“ELEKTROTEXNIKA” FANINI “UMUMIY FIZIKA” FANI BILAN INTEGRATSIYALAB O‘QITISHDA VIRTUAL LABORATORIYA STENDLARIDAN FOYDALANISH METODIKASI

Bakhranova Umida Islomovna
Buxoro davlat universiteti 1-bosqich tayanch doktoranti

Annotatsiya: Oliy ta’lim muassasalari 6012300 – Texnologik ta’lim yo‘nalishi o‘quv rejasidagi “Elektrotexnika” fanini “Umumiy fizika” fani bilan integratsiyalab o‘qitishda dasturiy ta’lim vositalariga asoslangan virtual laboratoriyalarni ishlab chiqish, undan foydalanish bo‘yicha metodik tavsiyalarni shakllantirish orqali o’quv simulyatorlari va virtual laboratoriya stendlaridan foydalangan holda o’quv jarayonini tashkil etish bo’yicha ilmiy-metodik tavsiyalar pedagogik jihatdan nazariy asoslangan.

Kalit so‘zlar: dasturlashtirilgan o’quv qurollari, elektron didaktik vosita, elektron darslik, o’quv simulyatorlari, virtual laboratoriya stendi, elektron konstruktor.

ПРЕПОДАВАНИЕ ПРЕДМЕТА «ЭЛЕКТРОТЕХНИКА» ИНТЕГРИРОВАНО С ПРЕДМЕТОМ «ОБЩАЯ ФИЗИКА» МЕТОД ИСПОЛЬЗОВАНИЯ ВИРТУАЛЬНЫХ ЛАБОРАТОРНЫХ СТЕНДОВ

Аннотация: Высшие учебные заведения 6012300 – Направление технологического образования разработка виртуальных лабораторий на основе программных средств обучения, методические рекомендации по их использованию при преподавании предмета «Электротехника», интегрированного с «Общей физикой» в учебной программе технологического образования, научно-методические рекомендации по организации учебного процесса с использованием учебных тренажеров и виртуальных лабораторных стендов в процессе формирования педагогически теоретически обоснованы.

Ключевые слова: программные средства обучения, электронный дидактический инструмент, электронный учебник, учебные тренажеры, виртуальный лабораторный стенд, электронный конструктор.

TEACHING «ELECTRICAL ENGINEERING» SUBJECT INTEGRATED WITH «GENERAL PHYSICS» SUBJECT METHOD OF USING VIRTUAL LABORATORY STANDS

Annotation: Higher education institutions 6012300 - development of virtual laboratories based on software training tools, methodical recommendations on their use in teaching «Electrical engineering» subject integrated with «General physics» in the curriculum of technological education scientific-methodological recommendations on the organization of the educational process using educational simulators and virtual laboratory stands through the formation are pedagogically theoretically based.

Key words: programmed teaching aids, electronic didactic tool, electronic textbook, training simulators, virtual laboratory stand, electronic constructor.

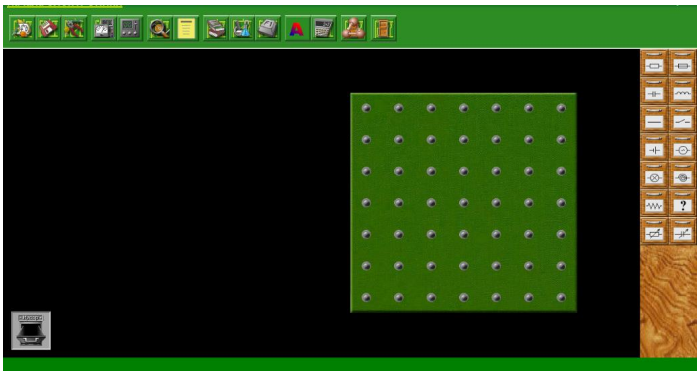
Introduction. We know from pedagogical experience that the use of information technology in higher education institutions, especially in the teaching of humanities and natural sciences in the field of technological education, plays an important role in increasing the effectiveness of education. Programmed learning tools have a special place in this.

The psychological and physiological effectiveness of programmed learning tools is determined first of all by the level of students’ mastery of learning materials, upbringing and intellectual development, performance indicators, levels of motivational stability. Second, it is related to the teacher’s activity, which is determined by the concepts of teaching, indicators of rational use of pedagogical technologies and teaching aids, stable motivation of the teacher to work, ability to work.

It is important to take into account the psychological and physiological characteristics of students in the development of programmed learning tools. The functional, psychological and physiological capabilities of students must be taken into account in the formation of students’ independent learning skills and competencies based on the use of programmed educational tools. In this regard, the virtual laboratory

stand, part of the programmed e-learning tool developed in the department of «Electromagnetism» in physics, designed to improve the methodology of professional competence of future teachers of technology, designed for students of higher education 6012300 – Technological education (Future Teachers of Technology) .

The program consists of an electronic constructor, which allows you to display the assembly process of electrical circuits on a monitor screen, to study their mode of operation, to measure electrical quantities as in real experiments. [1;2].



Picture-1. View of the virtual stand head window.

One of the main features of the complex is that it is able to reflect the real physical process to the maximum.

Literature review

Based on the important tasks described above, to educate future teachers of "Technology" as teachers with high intellectual potential in "Physics", professionally mature, creative thinking and observation on the basis of innovative achievements of science. and the creation of a new generation of virtual learning tools programmed to train competitive, highly qualified personnel.

Of A.R. Juraev “Improving the methodology for the formation of professional competencies of future teachers based on training software” In the dissertation of Doctor of Philosophy (PhD) in pedagogical sciences, on the basis of programmed teaching aids (convenience, visual, practical orientation) by developing didactic opportunities for the formation of general technical skills in the qualification requirements through the use of programmed teaching aids in the preparation of future teachers (expansion-computational-graphic, technological-design, creative design), improving the development of interactive teaching methods on the basis of the laws of virtual reality.

Research Methodology

The following is an example of a laboratory lesson from the Department of Electromagnetism in Physics:

The purpose of the work: to determine the specific resistance of the conductor and compare it with the quantity in the table.

1. Brief theoretical information

In 1826, the German physicist Georg Om (1787-1854) determined that the ratio between the voltage U between the ends of a metal conductor, which is part of an electrical circuit, and the current *I* in the circuit was a constant value.

$$R = \frac{U}{I} = const \quad (1)$$

This is called the electrical resistance of an *R*-sized conductor. Electrical resistance is measured in Om. In a part of a circuit with a current of 1 A with an electrical resistance of 1 Om, the voltage is 1 B:

$$1Ом = \frac{1В}{1А}$$

Experiments show that the electrical resistance of a conductor is directly proportional to its length *L* and inversely proportional to the cross-sectional area *S* of the chain:

$$R = \rho\frac{L}{S}; \quad (2)$$

The constant parameter for this substance is called the specific electrical resistance of the substance. Relative resistance is measured at Ом · м^2 / м.

Below are photos of the procedure and the process of conducting laboratory classes using a virtual stand:

The method "Logically confusing chain"

The method "Logically confusing chain" – new concepts on the subject in the course of the lesson, to ensure the connection between the ideas expressed, to ensure the correctness of the stages of a technological process, to help them to express and place them logically in a consistent sequence. [3;4].

The task of students is to correctly place the logically and sequentially misrepresented information (steps), to correct the logical confusion, to "connect" the broken chain by placing the ideas in the right order.

Application of the method in training is carried out in the following order:

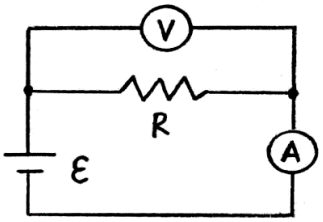
- students are divided into 3 or 4 small groups;
- handouts (cards) with confusing information are distributed to groups;
- Students try to "connect" the broken chain by identifying the logical errors and confusions expressed in the cards;
- At the end of the allotted time, one member of each group states the group's response;
- The teacher evaluates the opinions of the groups, demonstrates the correctness of the process using programmed teaching aids, interprets and summarizes the ideas.

2. The order of work

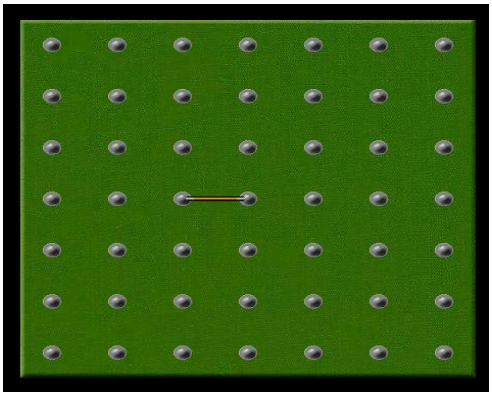
2.1. Assemble the wiring diagram shown in the figure on the assembly table:

2.2. Select nickel as the conductive material, specify the length and cross-sectional area dimensions:

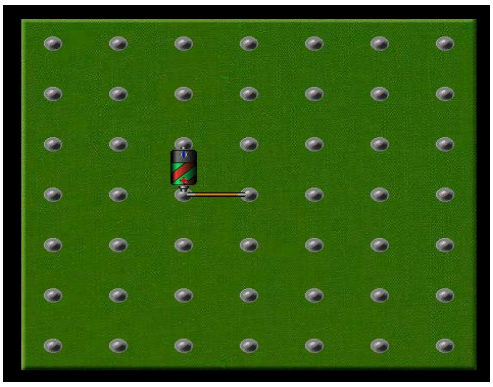
L = 100 м; S = 0.1 мм^2;



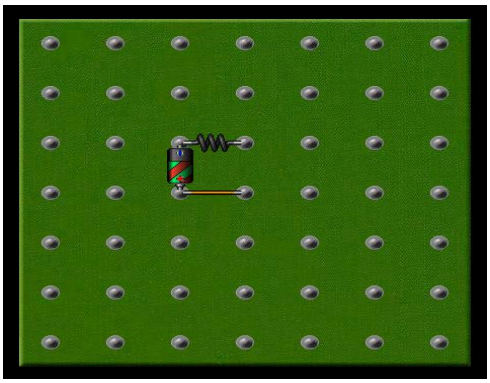
Picture-2. View of the electrical circuit.



Picture-3. Place the conductor on the mounting table.



Picture-4. Place the AC power supply (battery) on the mounting table.



Picture-5. Place the real conductor on the mounting table.

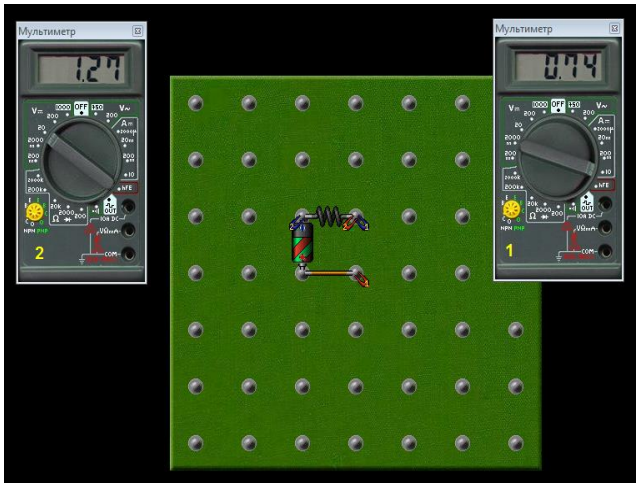
2.3. Determine the current in the circuit using a multimeter.

Connect the multimeter in series with the circuit, taking into account the alternating current and polarity, and turn it on in measurement mode. Record multimeter instructions.

Picture-6. Place the multimeter (to measure current) on the mounting table.

2.4. Using a multimeter, determine the voltage across the conductor experimentally.

To do this, the multimeter must be connected in parallel to the conductor, in the mode of measurement of constant voltage, taking into account the polarity. Record multimeter instructions.



Picture-7. Place the multimeter (for measuring voltage) on the mounting table.

2.5. Calculate the conductor resistance by formula (1).

$$R = \frac{U}{I} = \frac{1{,}27}{0{,}74} = 1{,}71 \text{ Ом}$$

2.6. Determine the specific resistance of nickel by formula (2).

Experience 1: (L = 100 м; S = 0.1 мм^2;)

$$\rho = \frac{RS}{L} = \frac{1{,}71 \cdot 0{,}1 \cdot 10^{-6}}{100} = 0{,}17 \cdot 10^{-8} = 1{,}7 \cdot 10^{-9} \text{ Ом} \cdot \text{м}^2/\text{м}$$

2.7. By changing the length, 2.3 - 2.6. calculate the points, however, do not change the conductive material and the cross-sectional area.

Experience 2: (L = 200 м; S = 0.1 мм^2;)

$$\rho = \frac{RS}{L} = \frac{1{,}71 \cdot 0{,}1 \cdot 10^{-6}}{200} = 0{,}08 \cdot 10^{-8} = 0{,}8 \cdot 10^{-9}\ \text{Ом} \cdot \text{м}^2/\text{м}$$

Experience 3: (L = 300 м; S = 0.1 мм^2;)

$$\rho = \frac{RS}{L} = \frac{1{,}71 \cdot 0{,}1 \cdot 10^{-6}}{300} = 0{,}05 \cdot 10^{-8} = 0{,}5 \cdot 10^{-9}\ \text{Ом} \cdot \text{м}^2/\text{м}$$

2.8. Enter the measurement results in the table:

Experience №	**Length, м**	**Voltage, B**	**Electric current, A**	**Resistance, Ом**	**Tax rake resistance, Ом · м^2/м**
1	100	1,27	0,74	1,71	$1{,}7 \cdot 10^{-9}$
2	200	1,27	0,74	1,71	$0{,}8 \cdot 10^{-9}$
3	300	1,27	0,74	1,71	$0{,}5 \cdot 10^{-9}$

2.9. Find the average value of the specific resistance and compare it with the quantity in the table.

$$\triangle \rho = \frac{\rho_1 + \rho_2 + \rho_3}{3}$$

$$\triangle \rho = \frac{1{,}7 \cdot 10^{-9} + 0{,}8 \cdot 10^{-9} + 0{,}5 \cdot 10^{-9}}{3} = 1 \cdot 10^{-9}\ \text{Ом} \cdot \text{м}^2/\text{м}$$

2.10. Directly, measure the resistance of the conductor using an ohmmeter. Compare the results obtained.

Describe the results of the work done.

Conclusion

The virtual laboratory stand, which is part of the programmed e-learning tool developed by the Department of Physics «Electromagnetism» in improving the methodology of formation of professional competencies of future technology teachers, consists of developing theoretical skills and practical skills in laboratory experiments, programmed teaching aids. serves as an electronic didactic tool.

The constructor can be used in the teaching of physics in the direction of 6012300 – Technological education and for independent creative work of students, within its capabilities and in other matters.

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