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## SCIENCE AND COMMUNICATION: HOW TO TRANSFER KNOWLEDGE?

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*There is no such thing as moral or immoral books.  
Books are well written or badly written. That is all.*

Oscar Wild

A couple of months ago I came back to the University after vacations: well rested, full of ideas and having a strong desire to tell students everything I knew about my “beloved” organic chemistry. The counterpart was even better (in all the cases they were younger, *ça se passe de commentaire*): a large majority of the students are smart, attractive, and well put together. Just seemed to be the best time and place for effective teaching-learning (as we like to say in articles) process. As usual, I had a feel of joy during the first lecture (feeling happy of touching once more I like so much and engaging in my own understanding of the subject) and after the first seminar where students followed generally the logics and way of professor thinking. However, a few days later during the classes followed by the romantic period of our acquaintance I faced the problem: students barely understood some very easy things. Not because they didn’t know, not because they were lazy, as they could understand the more difficult things (I work at the Medical University with the highest students’ percentile). They couldn’t understand very simple things because sometimes we were on a different wavelength. To some extent and in some cases it’s a problem of interlingual interference of the mother tongue (Chittima Kaweera, 2013): one third of my students are overseas and we need to communicate in the international languages, like English or Russian. But misunderstanding is taking place for communication even with the native speakers: and the problems are basically the same we face with foreigners. I thought about the phenomenon for years, tried to explore the problem empirically and now is convinced – communication is a very complicated process consisting of many subunits and some of them are within the formal command of Lexicon and Grammar without taking into account the Context.

A few weeks ago I visited Japan for the first time. I expected to see something mysterious and different from what I used to see in the Europe. I was afraid the Japanese would be closed. Not at all. I liked Japan, but it’s the topic for another article. The Japanese are very friendly and unexpectedly for me there are fond of the western culture (it does not prevent them to keep their own traditions!) and open for communication. In all, the situation I needed the aid, they wanted to help, to explain....but....Usually we faced a problem of communication. The average Japanese I met knew many English words and tried to list them when answering to my questions. But it was a great “gap” between the “object meaning”, they tried to represent. It was the



meaning we usually associate with nouns. We lacked “communication”. I found no connection between the nouns they listed to visualize the objects. I saw no processes which were associated with verbs and attributives. Finally, while staying there we found the other means for understanding: jesters, signs and finally smiles))) and I had nice time in Japan. But coming back to Minsk I thought again about the importance of “connections”, depicting of the processes occurring between the objects. It’s much easier to learn (by heard!) terms, definitions, but more important to understand the process. In some sense it sounds like the educational paradigm.

When teaching foreign students (even, when they are speaking fluently!) I found they can’t understand some word combinations we used to say from school (sometimes from kindergarten). There are basically two main reasons for such misunderstanding. The first one is connected with the specificity of the processes occurring with the Science objects (better to say with models depicting the real objects). For sure, we could find no tradition in folk for visualization of a chemical reaction. But people brewed beer, dyed fabrics, melted metals kept in a pottery kiln... Chemical reactions, such as combustion in the fire, fermentation and the reduction of ores to metals were known since antiquity (Grinev-Griniewicz, 2004). Just the reason why scientists and teachers found some verbs and attributives to visualize the behavior of the Science objects. It’s a question of the Psycholinguistics that is an interdisciplinary field having roots in the Education and Philosophy (Levelt, 2013). It answers the question how do people acquire, process and comprehend the language. In our “Science Education” context it’s interesting to compare how processes are traditionally semantically expressed in different languages. The understanding of semantics can help us to explain better the Science topics not only for foreign, but also native speaking students. For example, we say the reaction *proceeds* or *goes* in English. In other languages we use the other verbs, which are in literal translation will be: *unroll* in French, *run* or *go* in Ukrainian and Slovak, *take place* in Belorussian, *flow* in Russian and so on. Sometimes there are few accepted words, some of them are close to other languages by meaning. However, the literal calque translation can lead to misunderstanding in other languages.

The other issue is connected with **Pragmatics**, which is a subfield of linguistics and semiotics and studies the ways, in which the context contributes to meaning. Just while saying "You have a red light" you are ambiguous. In different contexts it could mean that:

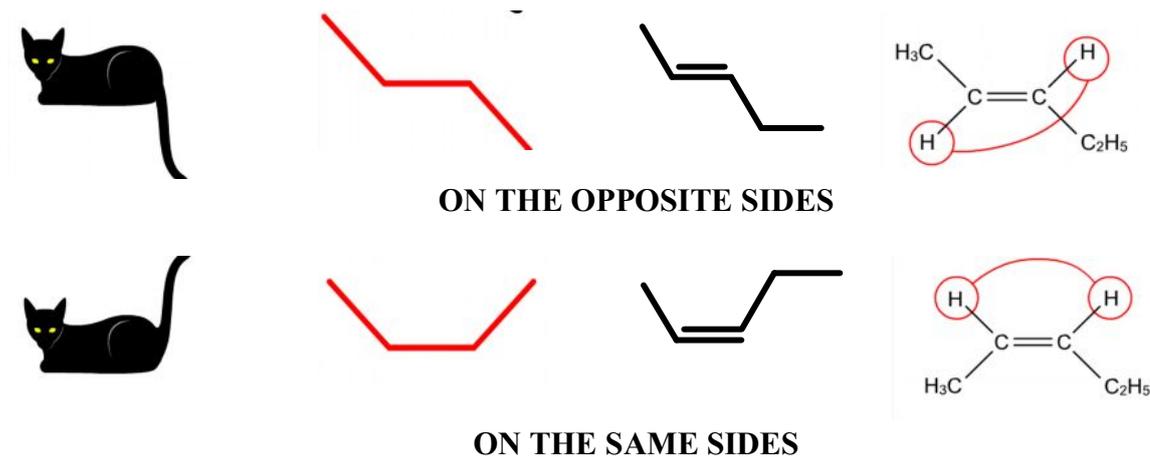
- ✓ you have red lighting in the garden;
- ✓ you face is red because of heart attack;
- ✓ your project was stopped and you failed to be granted;
- ✓ you have a red light while driving your car...

Without knowing the context, it is difficult to understand the meaning with confidence. When teaching foreign students, we face with misunderstanding for the classes accepted in our language. For example, the word combination “distance between atoms” (very frequently used in Chemistry and Physics) sounds in Russian (in literal calque translation) “distance between nuclei”. In English we say (in terminology) about the “ends” of the Carbon chain and in Russian we used to differentiate the “end” and the “beginning” of the chain. There are many other examples. One can say, it’s a problem of command of language. But now I’m convinced a large majority of the native speaking students learned the terms formally by heart and do not understand either object structure or processes occurring with them. To make the understanding easier we need to introduce in Education different types of visualization, including formal techniques (model kits, computer programs, graphic representation) and informal explanation with the aid of image visualization of known objects (Lakhvich, 2010).

For example, structural isomers can be visualized as sequence of animal toys. Structure defines the sequence of bonding, and it looks like the toy animals holding hands each other.

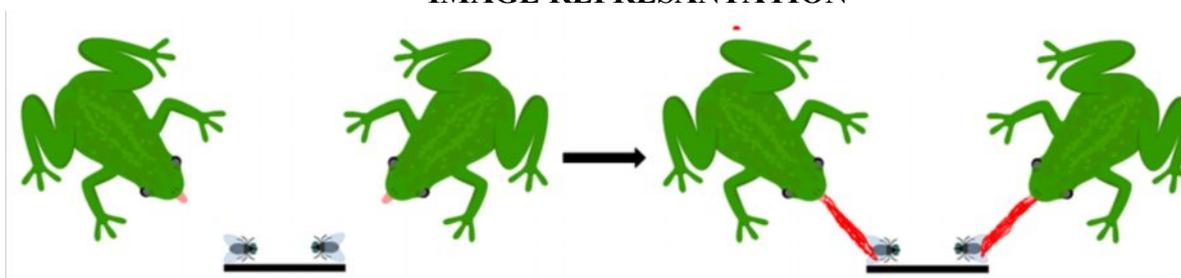


The next example defines the difference (and the process of possible transformation when heating!) between E-Z (cis-trans) isomers.

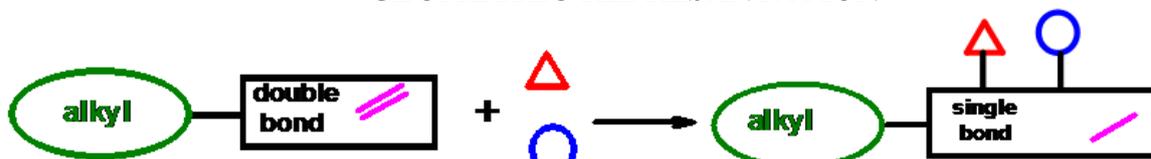


And finally, we tried to visualize the process of the addition reaction by means of image and geometric types of representation followed by the final model presented by a usual chemical graphical form.

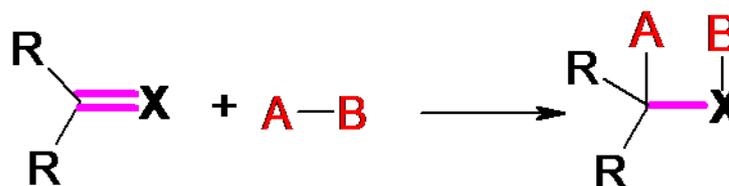
### IMAGE REPRESENTATION

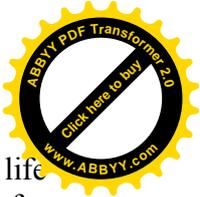


### GEOMETRIC REPRESENTATION



### CHEMICAL REPRESENTATION





Thus, the visualization with the aid of previously acquired models (known from life experience, or from the other disciplines) helps to promote the understanding process both for foreign and native speaking students.

The same is important for writing materials: taking into account, not only manuals, but also scientific articles, as well. In this context the formal knowledge of words and Grammar doesn't mean the effective intra-lingual transfer. And reviewing proposals in English from different countries the members of the Editorial Body face frequently the misunderstanding problem. Subject context means we should use the similar models, both in the Science and Education, operate with the accepted language clichés related to definite field of knowledge and geographic area. When you are not a native speaker, we would advice to avoid the odd idioms, even if they are used in your mother tongue. The shorter phrase means the better understanding. So, do not afraid to put few simple sentences instead of one complex or even complex-compound sentence. Nobody challenges your knowledge about the usage of absolute participle construction. But we want everybody when reading the article clearly understands what the author wanted to say.

And finally, we advice to follow the rules for authors. We just want to repeat once more “All authors must take care of the language revision by they own. The language must be clear and accurate. The work should be written in an impersonal style. The editor reserves the right to send the manuscript to be reviewed. If English is a second language for the author, please consider having the manuscript proof read and edited before submitting”. To comply with the requirements of scientific ethics, I give the citation to the page, which regard our authors what they need to do we understand what they wanted to say in their proposals.

([http://www.scientiasocialis.lt/pec/files/General\\_Requirements\\_PEC.2010.pdf](http://www.scientiasocialis.lt/pec/files/General_Requirements_PEC.2010.pdf)).

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