



THE IMPORTANCE OF STEAM EDUCATION IN THE METHODOLOGY OF TEACHING THE TOPIC "ELECTRICAL PROPERTIES OF SEMICONDUCTORS" IN ACADEMIC LYCEUM AND VOCATIONAL COLLEGE

*Ibadullayev G.A., Sapayeva L.Kh., Rajabova B.Sh., Urazboyeva Zeboxon
Department of Physics and Astronomy, Urgench State Pedagogical Institute.*

***Abstract:** In this article, the subject of "Electrical properties of semiconductors" in academic lyceums and, vocational colleges, is covered STEAM technology with the support of pedagogical technologies. The article analyzes ways of effectively organizing the process of teaching electrical properties of semiconductors in academic lyceums and vocational colleges. The advantages of interactive methods, practical exercises, virtual laboratories and the STEAM approach are, covered in teaching the subject.*

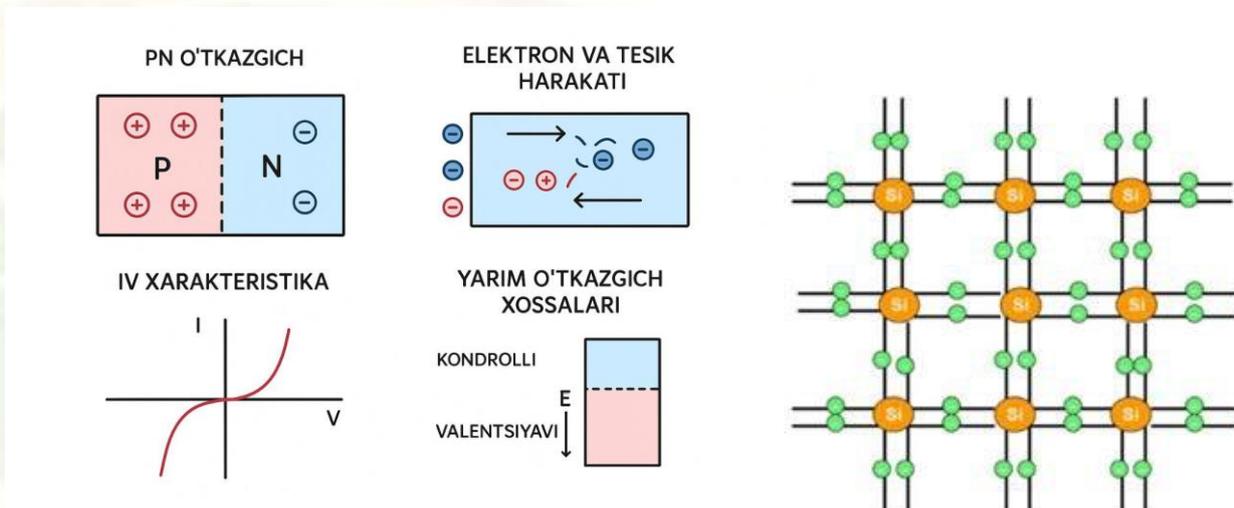
***Keywords:** STEAM technology, semiconductors; electrical conductivity; donor and acceptor compounds; p-n junction; electron-hole conductivity; energy zones; diode; Teaching at academic lyceums and vocational colleges; interactive methods; virtual laboratory; STEAM approach; practical experience; fundamentals of electronics.*

Introduction:

It is, related to modern STEAM education, which reveals the fundamental laws of physics and natural phenomena and connects them with practical life. Semiconductors are materials that conduct electricity well, and materials that do not conduct electricity well, i.e. dielectrics, and are located in groups II, III, IV, V and VI in Mendeleev's periodic table. This is in Academic Lyceum and Vocational Colleges, this topic helps students:

- Understand the basics of electronics
- Develop professional skills

- Forms physical thinking in students through practical experience, and this is STEAM education. Therefore, study semiconductors is highly important. Theoretical knowledge in teaching electrical properties is important for forming practical skills. Semiconductors are materials between metals and dielectrics in terms of their conductivity, and their physical properties can change under various external influences. Semiconductors are widely used in electronics and microelectronics. All modern electronic devices, from computers to cell phones, rely on semiconductors. Of these, the most widely used semiconductor is silicon, and it can be said that it is used in almost everything.



The conductivity of any substance is, determined by the presence and mobility of charge carriers in this substance and is calculated using special formulas. In *solids*, electrical conductivity is carried by free electrons or holes. However in semi-conductor it has its own properties. At the same time, STEAM education is important in teaching these subjects to students because this modern educational technology helps students to think innovatively, think critically apply engineering or technology to real-life problems. It is to teach how to use it in a creative approach. In this, it helps students to apply their knowledge in practice, relying on their knowledge of mathematics and natural sciences. In science, students learn concepts such as the crystal structure of semiconductors, valence band, conduction band, energy (ΔE) the most important physical formula:

$$\sigma = nq\mu$$



Hare:

S - Electrical conductivity,

N- Concentration of charge carriers,

Q - Electron charge,

M - Mobility.

In semiconductors, the increase in conductivity when the temperature increases is justified by the following expression:

$$n < e^{-E_g/2kT}$$

Through the STEAM approach, students observe how device parameters change using realistic circuits.

The STEAM method, the student can see this physical process through experience and analyze the mathematical connection by himself.

Pedagogical advantages of STEAM in the topic of semiconductors:

- ✓ Connects difficult theory with practice
- ✓ Enhances experimentation and modeling
- ✓ Teachers the student to think creatively and critically
- ✓ Bring modern technologies into the educational process
- ✓ Increases interest in electronics
- ✓ Encourage the student to create an independent project

Main part:

The main goal of the subject is to form students' theoretical knowledge and skills in the field of electrical properties of semiconductors in academic lyceums and vocational colleges based on practical experiences and laboratories. Interesting topic Enrichment with methods allows strengthening through STEAM - technology, as a result, students understand the subject better. In this direction, the emphasis is on mastering science, problem solving, and logical thinking. To, STEAM students provides the opportunity to succeed in school, work and various hobbies. For example, if we take STEAM as a carpenter's box with various tools, a child who has



mastered it well can choose the necessary tools from the box and make what he wants. That is, all the sciences are necessary, but not one alone. Together they give a useful and expected result. It also focuses on understanding how light, plays a role in everyday life, such as color images, optical instruments, laser technology, or mirrors. Knowledge of the electrical properties of semiconductors broadens students' scientific outlook. Methodologically correct organization of the teaching of the topic "Electrical properties of semiconductors" ensures deep mastering of physics. Enriching the lesson with practical examples, experiments, videos and simulations students not only remember the topic, but also connect it with real life processes.

In short, teaching the topic "Electrical properties of semiconductors" in academic lyceums and vocational colleges not only deepens students' physical knowledge, but also directs them to scientific research activities, and STEAM education plays an important role in their future professional formation.

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