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## Medical Metaphor as an Instrument of Increasing Performance of International Students from the Preparatory Department

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### Abstract

The aim of the article is to decrease the academic difficulties of international students studying "Biology" in Russian within the pre-university program. The authors discussed the educational expediency of using metaphors in the teaching process for international students wishing to take a medical program in the future. The occurrence of new medical metaphors and their usefulness in the frame of a Biology course are demonstrated. Examples of problems designed with medical metaphors are shown. The authors reveal the essence of medical metaphors and classification principles of metaphorical terms. Lexical analysis of medical-biological literature was conducted to identify metaphors and their distribution in the methodical materials for students. The metaphorization helped to identify interdisciplinary bonds between the natural-scientific and humanitarian courses. The authors proposed to include the supplementary material "Medical metaphors" for teaching Russian language and to expand the set of educational materials for international students of medical-biological profile within the pre-university program.

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## 1. Introduction

Development of scientific knowledge and introduction of new technologies into all spheres of life lead to the changes in the familiar image of a student. Today students (including international students) have a great arsenal of electronic capabilities for learning at their disposal and enjoy high accessibility of the information. At the same time two trends are visible: (1) decreasing ability to process verbal information, (2) sharp drop in the ability to concentrate attention on the subject matter. The portrait of a teacher and pedagogical approaches to education are also changing. National curriculums in Great Britain and Japan and the National Science Education Standard in the USA state that the aim of education is to prepare young adults to the social life, develop critical thinking abilities and a desire to renew knowledge. American educator William A. Wirt noted that the task of pedagogy is not to give profession to a man, but to create such professions that could simultaneously serve as personality expression and be socially useful (National Curriculum, 1988; Wirth, 1988). Therefore, the search for new forms of class exercises based on a learner-centered approach becomes essential.

Formation of the pre-professional competency in international students at the preparatory department starts with the introduction of physics, chemistry, mathematics, and biology into the program. Teaching of biology is always supported by a rich linguistic foundation. However, weak knowledge of Russian language, unformed visual thinking, and lack of capacity to create his own associative array prevent the foreign student from understanding and remembering medical terms and expressions. Training of the learners in non-mother tongue has several difficulties, and study of medical science presents one more problem – wide use of metaphors. In the teaching process, instructors faced several casuistic cases that took place during biology classes. Thus, incorrect audition of the term “proteins” (Belki – rus., second syllable is stressed) caused miscomprehension by the international student as he thought that the lecturer referred to squirrels (Belki – rus., first syllable is stressed). A medical expression “pelvic/pectoral arch” in Russian is “poyas nizhnikh/verkhnikh konechnostey” and “poyas” means “belt” in Russian, which causes confusion among international students. Another example is the term “gastrointestinal tract” (“zheludochno-kishechny trakt” in Russian). As the English word “track” (similar to “trakt” in Russian) has a meaning “road”, an instructor on one occasion had to spend significant amount of time explaining Russian terms connected with roads and traffic to distinguish them from “trakt.”

One may ask the question, whether it is necessary to use metaphorical terms at all in teaching biology to international students at the preparatory department. In order to answer it, it is necessary to understand what a metaphor is. Metaphor is transference of properties of one object or phenomenon to another based on a common feature for both ((Electronic version). URL: <http://www.lingvo-online.ru/ru/Translate/en-ru/metaphor/Data> check: 05/08/2015). In itself, metaphor comes under universals of natural languages and essentially cannot be removed from the terminology, which is a product of the natural language development. Metaphor acts as the link between scientific and common registers, adorning the language and giving it picturesqueness and verve (Golovina, 2010; Ozingin, 2009). Besides, medical terminology has historically always been full of metaphors and continues to be enriched with new terms -- metaphors (Ozingin, 2009; Sedov, 2000). Many authors think that at present and in the near future, the development of biology and medical science will be connected with the creation of new metaphors that will form from the notions and models from ecology, biotechnology, cultural science, psychology, sociology and many other biological and humanitarian sciences. This tendency can be traced in vocabulary, syntax and stylistics of the latest genetic and biological reviews, articles and lectures (Sedov, 2000). Thus, some of the terms that would not have been used ten or fifteen years ago are now set expressions, for example, “interleukin cocktail”, “intimate mechanisms of hematopoiesis control”, “ignorant DNA”, “bouquet stage”, etc. Metaphorical naming is also one of the most effective mechanisms of creation of terminological items necessary for the linguistic fixation of the new processes and notions (Ozingin, 2009; Sedov, 2000; Utkina & Gulyaeva, 2006).

The aim of this research is to ascertain the possibility of using metaphor as an instrument for increasing academic adaptation and formation of pre-professional competenc of international students of biomedical profile at the preparatory department.

## 2. Research material and methods of analysis

The subject of the research are metaphorical terms found in the texts of teaching aids on biology that are used in classes for international students of the preparatory department. This work employs modern descriptive methods of system analysis of linguistic phenomena, componential analysis of lexical meaning, cognitive and linguoculturological methods of language analysis, as well as empirical methods. Data from special literature for the courses “General biology”, “Botany”, “Zoology”, “Basic concepts of anatomy” that were written for international students of the biomedical profile of the preparatory department were used as material for research. Medical texts of different genres (medical textbooks and courseware, monographs and scientific articles on various spheres of medical science) were also used as material sources.

## 3. Research results and discussion

According to one of the classifications, any metaphorical term can be divided into several categories: (1) its origin (in science or practice); (2) what structural level of biology does it characterize; (3) when did it first occur (Golovina, 2010; Dyachenko, 2003; Ozingin, 2009).

At the first stage of the research it was important to divide metaphors along the first criterion. On the basis of continuous sampling, 500 medical metaphor terms were revealed. Analysis showed that anthropomorphous metaphors include naming units formed from the name of historical personalities and characters from the classical literature, fairytales, and myths. Among zoomorphic metaphors one can notice naming units of the animals or body parts of animals, birds, and insects. Geomorphic objects that are subject to metaphorization include names of celestial bodies, atmospheric phenomena, elements of the landscape, flora, and fauna. Conceptual naming is based on names of kinship, professions, and lines of work. Semantic distribution according to the sphere of lexis borrowing is presented in the Table 1.

Table 1. Semantic distribution of medical metaphors (sphere of lexis borrowing).

Group No	Group name	Examples of metaphors
1	Anthropomorphous	Tailor's chest, Cobbler's chest, "Roly-poly toy" syndrome
2	Zoomorphic	Snakeskin, Hare-lip, Wolf jaw, Chicken breast, Goose gait, Beef heart, <i>Grudnaya zhaba</i> (Angina pectoris, in Russian is known as <i>zhaba</i> , which also means "toad"), <i>Mushki v glazakh</i> (Floaters, in Russian are known as <i>mushki</i> , which also means "midges")
3	Geomorphic	Moon face, Tower skull, Marbled skin, Barrel-shaped/funnel chest
4	Myths	Medusa head, <i>Litso sphinksa</i> (Myopathic facies, in Russian known as "Sphinx face"), Olympian forehead, Adam's apple
5	Conceptual	Stargazer's head (condition at ptosis), <i>Mishtsa gordetsov</i> (Procerus muscle, in Russian known as arrogant man's muscle), Knife-like pain, Herald patch (In Russian – Mother patch), Miner's disease, Fencing posture, Washerwoman's skin

Classification of the metaphors along the second criterion revealed all levels of living things' organization (molecular, cellular, tissular, organs, and organism). Semantic distribution according to the structural level of living things' organization is presented in the table 2.

Table 2. Semantic distribution of medical metaphors (structural level of living things' organization).

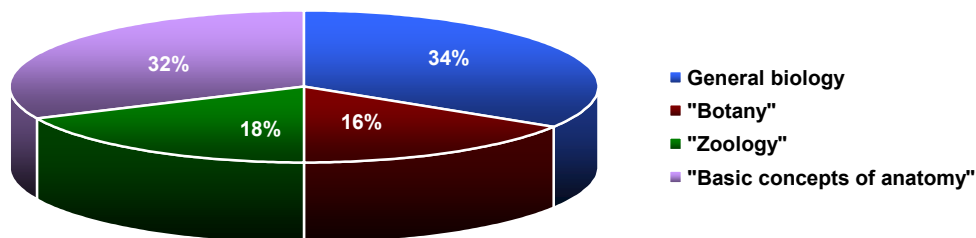
Group No	Group name	Examples of metaphors
1	Molecular	Gene drift, Silent gene, interleukin cocktail
2	Cellular	Cleavage spindle, cell wall, nuclear pore, crescent cell, targeting cells
3	Tissular	Ascending/Descending fiber tracts, Conductive tissue, Branches of the nerve, Starburst veins

4	Organs	Calices-pelvis system, Root of tooth, Ethmoidal labyrinth, <i>Tschitovidnaya zheleza</i> (Thyroid, in Russian from the word <i>tschit</i> – shield), Aqueduct of cerebrum, Willis artery, Pons Varoli, Sylvian aqueduct, Anterior circulation
5	Organism	Ballerina pose, Seaman's gait, Hare-lip, Wolf jaw

Analysis of the lexis along the third criterion showed that appearance of the metaphorical terms can be traced back to the times of Galen, Paracelsus, and Hippocrates. This usage of this lexis has been increasing progressively following the development of medical science (caesarean section, pugilistic stance, legionnaires disease, and killer cells) (Dyachenko, 2003; Ozingin, 2009).

It can be seen from the material presented that medical terminology is rich in metaphors and continues to be enriched by the new metaphor terms, lexis for which is being borrowed from such sphere as everyday life, jobs, nature, and history. Most of the metaphors belong to one sphere of medical science – therapy, which is not being studied at the preparatory department. Therefore, the next step was the analysis of the teaching aids on biology for international students in order to allocate metaphors.

Analysis of the special literature for international students of the biomedical profile of the preparatory department revealed 150 metaphor terms. Different branches of biological science have different frequency of metaphorical terms allocation (Picture 1).



Picture 1. Frequency of metaphor allocation along the branches of biology.

Obviously, the largest number of metaphors is presented in the branches "General biology" and "Basic concepts of anatomy". Examples of metaphorical terms used in training of international students of the biomedical profile of the preparatory department are shown in Table 3.

Table 3. Metaphorical terms of different branches of biology in the lexis of teaching aids for international students of the preparatory department.

No	Branch	Examples of metaphors
1	«General biology»	String of DNA(RNA), Cell wall, Nonpolar tail of lipids, Nuclear sap, Cytoplasmic reticulum, Sodium-potassium pump, Cleavage spindle, Equator of a cell, Struggle for existence, Clubbed fingers, Mitotic spindle, Metaphase plate, Replicating fork, Lampbrush chromosome, Sister chromatids
2	«Botany»	Plant kingdom, Strengthening tissue, Conductive tissue
3	«Zoology»	Sucker cups and hooks of scolex, Tubemakers, Pork/beef tapeworm, Antennae of crawfish, Pulmonary sac, Nerve knot and ring, Lateral line
4	«Basic concepts of anatomy»	Spinal column, Pelvic/pectoral arch, Risorius muscle, Procerus muscle, Pelvic bones, Articular capsule, Aortal arch, Pericardial sac, Apex beat, Incomplete rings of reinforcing cartilage of trachea, Cardiac electrical axis, Bronchial tree, Digestive tract, Gastric/pancreatic juice, Minor calyx, Kidney pelvis

The next step was a classification of the chosen metaphors taking into account spheres of lexis borrowing (Table 4).

Table 4. Allocation of metaphors in biology along the spheres of lexis borrowing, items.

Branch of knowledge	Geometry	Physics	Geography	History	Anthropology	Everyday life
Branch of biology						
«General biology»	2	3	3	1	6	36
«Botany»	2	1	6	2	3	10
«Zoology»	8	4	7	0	1	8
«Basic concepts of anatomy»	5	2	3	0	7	30

1. Write the expression matching medical metaphor that is used in physics, as in example.

Medical term	Physical term
Cardiac electrical axis	<i>Electricity</i>
Motor nerve	
<i>Maliy (bolshoy) salnik zhehudka</i> (Gastrohepatic/Gastrocolic omentum)	
Ascending/Descending fiber tracts	

2. Finish sentences, using pictures:

- (a) A tooth consists of a crown, neck and \_\_\_\_\_.
- (b) Bronchi are split into branches and diminish in diameter, forming a bronchial \_\_\_\_\_.
- (c) Sanguimotion goes through lesser and greater \_\_\_\_\_.



Picture 2. Fragment of the final test with the metaphorical terms (tasks 1 and 2).

It is worth noting that this allocation is quite provisory, because a metaphorical term consisting of two or more words may be attributable to different branches of knowledge.

Having received and analyzed a selection of metaphorical terms, we tried to use the material as a basis for creation of a new instrument to increase academic adaptation of international students of preparatory department. We have compiled entry, in-progress and final testing materials containing metaphors. Final test was given to two groups of international students that study biology in non-mother tongue. During the process of education, one part of the group was treated by the methodological approach based on metaphors, and the **second** part of the group was educated without such an approach. At the end of the course “Basic concepts of anatomy” students were given a final test. Here’s a fragment of such test (Pictures 2 and 3).







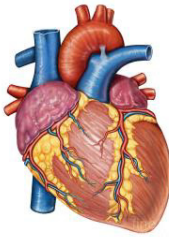
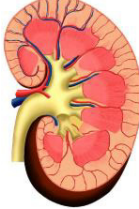
It is necessary to notice that the syllabus of the Russian language course for international students of the biomedical profile to the preparatory department does not allow familiarization with such lexical structure as metaphor and its usage in oral and written speech.

Students, who were regularly completing the additional tasks with metaphorical terms, demonstrated successful performance. High effectiveness of this approach to the teaching of medical terminology is driven by the characteristics of the metaphor as a linguistic phenomenon. Visualization in the process of education; ability to form associative pairs, rows, and fields; ability to secure subconscious fixation of the information; and understanding of the foreign elements – all of these features are intrinsic to metaphor.

### 3. Match the picture with the everyday term or a medical metaphor

Term	Picture number
Juice	1
Gastric Juice	
Acid	
Deoxyribonucleic acid	
Orifice	
Ureteral orifice	
Sac	
Pericardial sac	

The picture for exercise №3

			
1	2	3	4
			
5	6	7	8

Picture 3. Fragment of the final test with the metaphorical terms (task 3).



#### 4. Conclusions

1. Scientific research on the usage of metaphors for training of international students requires not only lexical and empirical research methods, but also an adaptive mathematical apparatus.
2. Effective mastery of biological and medical terminology by international students of the preparatory department is possible when they also study Russian using lexis of special subjects with systematic and constant usage of identical expressions on different disciplines (physics, chemistry, and biology).
3. It appears to be constructive to include a section “Medical metaphor” in the syllabus of the Russian language course for international students of the biomedical profile of the preparatory department.
4. It is necessary to add glossary, dictionary and lexical minimum based on metaphorical terms to the package of teaching and learning aids.
5. It is desirable to develop exercises and test tasks based on metaphors.
6. Metaphors should be used during the preparation of international students for speeches on conferences.
7. The tandem of linguists and biologists for studying metaphorical terms in biology seems to be promising. A result of such joint work could be a method of medical/biological literature comprehension by people lacking the fundamental knowledge in these subjects.

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