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Generalized concepts about machines for future technology teachers in Ukraine

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Abstract. *The article justifies the need to replace the content of the mechanical science knowledge of future technology teachers, selected from the professional activities of a design engineer in the mechanical engineering industry, with the content of the mechanical science knowledge of the machine user. Accordingly, the gearbox as a basic unit of a working machine is studied not for the development of design documentation intended for its manufacture, but for schoolchildren to clarify the essence of the technical phenomena used in it.*
Keywords: *technology teachers, mechanical science knowledge, gearbox, technical phenomena.*

Mechanical science training of future technology teachers in Ukraine is a component of their professional training. In particular, the curricula include a mandatory complex discipline "Working machines" with a module "Machine parts". Traditionally, the content of this module coincides with the content of the same academic discipline in the curricula of future engineers in Ukraine.

However, if in the 20th century, when implementing the concept of polytechnics, such an approach was functional, then in the 21st century, when implementing the competency-based approach, the content of mechanical science knowledge of future technology teachers became irrelevant to the content of their professional activities. Let us reveal the essence of the irrelevance of the actual mechanical science knowledge of future teachers of labor training. The organizational forms of studying mechanical science are lectures, laboratory and practical classes, as well as a course project. During lectures, students receive theoretical knowledge about the morphology and design calculations for the strength of the main mechanical gears (cylindrical gears, bevel gears, worm, chain, screw-nut, friction, belt). During laboratory classes, they determine the main geometric dimensions of real mechanical gears (models or machine units). In practical classes, the main kinematic parameters of real mechanical transmissions are determined, and calculations are made for the strength of gear transmissions. The formed mechanical science knowledge and skills are practically implemented in the design of a single-stage gearbox. The gearbox as a design object has been used for almost a century in the training of future engineers and was mechanically transferred to the training of future technology teachers. The result of the course project is a set of design documentation, with the help of which it can be manufactured at the factory. It is clear that this design documentation has no relation to the professional competence of the future technology teacher. We proposed to use the gearbox to study three

generalized technical phenomena: transmission of mechanical motion in space; changes in kinematic parameters; changes in force parameters [2]. In further research, we substantiated the concept of "worldview mechanical science knowledge" in accordance with the concept of the machine user [1]. In both studies, we proceeded from the statement of researchers led by E. Crawley that the life cycle of machines is closely related to the energy laws of their functioning [3].

The results of studying three generalized technical phenomena by future technology teachers will be knowledge and skills related to the transmission of rotational motion to any point in space, understanding on a multidisciplinary basis why the angular velocity of the driven shaft changes if the diameters of the driving and driven elements of mechanical transmissions are changed, understanding on a multidisciplinary basis why the torque changes if the diameters of the driving and driven elements of mechanical transmissions are changed.

The relevance of such mechanical science knowledge will be that on their basis it will be possible for future technology teachers to organize educational design and construction in mechanical science for senior school students. By carrying out educational projects, schoolchildren will realize the energy laws of the operation of any working machine, regardless of the type of drive used in them. The results of educational projects can be models of mechanical transmissions made by schoolchildren, expert conclusions about the specifics of implemented technical phenomena in specific mechanical transmissions, analytical reviews of energy patterns in specific samples of robotics, etc.

The use of knowledge about generalized technical phenomena in teaching schoolchildren will also allow overcoming the fundamental drawback of technical knowledge - their utilitarianism, which did not allow technology teachers to form a cognitive interest in machines. This opens up the prospect of forming a spectrum of educational narratives that will stimulate the interest of schoolchildren and the development of the cognitive interest of schoolchildren on its basis.

We see the prospect of further research in the formation of systemic knowledge about generalized technical phenomena based on the use of systems of educational tasks, as well as systems of educational narratives.

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