

SCIENCE EDUCATION: SEARCH FOR HARMONY AND BEAUTY

Those who find beautiful meanings in beautiful things are the cultivated. For these there is hope.
(Oscar Wilde. *The Picture of Dorian Gray*)

Dear Readers!

We all live in a changing interdependent world where Technology and Science are among the forces defining the development of any country, nation and all the civilization. Education gives people skills and knowledge, which make Technology and Science the tools to gain a progress and success. The time science created crisis seems to go away and just now the same science may resolve the most exciting challenges of our civilization. It's still a time when acquisition and proliferation of scientific knowledge is obviously the way for solving of many social, ecological and other problems. Scientists have been advocating for the idea for last decades. And finally Policy makers have awakened to the realities of the situation and just now accept the fact the Science is a powerful source for sustainable development. Now we all need to affect public opinion for endorsement of the idea of Science utility and relevance. Thus questions how to teach Science in all the aspects and what ways to choose for organizing a process of education are of great importance both for scientific fundamental or applied researches and social, cultural and economic development of any country.

In recent years many researchers (ROSE project in particular) found the Science has become one of unpopular areas of knowledge. Most students and graduates are not going to link their fates with the Science and technology. As the result we are facing the decline of University Science and Technology Education as only few talented students choose science as their priority area of their interest and even less of them decide to teach the Science in school and University.

Unfortunately, often this problem is discussed in terms of „hackneyed phrases“and journalistic clichés, and unskilled discussion often leads to an even greater decline in the popularity of Science Education. We need to be more critical and should identify several main reasons of such a decline.

First of all the crises is characteristic of the whole education system. To paraphrase a famous revolutionary, the leader of the tragic upheaval of the 20 century, who said about lower classes and authorities “The lowers (*students*) do not want to learn the old, and the tops (*teachers*) do not know how to do it in a new way”. The introduction of new educational technologies, forms and methods of educational process, institutional changes - this is not “story telling”. *Technology will never replace teachers, but teachers who use technology effectively will replace those who don't* (“Shodor philosophy” on technology in education). We all need new technologies and Science Education need it even more compare to other fields of knowledge.

There are several causes of inadequate understanding of the role of Science in society. Unscientific thinking becomes fashionable, and lack of knowledge is compensated with aplomb, scandalous



performances. It is frustrating to offer simple solutions to complex life and social problems. Television, Periodicals flooded with hordes of magicians, seers, pseudo-healers, mountebanks and other charlatans. All those movements for home birth in a non-clinical setting and against immunizations, abandonment of traditional medicine, and etc ... When people choose a medication only because it contains no synthetic components they show their poor knowledge in the field of Science Education. In contrast to this our professional knowledge helps us to have a critical view on many issues, which are usually presented faulty by unscrupulous media. Let us assume that this is true, and many synthetic drugs really were created after the establishment of the structure of some active components of natural objects. But only the development of synthetic methods for industrial production of chemically pure medicinal substances, the modification of the native structure to improve selectivity of drug effects and side effects led to the chemotherapy, a major achievement of the 20th century medicine. As a result, life expectancy increased by more than 40 years! Science has also made a tremendous contribution to the development of social self-regulation mechanisms of modern society: a synthesis of cheap and affordable new materials and transformation of power sources in energy allowed to create a foundation for prosperity and relative accessibility of the majority of the benefits of modern civilization for all members of the society. Thus, the foundations have solved the real problem of class struggle, and gave a rise to the development of post-industrial society based on democratic principles and the recognition of the priority of individual rights. And from this point of view we all, researchers and science-teachers, should be more "aggressive" in promoting a positive attitude towards science, to promote its role in the development of our civilization, improving conditions and quality of life.

The other aspect is concerned with the way how we present Science to learners. Usually when discussing the role of some phenomenon we are facing two approaches, two paradigms. Whether we need something only because of its usefulness, or we can find in this activity the Extra-meaning, inducing the new understanding of beauty and thus aesthetic and spiritual. Usually people perceive Science as something useful, obligate for further development but boring, filthy and finally (*consequently!*) uninteresting to teach.

Dominated by a pragmatic thoughtways, the author of the editorial have chosen as recently as a quarter of a century ago Chemistry as a **very practical and applicative** field of Science knowledge. After graduation from the University and Ph.D program a young Chemistry newcomer moved to a determinate variation from "Pure Science" to "Applied Didactics" and started his professional career as Uni Professor. And finally I perceived the importance to find "beautiful meaning in beautiful things". And still pursuing both scientific and academic activity regarding their practical utility I started my own way to reveal the aesthetic potential of the objects I dealt with, namely the *Chemistry objects*. It was easy enough to find the beauty of real objects. Fine design of chemical glassware, a specific aesthetics of the chemistry laboratory, which was functional and enigmatic at the very same time, and finally (trust *Organic chemist* to say that!) substances with their smell, colours and tendency to behave in way scientist can not predict... The attraction of chemistry in that context was perfectly expressed by Robert Woodward (Nobel Prize, 1965), uncrowned king of organic chemistry design, who was in part the challenge of performing syntheses that no one else could carry out (still very pragmatic context, but it was certainly the sensual aspects of the subject, too). "It is the *sensuous* elements which play so large a role in my attraction to chemistry. I love crystals, the beauty of their form – and their formation; liquids, dormant, distilling, **sloshing**; swirling, the fumes; the odors – good and bad; the rainbow of colors; the gleaming vessels of very size, shape, and purpose. Much as I might think about chemistry, it would not exist for me without these physical, visual, tangible, sensuous things" (Woodward, 1984, p. 137). Then I faced a problem how to present a beauty of 'unreal objects'. And I tried to discern the attractiveness of micro-objects in a



great distance which can be overcome through visualisation techniques. You find the author romantic to excess? Still no more than it's required from the educator. The main reason was to reveal the beauty which might help him to motivate student to teach chemistry and thus make teaching more effective. Just we can say about very pragmatic and utilitarian reason. Still the author followed simply the Nobel Prize winner Robert Mulliken who confessed that he "...loved molecules in general, and some molecules in particular" (Mulliken, 1968, p. 19).

We revert to the point we started from: we explore something what is beautiful and useful at the very same time. Both attributes are referred to Science. And our mission of educators is to show the attractiveness of Science and relevance of Science Education.

Every lesson, lecture, research project and finally their presentations in the form of article, interview or other public activity should contribute to the growing popularity of Science. I like, I admire and even *apotheosize* the Science and I want the other feel the same. And to do this we must learn to behave in a more aggressive (*in the best sense of the term*) way to present to others the utility and beauty of Science and its crucial role in the development of our civilisation.

References

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