Technology and Language Технологии в инфосфере
2020. 1(1). 49-50
https://doi.org/10.48417/technolang.2020.01.11

Engineering Education – Convergence of Technology and Language

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Abstract
This essay for the inaugural issue of *Technology and Language* demonstrates the close relationship between technology and language with just a few examples from engineering education. Just like a name becomes meaningful in the context of a sentence, the meaning of an engineering object depends on external circumstances. This relation between technology and language is not the same in all Engineering cultures and languages, however – as testified by the differences between engineering education in Russian and English.

Keywords: Engineering education; Language of kinematics; Russian and English engineering languages

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* рассматривается тесная взаимосвязь между технологией и языком на нескольких примерах из инженерно-технического образования. Подобно тому, как имя становится значимым в контексте предложения, значение технического объекта зависит от внешних обстоятельств. Однако эта связь между языком и технологией не одинакова в различных языках и культурах, о чем свидетельствуют различия между инженерным образованием на русском и английском языках.

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The knowledge and experience gained in technology are concentrated in a system of concepts, designations, relationships and other phenomena. For engineering, this system is a convoluted, condensed knowledge in the form of a symbiosis of linguistic and non-linguistic elements. Mastering a profession involves learning the rules of compressing, coding relevant information and the rules of decoding it. Engineering educational practice provides ample room for reflection on the relationship between technology and language.

The purpose of a study course on the *Theory of Machines* is, *inter alia*, to systematize the mechanisms and their parts. At the same time, students have to learn a specific language, which Franz Reuleaux referred to as the *language of kinematics*. The units of this *language* are names of kinematic pairs, links, and there are rules by which these units are combined and assembled to form a kind of sentences, relevant to the structure of mechanisms. Following Ludwig Wittgenstein's logic, units of the language of kinematics are related to sentences (and utterances) in the same way as semantic knowledge corresponds to factual knowledge about an object. The logic-semantic thesis of Wittgenstein that a name only becomes meaningful in the context of a sentence is expressed in engineering science in the fact that the name of an object depends on certain phenomena external to it. Thus, one of the main objects considered in the course on *Strength of Materials* is a "bar." Depending on the type of the external load on an object, the semantic meaning of this name, that is, knowledge of the possibility of certain facts, can be transformed into the factual meaning represented by a triad: bar = *rod* (for tension – compression), bar =*shaft* (for torsion), or bar = *beam* (for bending).

The relationship between technology as a system of knowledge and language as a system for capturing this knowledge becomes particularly important with the internationalization of higher engineering education. Different natural languages follow their own logic, so even within the same course, objects with the same content may have different names in different language systems (English-Russian-Chinese, others). In engineering courses in Russian, mental and speech constructions often tend to capture and describe a *situation*, and in English to express *process* and *action*. For example, in all Russian textbooks for the course *Strength of Materials* there is a section «Stress & Strain at a Point» (naming, stating a certain phenomenon). The student will not find a similar section in an English-language textbook if he/she does not understand the logic of a study material, namely that stress and strain change when the position of an elementary plate/volume changes in the plane/space. In the English textbook the section is called "Stress and Strain Transformation" (action).

It is important for teachers and students to understand the interaction between technology and language that reveal itself in many ways.

Eduard Krylov