

## On forming primary class pupils' basic technical culture

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**Abstract :** *În articol se abordează problema formării culturii tehnice elementare la elevii claselor primare; se descrie metoda analogie utilizată la familiarizarea elevilor claselor primare cu unele noțiuni tehnice.*

**Key words:** *pupils, developing basic technical skills, analogy method, hydraulic, electrical engineering.*

The presence of technology is felt by the man at all ages, including school age. In everyday life pupils deal with different technical objects that are part of certain technical areas. For example, the tap and the drinking water supply system are part of hydraulics; the iron, the lighting system and the electric bell – electrical engineering; the heating system is part of thermotechnics.

Many technical objects that are used in everyday life are made of components from various technical domains. For instance, the juicer is made of components from electrical and mechanical fields. Thus, pupils, by interacting with technical objects accumulate a stock of information that comes from different domains of technique; however, this information is obtained in a chaotic manner, randomly. This stock of information will become useful for the training of basic technical skills only if it is systematized. Besides, the systematized information about technical objects will serve as a propedeutics ground for the pupils in their acquisition of knowledge during their subsequent study of several school disciplines. In terms of the above suggestions, the forming and systematization of technical knowledge have an important role in the training of primary class pupils' technical skills.

The training of basic technical skills depends greatly on the teaching methods used in the learning process [1]. One of the innovative teaching methods with good results in the training of technical skills is the analogy method. By the term analogous technical objects we define technical objects from various domains, which have similar functions, or similar core constructions, or similar principles of functioning.

Being aware of the importance of the *analogy method* in the training and systematization of technical information in the thesis “The methodology of promotion primary class pupils' basic technical skills” was conducted a teaching experiment on the training of basic technical skills in the primary school [3]. The

main issue was the explanation of the function, construction and the working principle of some technical objects frequently used by pupils as well as the systematization of technical information about these objects achieved sporadically by the pupils. The focus was on the analogy between hydraulics and electrical engineering.

The basic objectives of the experiment were:

- Training and systematization of the knowledge about the function, construction and the working principle of some technical objects from the hydraulic field.
- Training and systematization of the knowledge about the function, construction and the working principle of some technical objects from the electrical field based on the knowledge from the hydraulic area by using the analogy method.

The design of the experiment was created by respecting the principles of psychology, particularly - the stages of intellectual development of pupils. As mentioned in the psychology literature, between 7 to 10 years, children have a concrete thinking [2]. The thinking operations are related to object actions. At this age pupils encounter difficulties when they try to get out of the limits of information seized on illustrative support. The pupil can't make a generalization as he is bound to concrete material support. The operations of thinking are based essentially on tangible immediacy of the moment. The pupil hardly performs the transfer of common meaning from an area to another.

At the age of 11-12 years, the thinking of the pupil reaches a new stage of development - the stage of propositional operations. Starting with this age, we deal with the formal (abstract) thinking which becomes systematic at the age of 14 -15 years. The formal thought implies the launching and formulation of hypotheses, their review and conclusions. The thinking is no more related directly to objects or illustrative support. The pupil can make the transfer of common meaning from an area to another. The pupil can reason from cause to effect and vice versa.

Thereby, the teaching-learning activities using the analogy method were focused on concrete technical objects. The technical information was selected from the field of hydraulics, since the pupils can easily understand the construction of technical objects in this field, its function and its working principle. The pupils can pass easily from this area to another by reasoning using the analogy method, the technical objects from the area of electric engineering being much more difficult to observe through the sense organs.

We present below 2 columns containing technical information from the areas of hydraulics and electrical engineering that were focused on using the analogy method.

## Concepts in the field of hydraulics

- hydraulic conductor
- liquid molecules
- fluid power
- pressure difference
- hydraulic resistance
- the union of liquid pipes in series
- the union of fluid in parallel pipes
- hydraulic circuits
- liquid pump
- hydraulic motor
- hydraulic accumulator
- tap
- hydraulic safety valve
- hydraulic connection elements

## Concepts in the field of electrical engineering

- conductor
- free electrons
- electricity
- potential difference
- electrical resistance
- the union of electrical conductors in series
- the union of electrical conductors in parallel
- electrical circuits
- generator
- electric motor
- electric battery
- electric switch
- electrical fuse
- electrical connection elements

The general scheme of teaching-learning activities was the following:

*I stage* – teaching-learning of the function, construction and the working principle of some technical objects from the hydraulic area.

*II stage* – familiarization of the pupils with the function, construction and the working principle of some technical objects from the electrical field, using the analogy method.

*III stage* – conclusions: formulation of common significance for the technical objects from the area of hydraulic and the technical objects from the electrical field.

For example, we shall reflect the study of the hydraulic safety valve and the electrical fuse.

*Stage I* – function: the hydraulic safety valve is designed for the protection of the components of the hydraulic circuit of hydraulic overload (when the pressure of the liquid is bigger than the nominal one); construction: the valve consists of a cell body (ball, cone or cylinder), which is pressed by a spring valve seat; the working system: when the pressure in the hydraulic circuit is bigger than the nominal one the mobile element moves against the spring defeating its strength resistance and automatically opening the way to the fluid reservoir; the excess of the fluid returns to the reservoir, thus, decreasing the pressure in the hydraulic circuit.

*Stage II* – function: the electrical fuse is designed to protect the components of the electrical circuit of over current (when the intensity of the electricity is

bigger than the nominal one); construction: the electrical fuse is a copper wire of a certain thickness outdoor stretched between two terminals; the working principle: in case of exceeding the nominal value of the electrical current intensity, the copper wire heats up and melts automatically cutting off electrical circuit.

Stage III – conclusions: as we can see, the hydraulic safety valve and the electrical fuse fulfill the same function: protect the components of the electrical and hydraulic circuits of overload. We can say that in terms of function the hydraulic safety valve and the electrical fuse are analogous.

Thus, in the process of studying these technical objects, by using the analogy method, the pupils will perform the transfer operations of a common significance (of function) from one technical field to another (in our case, from hydraulics to electrical engineering). We mention that the transfer operations was made from an area easily observed (the movement of the fluid can be see with the naked eye) to another in which the observation is more difficult (the movement of free electrons cannot be seen).

Based on the analysis of the experiment, the following conclusions were determined:

- The pupils understood the technical information on the function, construction and the working principle of some technical objects from the hydraulic area.
- The pupils understood the technical information on the function, construction and the working principle of some technical objects from the electrical area using the analogy method.

From the ideas outlined above, we can trace the importance of the systematization of the technical information obtained by the pupils in a chaotic manner in everyday life as well as the importance of the analogy method in the training of primary class pupils' basic technical skills.

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