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Effectiveness of Using Interactive Methods in Teaching the Discipline 'Electrical Lighting'

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Abstract: In recent years, the use of interactive methods and pedagogical technologies has become increasingly relevant in the educational process, especially in the teaching of technical disciplines. This paper examines the significance of applying modern pedagogical technologies in teaching the discipline "Electrical Lighting," their theoretical and practical aspects, as well as the didactic effectiveness of integrating this subject with other disciplines. The role of pedagogical technologies in implementing learner-centered education, introducing systemic and activity-based approaches, preliminary instructional design, and monitoring the implementation of the educational process is substantiated.

Keywords: Interactive methods, pedagogical technologies, technical disciplines, electrical lighting, educational process, interdisciplinary integration, learner-centered education.

Introduction: At present, one of the most important tasks in the system of higher education is to improve the quality and effectiveness of teaching technical disciplines. The technological development of society, the introduction of innovative technologies into industrial sectors, and the growing demand for modern specialists require the organization of the educational process based on new approaches. From this perspective, the use of interactive methods and modern pedagogical technologies in the teaching and learning process is of particular relevance.

The discipline "Electrical Lighting" occupies an important place in the system of technical sciences and familiarizes students with the efficient use of electrical energy, the operating principles of lighting installations, modern light sources, and their practical applications. Traditional approaches to teaching this discipline do not fully ensure students' active participation and independent thinking. Therefore, the application of interactive methods in the educational process, the enhancement of students' cognitive activity, and the close integration of theoretical knowledge with practical training are essential conditions for effective learning.

Interactive methods in the educational process, oriented toward the learner's personality, contribute to the development of students' creative, critical, and independent thinking. Through these methods, students acquire skills in freely expressing their own ideas, analyzing problem situations, and working collaboratively in teams. Teaching the discipline "Electrical Lighting" in integration with other technical subjects has a particularly positive impact on deep and long-term mastery of the learning material.

This article examines the didactic possibilities of using interactive methods in the teaching of the discipline "Electrical Lighting," their influence on learning effectiveness, as well as practical approaches to their implementation during practical classes.

The use of interactive methods in teaching the discipline "Electrical Lighting" enhances the effectiveness of lessons, activates students' cognitive engagement, and directs them toward independent thinking. Since the content of this discipline requires not only theoretical knowledge but also the development of practical skills,

the application of interactive methods is especially important.

Interactive methods are based on cooperation between the instructor and students and ensure the active participation of learners in the educational process as full-fledged subjects. Within this approach, the instructor acts as a facilitator and organizer, while students acquire knowledge through independent exploration, analysis, and discussion.

In teaching the discipline "Electrical Lighting," the following interactive methods can be effectively applied:

-the "Concept Analysis" method;

-the "Conclusion (Summary, Fan)" method;

-the "Step-by-Step (Zinama-zina)" learning technology;

-the SWOT analysis method;

-learning activities based on problem-oriented questions and tasks.

These methods enable students to study lighting sources in depth, analyze their technical characteristics, advantages, and disadvantages, and establish a strong connection between theoretical knowledge and practical situations.

The topic "Sources of Electrical Lighting" is one of the core sections of the discipline, and the use of interactive methods in its instruction ensures effective mastery of the educational material. In particular, the application of the "Concept Analysis" method allows students to systematically acquire key concepts related to the lighting process.

Table 1. Key Concepts Used in Applying the "Concept Analysis" Method in Teaching the Discipline "Electrical Lighting"

Concepts	Description
Illuminance	The amount of luminous flux incident on a unit area of an illuminated surface; measured in lux (lx).
Luminous flux	The radiant energy emitted by a light source; expressed in lumens (lm).
Power	the amount of electrical energy consumed by a lighting device per unit of time; measured in watts (W).
Efficiency	an indicator of the degree of conversion of energy consumed by a lighting device into useful light.
Brightness	of luminosity visible to the eye of an illuminated or radiating surface.
Blindedness	a condition of visual discomfort resulting from excessive brightness of a light source.
Wavelength	the distance between the phases of a light wave, which determines the color of the radiation and its spectrum.
Voltage	the potential difference that allows charges to move in an electrical circuit; measured in volts (V).
Incandescent lamp	A traditional light source that produces light by heating a filament with an electric current.
Fluorescent lamp	a highly energy-efficient lamp that produces light through a gas-discharge process.
DRL lamp	A high-pressure mercury vapor discharge lamp used primarily for outdoor lighting
LED lamp	A semiconductor light source with high energy efficiency and long service life.

Using this method, students determine the content of proposed concepts. This process teaches them to

identify relationships between concepts and explain them using practical examples.

The "Summary (Fan)" method is also used to compare the advantages and disadvantages of incandescent, fluorescent, and LED lamps. This method helps students develop skills in summarizing educational material and formulating analytical conclusions.

Table 2. Comparison of electric lighting lamps based on the "Resume , Veer " method

Incandescent lamps		**Fluorescent lamps**		**LED lamps**	
Dignity	***Flaws***	***Dignity***	***Flaws***	***Dignity***	***Flaws***
The design is simple	High power consumption	Energy saving	Contains mercury	Very energy efficient	i High initial cost
Cheap	Short service life	High luminous efficiency	Does not work well at low temperatures	Very long service life	A special driver is required
Natural color rendering	It gets very hot	Lasts longer than an incandescent lamp	Complex disposal	Doesn't heat up	Directiona l light flux
Easy to connect	Low efficiency	Consumes less power	There may be a delay when turning on	Ecologica lly safe	Voltage sensitive
Conclusion: As a result of the comparison, it was found that LED lamps are superior to other types of lamps in terms of energy efficiency and service life, while other lamps have certain operational limitations.					

Using the "Summary (Summary, Fan)" method, students develop skills in comparing and analyzing the advantages and disadvantages of various types of electric lighting lamps, as well as formulating general conclusions. This method develops students' logical and critical thinking and teaches them to consider technical and economic factors when selecting lighting sources. This increases the effectiveness of learning the "Electric Lighting" course and enhances the practical relevance of theoretical knowledge.

Table 3. Expert sheet for the " Zinama-zina " technology (step-by-step training).

Groups	***Topics***	What do you know?
1st **group**	Technical characteristics, advantages and disadvantages of incandescent lamps	
2nd group	Operating principle and performance characteristics of fluorescent lamps	
3rd group	Energy efficiency and applications of LED lamps	
4th group	**The design, operating principles and electrical circuits of electric lighting sources**	

The interactive SWOT analysis method can also be used in practical classes on the "Electric Lighting" course. This method aims to identify problem-solving solutions by analyzing and comparing existing theoretical knowledge and practical experience, as well as to consolidate, review, and evaluate knowledge. Furthermore, this method helps students develop independent and critical thinking, as well as a creative approach to problem solving.

S - strength	Strengths
W - weakness	Weaknesses
O -opportunity	Possibilities
T - threat	Obstacles

For the Electric Lighting discipline, the method is applied as follows: perform a SWOT analysis of LED lamps and enter the results into this table.

Table 4. Analysis of LED lamps based on the SWOT analysis method

S – Strength	W **– Weakness**
– Very low power consumption	– High initial cost
– Long service life (up to 50,000 hours)	– A special driver is required
– Doesn't heat up	– Sensitivity to voltage fluctuations
- Environmentally friendly	– Directional light flux
O – Opportunity	**T – Threat**
Widespread implementation of energy-saving technologies	– Increase in the number of low-quality products on the market
– Use in smart lighting systems	– High initial costs
Expanding application in industrial and domestic spheres	**– Malfunctions in electrical networks**

The SWOT analysis revealed that LED lamps are distinguished by their high energy efficiency, long service life, and environmental safety. However, their high initial cost and specific technical requirements create a number of limitations. This analysis helps develop students' critical thinking and technical decision-making skills.

The SWOT analysis results confirmed the high energy efficiency, durability, and environmental safety of LED lamps, and also identified certain technical and operational limitations of other lighting sources.

When teaching the "Electric Lighting" course, the integrated use of interactive methods—Concept Analysis, Generalization (Summary, Fan), Zinama-Zina , and SWOT Analysis—significantly enhances learning effectiveness. Using these methods, students gain a thorough understanding of theoretical knowledge about electric lighting sources and acquire skills in analyzing, comparing, and applying them in practical situations.

As a result, interactive methods promote the development of critical thinking, independent decision-making, and professional competencies in students, making a significant contribution to improving the quality of teaching in the discipline "Electric Lighting."

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