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Improving the Methodology of Teaching the Laws of Thermodynamics in Secondary Schools

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Annotation: This article describes the combination of knowledge, skills and abilities acquired by students in the physical essence of the first law of thermodynamics based on modern educational technologies.

Keywords: thermodynamics, amount of heat, internal energy, work performed, methodology, training, energy, interactive method.

Before teaching students the I-law of thermodynamics, they were taught the knowledge of the law of conservation of energy, that is, the law of conservation and circulation of mechanical energy; the process of transformation of mechanical energy into thermal energy (internal energy), and vice versa, the cliff of rotation; methods of changing the internal energy of bodies (heat dissipation, work
first of all, it is necessary to repeat, summarize, and then deepen. It is advisable to use the interactive method BBB (I knew, I want to know, I learned) in a new type of knowledge-giving, after the information known about the transformation of different types of energy into each other is repeated and summarized. This leads to the fact that in the process of education, training will achieve high efficiency, of course.
1. step: the subject being outlined on the board is written. Readers are offered to write in their notebooks that they "knew" what they knew about this topic. 3 minutes are given for this. During the presentation, readers will tell what they know about the topic, for example, about internal energy, the amount of heat, about the work done. During the presentation, the rule of not repeating thoughts by groups back is strictly observed.
2. step: readers write in their notebooks "I want to know". In this, it is proposed to write what the new topic wants to know on the "I-law of thermodynamics". It is given a minute. A presentation will be held.
3. step: students are offered to open a textbook and write in their notebooks that they "learned". Readers, on the other hand, write in their notebook on a new topic, that is, what they understand that this law is the content of the law of conservation of energy. Ten minutes are given for this. After ten minutes of time, a presentation is held.
In all steps, students are required to follow the rule of listening to each other. And the materials left unspoken by the teacher on the new topic are filled in time, that is, let's assume that in the transition of the system from state 1 to state 2, its internal energy has changed to $\Delta U = U1 - U2$. Such a change can only occur when Q gives the system the amount of heat.
In addition to changing the internal energy, the system can perform mechanical work in an amount of A.
Let's see this as an example of a kettle that is being heated.
The amount of heat that the kettle receives is A mechanical operation, which is performed against the heating of the water inside Q, that is, the internal energy of the water increases ΔU, and the external forces (the weight force of the lid) when the water vapor lifts the kettle cover. Then it is possible to write a mathematical expression of the I-(head) Law of thermodynamics in the form of a sheep:
$Q = \Delta O + A$ (1)

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Hence, the amount of heat given to the system Q is a fraction of its internal energy ΔU to change, and the system is used to do a job against external forces.

Such a definition has also been adopted that further illuminates the physical essence of this law of thermodynamics, that is, affirms that it is impossible to create an eternal engine (Latin "perpetuum mobile"): - it is impossible for a periodic moving device to exist that does the job without receiving energy from outside. (1) as can be seen from the formula, if the amount of heat obtained from the outside is Q = 0, then A = - ΔU will be. A minus sign in the expression means that the system performs work due to a decrease in its internal energy. Considering that the amount of internal energy in the system is limited, the engine will stop after it is completed.

In the final part of the lecture, the teacher gives students a problematic assignment. Students, on the other hand, think creatively about the basic information given in the lecture.

By comparison and analogy with such an interactive method described by readers is as follows:

- on the fact that the I-law of thermodynamics is one of the laws of nature that affirms the movement of matter and that it is itself eternal;
- on the conversion of internal energy into mechanical energy when the gas is compressed or expanded;
- on the operation of heat engines based on the laws of thermodynamics, as a result of which it is impossible to imagine the well-being, culture of human beings now without heat engines, since in alleviating the hard work of a person, heat engines play a big role in leading a comfortable life, but in addition to such a useful aspect of heat engines, , they conclude that internal combustion engines release harmful gases into the environment during operation, and these are the reasons why the air is being poisoned.

Thus, the analysis, comparison and conclusions arising from them of the physical essence of the I-law of thermodynamics are embodied in the totality of students ' knowledge, qualifications, skills with methodically improved lesson development based on modern educational technologies.

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