ed or are difficult to conduct;		condition of the device;		
detail;	1			he device works clearly and smoothly;			- the possibility of not fully		
		- get acquainted with the description of the experimental device				understanding the principle of			
				a short time through the test;			operation of the device;		
					hod of operation of the device i		- the possibility of not being able to see		
a dynamic state (a			(animations)			the errors that occur when working with			
						the device	·•		



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laboratory equipment directly; - the delicacy of the equipment, statistic quarter of measuring instruments, measuring limits and working technique; - the delicacy of the equipment, and the five quarter of the delicacy of the equipment quarter of the delicacy of the equipment, the delicacy of the equipment quarter of the delicacy of the equipment, the delicacy of the equipment quarter of the delicacy of the theoretically correct formula is theoretically conditioned of the delicacy of the measurement results; - the delicacy of the delicacy of the delicacy of the delicacy of the measurement results; - the delicacy of the measurement results, the quality of the error calculation is check for delicacy of the delicacy of the delicacy of the delicacy of the	4. The technical basis of the laboratory training device:												
- the student learns the available laboratory equipment directly; - studies the accuracy of measuring instruments, techniques. - lack of equipment; - the delicacy of the equipment; - the delicacy of the equipment, - the delicacy of the equipment, - studies the accuracy of measuring limits and working techniques. - the delicacy of the equipment, - the delicacy of the equipment, - studies the accuracy of measuring limits and working techniques. - the delicacy of the equipment, - the availability of virtual electronic instruments and equipment even for experiments that cannot be monitored or are difficult to conduct. - the availability of virtual electronic instruments and the full one instead; - the availability of virtual electronic instruments realistically; - the availability of virtual electronic instruments and the full devices. - The process of setting up and measuring the experiment: realistically; - the doligation to check the correct operation device or scheme with his own hands and directly observes its the student calculation of the tools; - the obligation to check the correct operation. - measurements are performed automatically; the student assembles a the availability of virtual electronic light measurements are performed quickly and with high accuracy. - the reader does r measurements are performed quickly and with high accuracy. - the reader does r measurements is saved; the software automatically; the software automatically complete lack of understanding of measurement results; he does not know how to calculate for mausurement results; not understanding the system of unita. - the software automatically complete lack of understanding results are achieved by the theoretically correct instruments; destoftware automatically complete lack of understanding results	Traditional: Unconventional (virtual):												
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is not necessary.													
8. Theoretical and practical knowledge (analysis) acquired by the student during laboratory training	8. Theoretical and practical	knowledge (a	nalysis) acquired by the st										
Traditional: Unconventional (virtual):													
Achievments: Disadvantages:: Achievments: Disadvantages::	Achievments:		Disadvantages::		Achievments:			Disadvantages::					
	- as a result of the experiment, it is analyzed		=		- study of unobservable or difficult processes through			- theoretical and practical					
	· ·						knowledge is relatively						
knowledge is confirmed in practice or not; - the need for a lot of time to knowledge; shallow;		5											
- theoretical and practical knowledge is evaluate the acquired theoretical - the possibility of animated observation of process - lack of practi	- theoretical and practical k			0			- lack of practical						
relatively deeply and broadly analyzed and and practical knowledge. views and laws and their visualization. application of theoreti	relatively deeply and broadly a	and practical knowledge.		views and laws and their visualization.			application of theoretical						
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As a result of the above-mentioned analysis, the following can be recognized. Non-traditional classes differ from traditional classes in that students are given an environment of freedom and an opportunity to freely express their opinions.

According to the requirements of the non-traditional lesson, the teacher should motivate students, be a guide, supervisor, and observer. Including, the problem-based teaching method encouraging pupils and students to acquire knowledge independently, discussion, special positive tasks, and various interactive methods can take a proper place in the pedagogical process.

The use of computer technology and electronic pedagogical software as a nontraditional method in the course of laboratory training in physics creates a number of advantages for both students and teachers.



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To the teacher:

- provides sufficient opportunities for full coverage of the topic chosen for the experiment, that is, the quality, number and variety of laboratory work conducted by the experiment increases several times compared to the training conducted in the traditional method;

- allows for individual control of as many students as possible during training.

- provides an opportunity to monitor students' learning of the subject along with imparting knowledge during the training.

To the reader:

- increases his interest in doing experiments in physics;

- creates an opportunity to get acquainted with various software systems and to learn them, to put them into practice together with physics experiments;

- increases students' theoretical mastery of the subject;

- gives an opportunity to test his theoretical knowledge, practical skills and abilities. To take advantage of these benefits, students must have:

- sufficient theoretical knowledge and skills of the students;

- the technique of using information technology tools must be sufficiently developed. It should also be noted that the preparation of virtual laboratory works requires a lot of work and expenses and makes high demands on technical equipment. The use of computer equipment in laboratory training increases the quality of training.

Summarizing the results of the above opinion and analysis, we can say that organizing and carrying out laboratory classes in an unconventional way, that is, using electronic pedagogical software, to make effective use of the student's time, to effectively acquire and strengthen theoretical and practical knowledge, to control, evaluate and analyze the knowledge of students. , allows for operational evaluation of the obtained theoretical and practical knowledge. However, in order for physics laboratory training to be effective and the theoretical and practical knowledge of pupils and students to be deep and integrated, it is desirable to organize and conduct it in parallel with traditional and non-traditional methods in the same ratio.

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