

## DEBATE AND EDUCATION

## Medical physics education from the view of the possible structural changes

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Teaching subject physics at the university level represents a specific didactic transformation of the scientific field — physics. The determination of the content, extent, used methods, mutual relation to other subjects of curriculum as well as to the entrance knowledge of students are the most important parts of pedagogical activities in the educational process.

Based on own experiences, successes and mistakes in teaching so-called medical physics the authors discuss didactic procedures which should support the interest and creativity of students. Some changes in the structure of physics education are recommended. The usefulness of the international collaboration in the framework of projects such as TEMPUS, ERASMUS is also remembered.

The interaction of the physics with the medicine takes place on three levels:

1. inorganic,
  2. biological,
  3. information.
1. The interaction of the first type is based on the fact that physical laws are valid without the exception in all matter, i.e. also in living systems. It follows from this notion the need of the research of these systems from the point of view of physical properties as well as the need to study various physical influences on living systems. The sum of these problems is the content of a scientific discipline usually called the biophysics.
  2. The second type of the interaction is based on the fact that the genesis of all living systems is in physico-chemical systems, therefore many fundamental behaviors of these systems can be derived in principle from physico-chemical laws, i.e. in the last step from physical interactions. Problems of this category are a part of so-called synergetics and form the basis of theoretical biology.
  3. On the highest level of the evolution of natural systems the information phenomenon starts to have a dominant role (according to J. Krempasky) (1).

All above mentioned problems together form an interdisciplinary scientific discipline which should be didactically transformed into the teaching subject — medical physics. It should be reflected in the content, extent, used teaching methods as well as in the relation of the medical physics to the other subjects of the medicine curriculum. Some of these problems are discussed in our other poster contribution (2). Here we would like to comment shortly

one of lately published didactic structure from the point of the way we are using it in our pedagogical process (Fig. 1).

**Algorithm of teaching (HOW?)**

The contemporary extent of the physics teaching at the School of Medicine of the Comenius University in Bratislava is one semester in the first year of the study (fall semester) and it is usually represented by 3 hours of lectures and 3 hours of practical exercises (laboratory works) per week. The instruction of informatics is provided also by our Institute in the extent of ten hours of practical lessons during the summer semester.

The physics education for foreign students in English language takes place in the fall semester of the 1st year with the same number of teaching hours (3).

The practical exercises (laboratory works) are performed in the closed cycle system and they are characterized by three basic parts: A, B, C, which are arranged into the following didactic situations in accordance with a claim of pedagogic-psychological laws and relations (Tab. 1).

Times given in the table are only informative ones, they are a function of the subject matter (content, difficulty, etc.) of the given task (3).

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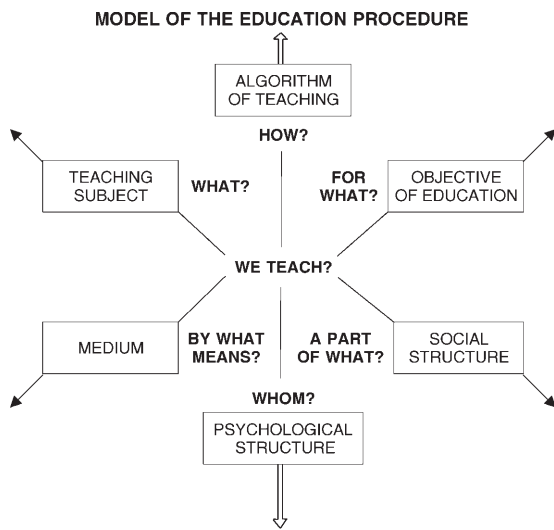


Fig. 1. Model of controlling cycle of education stimulating an education objective (according to von Cube) (3).

#### Teaching subject (WHAT?)

Medical physics, Informatics.

#### Psychological structure (WHOM?)

Students coming from secondary schools, mostly Grammar schools.

#### Social structure (A PART OF WHAT?)

Slovak students and students studying in English language.

#### Medium (BY WHAT?)

The Institute of medical physics and biophysics at the School of Medicine, CU, has had a significant success in presentation of teaching equipment, which has been developed in order to modernize practical teaching. At the Institute a zero set of electronic models of physiologic functions as well as biological and physical processes completed with teaching texts was developed.

By introducing these model tasks into practical lessons we want to acquaint students with the terminology of the model, the aim and the purpose of the modeling. In physical biomedical models properties of biological systems can be illustrated mostly by electrical quantities.

#### Objective of education (WHAT FOR?)

We would like to stimulate creative and exact thinking of students which is considered as a very important part of the education process in physics and in physical application in several science branches, especially in medicine. To reach this aim non traditional physical tasks are used.

Tab. 1. Pedagogic-psychological laws and relations.

A	1.	Solution of the running test	10 min
	2.	Pre-strengthening discussion	
	3.	Announcement of correct answers	7 min
	4.	Initiation of contradiction	
	5.	Presentation of teaching objectives	27 min
	6.	Creation of thesaurus	
B	7.	Making the 1-st part of the subject matter accessible	30 min
	8.	Individual working	12 min
	9.	Evaluating interview	6 min
	10.	Making the 2nd part of the subject matter accessible	21 min
	11.	Individual working	12 min
C	12.	Evaluation of the laboratory work	7 min
		Checking and correction of the learning activity	

#### The international collaboration

Integration tendencies in natural sciences, including physics, has contemporary manifested in educational projects at schools and exclusive at universities and colleges. Some of these projects are international projects and it would be of a great interest for us to find some possibilities how to exchange ideas and experiences with colleagues from abroad (4, 5, 6, 7).

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