THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE IN THE TOPICS OF "ELECTRIC CHARGE AND ELECTRIC FIELD" IN PHYSICS TEXTBOOKS

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Abstract: Currently, the demand for electricity is very high, and we use it extensively in our daily lives. Every device we use cannot function without an electric source. Therefore, it is essential to understand this field well. If we understand this area well, we will know how to obtain and utilize electric current, which is one of the global issues today. Through this article, we will answer the question of how the concepts of "electric charge and electric field" are taught in our textbooks, specifically in the 7th and 8th grade textbooks, and how students are grasping these concepts. We will analyze what achievements we can reach when explaining these topics through artificial intelligence. If we achieve our goal, students will gain new knowledge, skills, and competencies in this field. This will also enhance the teacher's proficiency during the teaching process. We hope this will improve the quality of our education, even if just a little.

Keywords: Theoretical knowledge, Logical questions and problems, Artificial Intelligence, Physics textbooks.

Introduction. The role of artificial intelligence in modern education is increasing. In the field of physics, particularly in studying fundamental concepts like electric charge and electric field, artificial intelligence technologies can be effective tools. In this chapter, we will review the nature of electric charge, its influence on the electric field, and how artificial intelligence can be utilized in studying these processes [2,3].

Unlike other textbooks, with the help of artificial intelligence, we can analyze the relationships between charges and fields interactively and present them in new ways that engage students. This chapter aims to combine theoretical foundations with practical examples to help develop a deeper understanding of electric charge and field.

Today, artificial intelligence (AI technologies) occupies a significant place in the field of education. With AI, the educational process can be made more efficient and interactive, as well as develop teaching methods tailored to the individual needs of students. In this regard, it is crucial to examine the significance of artificial intelligence in the topic of "Electric Charge and Electric Field." This, in turn, helps enhance the quality of education, learn new knowledge, and promote scientific research [4].

Thus, studying the importance of artificial intelligence in the topic of "Electric Charge and Electric Field" significantly contributes to improving the quality of education and advancing scientific research. This topic integrates modern technologies and pedagogical approaches, which elevates the teaching and learning processes to a new level.

Materials and Methods. We will begin our work by finding textbooks that cover the topic of "Electric Charge and Electric Field." These topics are present in the 7th grade physics textbook published in 2022 and the 8th grade physics books published in 2019. So, these

topics are included in the 7th and 8th grade textbooks and are currently being learned by the future generation [5,6].

In the 7th grade book, there is a comprehensive chapter titled "Electric," which includes the following topics:

"Charging of Bodies,"
"Electric Charge,"
"Electroscope and Electrometer,"
"Conductors and Dielectrics,"
"Interaction of Charged Bodies,"
"Distribution of Electric Charges in Conductors,"
"Electric Phenomena in Nature."

In the textbook, the topic "Charging of Bodies" provides students with the following theoretical knowledge:

When bodies are rubbed together, one becomes positively charged and the other negatively charged.

Any charged body has an electric field in the surrounding space.

Bodies with the same charge repel each other, while bodies with opposite charges attract each other.

The electric field exists independently of us.

In the topic "Electric Charge," it states:

There are two types of charges in nature: positive and negative.

The elementary charge is the smallest unit of charge that a charged body can have, equivalent to 1.6 × 10^-19 C.

The charge gained (or lost) by a body during the charging process is an integral multiple of the elementary charge.

The charge of an electron is e = -1.6 × 10^-19 C, and the charge of a proton is e = +1.6 × 10^-19 C.

Masses of protons, neutrons, and electrons are: $m_p \approx m_n = 1.67 \times 10^{-27}$ kg and $m_e = 9.11 \times 10^{-31}$ kg.

In the topic "Electroscope and Electrometer":

The electroscope determines the electric charge of bodies.

The electrometer indicates the level of electric charge of a body.

The electrostatic machine is a device that generates charges.

In the topic "Conductivity and Dielectrics," it is stated that bodies are divided into conductors and dielectrics based on their ability to conduct electric current.

The topic "Interaction of Charged Bodies" explains the subject through several experiments [7].

In the topic "Distribution of Electric Charges in Conductors," the following knowledge is provided through Faraday's laws:

The charge on the surface of a spherical conductor is distributed evenly.

In differently shaped conductors, charge is distributed unevenly along their surfaces.

The topic "Electric Phenomena in Nature" covers:

Lightning, thunder, and static electricity as electric phenomena in nature.

Thunder occurs due to the heating of air along the path of lightning.

Lightning rods are used to protect from lightning.

The theoretical knowledge is consolidated at the end of the topic.

Now, let's analyze this textbook using artificial intelligence. We will ask AI the question: "How can we present the electric section of the 7th grade physics textbook meaningfully and understandably to students?" The AI responded as follows:

Today, the role of artificial intelligence (AI) technologies in the educational process is increasing. Especially in physics classes, particularly in teaching the "Electric" section, AI's capabilities are very important. In this presentation, we will discuss how to effectively explain the electric section in 7th grade physics classes.

Interactive Simulations

First, we will consider interactive simulations. Simulations created with the help of AI allow students to visually see the interactions between charges and electric fields. Students can place charges themselves and observe their effects, testing theoretical concepts in practice [8,9].

Materials. Second, we highlight the importance of engaging video materials. Through automatically generated teaching videos using AI, complex concepts can be presented in a simplified manner. These materials capture students' attention and make the topic more interesting.

Individual Learning Plans. Additionally, creating individual learning plans is crucial. Artificial intelligence can analyze students' abilities and difficulties to develop tailored learning plans for each student. This helps students better understand the concepts.

Question-Answer Platforms. Question-answer platforms are also an effective tool. Students can ask questions on online platforms powered by AI and receive quick responses. This creates a convenient opportunity for self-assessment and reinforcement of knowledge.

Virtual Experiments. Through virtual experiments created with AI, students can practically learn about the properties of electric charges and fields. Such experiments help apply theoretical knowledge in practice and increase students' interest.

Group Discussions. Lastly, we include group discussions. With the help of AI, students can conduct group discussions, explore each other's opinions, and exchange knowledge. This process encourages collaborative learning.

Results. Artificial intelligence is an effective tool for teaching the "Electric" section in 7th grade physics classes. Through interactive simulations, video materials, individual learning plans, question-answer platforms, virtual experiments, and group discussions, students can enhance theoretical knowledge in practice and improve understanding. These opportunities provided by artificial intelligence are significant in enhancing the quality of education.

Now, let's analyze the 8th grade physics textbook. This textbook also includes similar topics and provides the same theoretical knowledge. However, the 7th grade book contains fewer logical problems, while the 8th grade book covers them in more depth. Specifically, the following problems are presented:

Series and Parallel Resistance Connection: Three resistors of 1 Ω, 2 Ω, and 3 Ω are connected in series, with a current of 1 A flowing through them. What is the voltage across each resistor, and what is the total voltage?

Coulomb's Force: Two spheres, one with a charge of -2 nC and the other with a charge of 3 nC, are 10 cm apart. What force do they exert on each other?

Field Strength: When a point charge of 0.2 nC is placed in an electric field, it experiences a force of 5 mN. What is the strength of the electric field?

Work Done in Electric Field: A voltmeter connected in parallel to a lamp shows 1.5 V. How much work is done when 10 C of charge passes through the lamp?

Resistance in Electric Circuits: If the resistance of a resistor connected in an electric circuit is 100 Ω and the voltage across the resistor is 10 V, what current flows through it?

Find the total resistance and voltage. Capacitance of a Capacitor: A flat capacitor with a surface area of 25 cm^2 is separated by a 5 mm thick dielectric. What is the capacitance of the capacitor?

Magnetism: A conductor 20 cm long is placed perpendicular to a magnetic field with an induction of 0.5 T. What is the force acting on the conductor if the current flowing through it is 0.03 N?

Electric Motors: What force acts on a proton moving at a speed of 20,000 km/s in a magnetic field with an induction of 0.6 T perpendicular to the field lines?

These problems help consolidate the knowledge gained.

Now, we will ask artificial intelligence again: "What logical problems could help in mastering these topics?"

Connection Between Charge and Field: If there is a charge of +5 μC at a point, what would the electric field be at that point? If the electric field is 2000 N/C, what force acts on the charge?

Counter Charge: If there is a charge of -3 μC at a point where the electric field is 1000 N/C, what is the effect of that charge? Calculate the force acting on this charge.

Force Between Charges: Calculate the force between two charges (+2 μC and -2 μC) that are 10 cm apart. (Use Coulomb's Law.)

Effect of the Field: If one charge is +1 μC and the other is +3 μC, what force does the second charge exert on the first if they are 15 cm apart?

(Continued similar problems...)

Conclusion. To organize the lesson process in accordance with modern requirements, we must apply the latest techniques and technologies, among which artificial intelligence plays a significant role. Nowadays, everyone has access to information regarding AI. In the age of technology, utilizing it in the lesson process creates great opportunities. Organizing lessons in this way helps students retain the topic and acquired knowledge better, while also enhancing the teacher's pedagogical skills[1-9].

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