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Research Article

THE IMPORTANCE OF MODELS AND LAYOUTS IN THE PREPARATION OF FUTURE ENGINEERS FOR PROFESSIONAL ACTIVITIES

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ABSTRACT

Simple didactic materials used in engineering education are models, their advantages are that they can demonstrate movement, hold hands and control their movement. In the process of use, future engineers can easily visualize the complex objects being studied, methods of their preparation in an educational institution and the definition of layouts are presented.

KEYWORDS

Design, pressure, temperature, models, layouts, physical models, geometric models.

INTRODUCTION

Models are one type of didactic materials used in the training of future engineers for professional activities. They differ from previous ordinary didactic materials by their advantages such as volume size, the ability to show movement, the ability to hold and control its movement. Therefore, when we use them, future engineers can easily visualize the complex objects under study. Models can come to the school ready, we can prepare them ourselves in the conditions of the school.

A model is a prototype of the studied object made similar to itself, which is made with all-round simplification. This is modeling, and the model being prepared is brought to a suitable scale. First of all, attention is paid to the geometric scale, that is, it is brought to the scale of the audience. Small

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objects can be enlarged, large objects can be reduced, some objects can be made in their own size if they are close to the audience scale. As a result, it will be convenient to use them. If our model is moving, we also need to pay attention to the force scale. The driving forces, such as rotational motion, pressure, temperature, friction, current and other forces, must be proportional to the geometric dimensions of the model. Otherwise, if the force is small or large compared to the dimensions of the model, we will not be able to show the desired movement.

The model should be simplified as much as possible. It is enough to have basic geometric elements and details that perform the main work, otherwise it will be uncomfortable to use.

The appropriateness of the model is determined by the desire to achieve a certain result and its importance. Practice shows that the real effectiveness of education is the maximum possible matching of the goal and the results obtained according to all the specified parameters. It can be seen that the vagueness and non-diagnosability of goals make the multi-planned and multi-layered system of evaluation of educational results predictable and arbitrary. Accordingly, the scientific research of V.I. Andreev [1] discusses the problem of scientific setting of educational goals and improvement of the set goals.

In most technical schools, laboratory work in electrical engineering and physics is performed on various sized and complex electrical devices, such as ANN-70, ANN-90, "Razryad"-1. Such large-scale machines and devices require a lot of space and require special laboratories to install them. In addition, they do not have the opportunity to conduct independent laboratory work for each future engineer. One more active student in the group does the work, while the others participate as simple passive observers. Also, it takes a lot of money to buy and install such a variety of huge and complex machinery. In this sense, the development and creation of a model of a small-scale universal teaching-artificial laboratory device complex has an important pedagogical value. This can be justified by the fact that in small-scale devices, each future engineer will have the opportunity to carry out laboratory work on an individual basis, to have deep knowledge, solidity and efficiency.

V.V. Kraevskiy mentions that the process of modeling scientific knowledge is especially difficult for pedagogy and at the same time necessary [2].

The process of initial preparation of a simple model of a high-voltage universal TV device from TV or computer parts is shown in Figure1.

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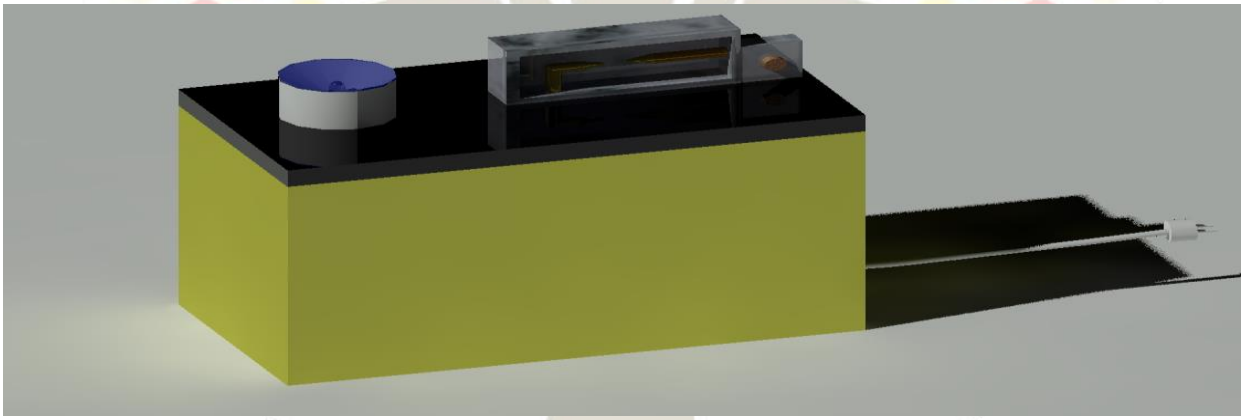
Picture 1. The process of preliminary preparation of a physical model of a didactic electronic device.

Below, as a result of our many years of creative research, we created a physical model of a 25 kV didactic electronic device from TV and computer parts in order to implement interdisciplinary integration in the essence of the STEAM educational methodology in Figure 2



2 – picture. Created physical model of high-voltage universal teledevice.

On the basis of the use of didactic artificial electronic devices, future engineers will increase their interest in the integration of electrical engineering, physics, material sciences and direct the study process to scientific and creative activities.

Another characteristic of the modeling method, which is of great importance in pedagogical

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research, is its universality. This model is not tied to any particular stage of research and can be used in many stages. Another important aspect of the modeling method for the researcher is that it is the implementation of prediction (prognostic), which is important in pedagogy. Modeling is the study of objects of some events, processes or systems with the creation of their models, optimization of the methods of construction of new objects from models, and determination or specification of their characteristics [3; 4; 5].

We mainly distinguish three types of models. These are geometric, physical and functional models.

Physical models represent the physical properties of the object being studied. For example, we use physical models to represent friction, pressure, temperature, magnetic field, rotational motion, and other properties. Continuing with the above example, we can explain that the physical model of the cylinder and piston of an internal combustion engine, as a result of the increase in temperature in the combustion chamber of the cylinder, creates pressure and forces the piston to move.

Geometric models provide information about the geometric properties of the studied object, that is, relative sizes, shape and geometric elements. For example, the geometric model of the cylinder and piston of an internal combustion engine provides information about its geometric structure and relative dimensions.

Functional models are distinguished by their complexity. They are designed to show the function of the studied object, and show the operations performed, such as walking, lifting, cutting. If we develop the example given above, we can show that the advance-return movement of the piston in the internal combustion engine gives a rotational movement to the crankshaft and the function performed by the engine.

Layouts are considered more complex than models and can contain multiple objects. In this regard, the layout may contain several models. They can be models of technological machines and equipment, models of buildings and structures, and models of technological processes. In engineering education, with the help of models of technological machines and equipment, we can show their structure, principle of operation and technological operations. For example, if we take a model of a drilling machine, it may consist of the main elements of the machine: a table for fixing the jig, a machine body, a drill, an electric motor, and a rail.

Models of buildings and structures are designed to show the structure, location and function of buildings and structures in different buildings. For example, a model of a residential building, a model of an elevator. In such layouts, we can show the elements of the building, the structure of the structure, what kind of technological machines and equipment it consists of, what kind of technological operations they perform among themselves.

Models of technological processes are the most complex models, they are a complex model that provides information about the entire enterprise.

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It may also contain models of various models, technological machines and equipment, as well as models of buildings and structures. With the help of such models, the technological operations or processes performed from bringing raw materials to the production of products can be imitated. As a result, future engineers are more interested in studying this process, and it becomes easier to imagine and understand it. For example, if we take the model of a cement plant, then the production buildings and structures of the enterprise will be placed in this model based on a sequential technological process.

Such layouts can even be made movable. In general, these models will greatly help future engineers to develop their professional skills, learn to manage the sequence of technological operations during the production of products. At this point, if we also touch on the stands, these are didactic materials that are part of complex exhibition materials. Therefore, the stands, unlike ordinary didactic materials, are used mainly as fixed ones. Stands can embody several topics in one direction, even a whole science. Therefore, all kinds of didactic materials can be used at the stands. They provide summarized information.

Stands can be related to the study of topics, technological machinery and equipment, or chemical technological processes.

In conclusion, physical models show the physical properties of the studied object. For example, physical models are very important to show friction, pressure, temperature, electric magnetic field, rotational motion and other properties. In the models, we can show the elements of the building, the structure of the structure, what kind of technological machines and equipment they consist of, and what kind of technological operations they perform among themselves. These are very important for engineering education. is important.

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