Development of Systemic Natural Science and Technology Didactics

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Abstract

Nowadays, there is an urgent need to increase the e f f e c t i v e n e s s of Natural Science and Technology Education (NSTE). Traditionally, the Professional NSTE systems in our general schools are dominating and today it is one of the points, why we need serious improvement – the development of modern G e n e r a l N S T E as fundamental background of modern Professional NSTE, as well as modern General Education for all. Principal differences in understanding the concept "didactics" by professional scientists/engineers and educators are discussed. Special attention to systemic character of corresponding problem is paid – actual need for systemic interconnection of Science and Technology as well as General and Professional Education is noted.
Key words: didactics, science and technology education, general and professional education, systems approach.

1. Introduction

This is not typical research paper with corresponding formal structure**.** It's personal overview of some basic ideas of the author what had been already discussed in many local meetings and tried to implement in educational practice. It's the paper prepared in English to continue presentation of those ideas to our Western as well as other post-soviet colleagues in Eastern Europe [1, 2].

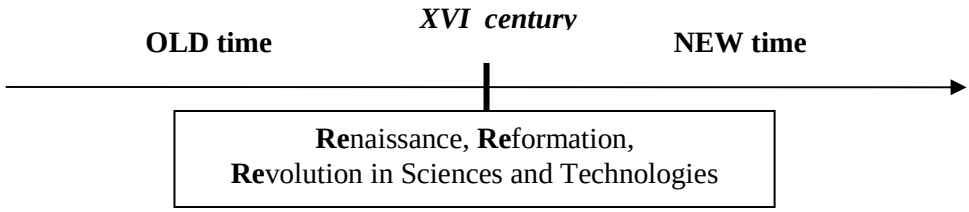
The central problem in the development of modern education is an urgent need to increase the ***effectiveness*** of Natural Science and Technology Education (NSTE). To solve this problem we need to compare needs for education with corresponding satisfaction of those needs. Needs for education always are determined by real life, so it's very fruitfully to use the definition of education as follows: ***education is*** a specially organized gaining of ***life experience*** (knowledge, attitudes or values, skills) ***for life*** (cognition, consideration, behaviour). Life and education are two fundamentally interconnected phenomena and changes in our life determine corresponding changes in our education [1, 3]**.**

2. Some principal notes on the development of Western life and education

During former period of the development of Christianity nothing more than revolution in science and technologies has very seriously influenced the life of World's society. The scientific and technological revolution has materialized in the form of global transportation, energy and information networks, and it has devoted far too little attention to the nurturing of human values and orientations.

Table No1

Development of Western lifestyle (culture and civilization)

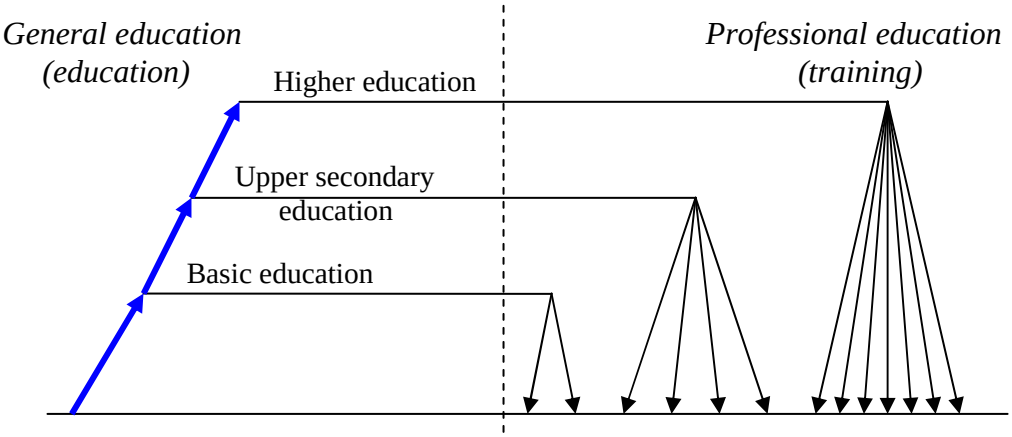


Emotional and Rational	Rational and Emotional
Feelings and Mind	Mind and Feelings
Natural and Artificial	Artificial and Natural
Art and Science	Science and Art
God and Human	Human and God
S i m p l i c i t y	C o m p l e x i t y
Professional Education	**General and Professional Education**

Compare with Old time today we have more knowledge, more technologies, more services, more consumers, less producers, more liberalism, less socialism etc. Our life has become more rational, more artificial, less natural. Old time's simplicity is changed to New time's complexity. If education is life experience for life, the only fundamental question always rises: ***what education for what life ?*** Education today – it's general and professional education (traditionally in English language corresponding pair of terms "education and training" is widely used). Today we have well developed higher education to satisfy our needs for highly qualified specialists in many "hi-tech" branches of modern life. Traditional literacy has been extended and now includes also computer literacy. Finally, today we are living rapidly changing life and the need for life long education has become important.

Table No2

Levels of modern Natural Science and Technology Education



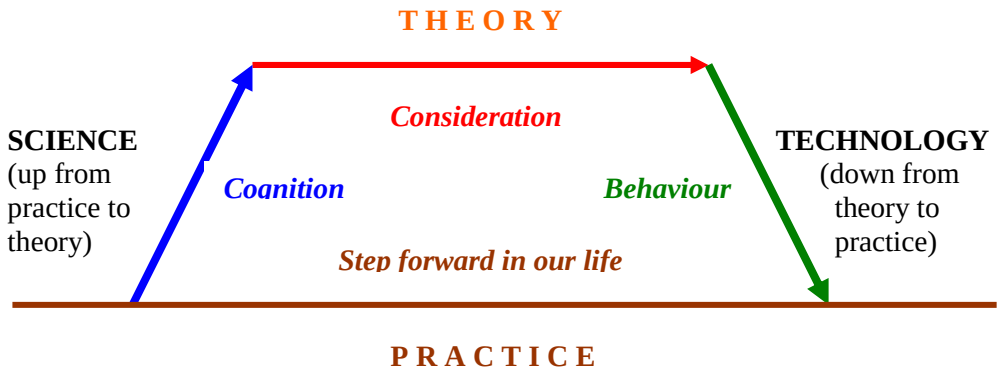
All this above mentioned has seriously changed relations between traditional professional and modern professional education – we need to develop new version of general education what serves as a universal background or backbone for further training of narrow field specialists – professionals. In other words, we need to turn away from traditional general education what has become overcrowded with professional details from various practical branches. We need to develop modern life based general education what provides basic general skills for this life.

3. Systemic relations between modern Science, Technology and Education

For the development of modern Didactics (theory of Natural Science and Technology Education - NSTE) author proposes to use systems approach: first clearly separate and then interconnect Science, Technology and Education. As a principal background for this we can use the universal structure of human's purposeful actions what presents fundamental subsystem (fractal) of our life as a whole [1, 3]. According to this *cognition* means science, *behaviour* - technology, but consideration as a ***theory*** bridges science and technology. All three processes are connected to real life ***practice,*** what is illustrated in Table No3 to prepare us for systemic understanding of modern NSTE.

Table No3

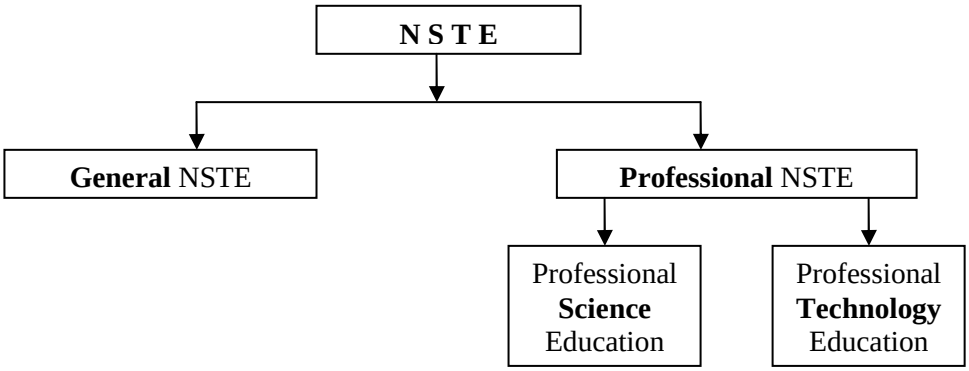
Bridging gap between modern Science and Technology



Representing four different branches of human life activities (Science, Technology, Theory, Practice) corresponding notions (concepts) are closely interconnected with two basic kinds of Education – General and Professional Education. Table No4 illustrates systemic hierarchy of all these notions (concepts) in case of NSTE.

Table No4

Principal structure of modern Natural Science and Technology Education (NSTE)



General NSTE includes the whole cycle of cognition – consideration – behaviour, what means integration of basic concepts from Science and Technology without any dominance of professional details. In Professional Education concept “didactics” traditionally is understood only as the methodology of Science or Technology itself. For the development of modern General NSTE didactics we need systemic overlapping of scientific/technological content and methodology with general pedagogical concepts and structures.

4. Conclusions

There is an actual need for ***systemic updating of NSTE didactics*** and its implementation in modern General as well as Professional Education.

Progressive development of our life today needs more theory as consideration to build ***sustainable bridge*** between Science and Technology. Modern General NSTE must be oriented towards just only one clear goal – development of general, based on modern knowledge and values, ***scientific thinking skills***. Philosophy and psychology must become a part of modern General NSTE.

Development of NSTE didactics must be supplemented with a new generation of ***educational materials*** which contain not only professional instructions and knowledge (sets of detailed algorithms for practical training), but serve also as ***methodological background for life long self-education*** with corresponding use of modern e-education tools [4].

Good theory – it is a map or plan for our successful behaviour in real life. Good theory – short, clear and exhaustive. Author of this article has tried to follow this principle. ***Good luck to all of us*** when developing systemic didactics of modern General NSTE!

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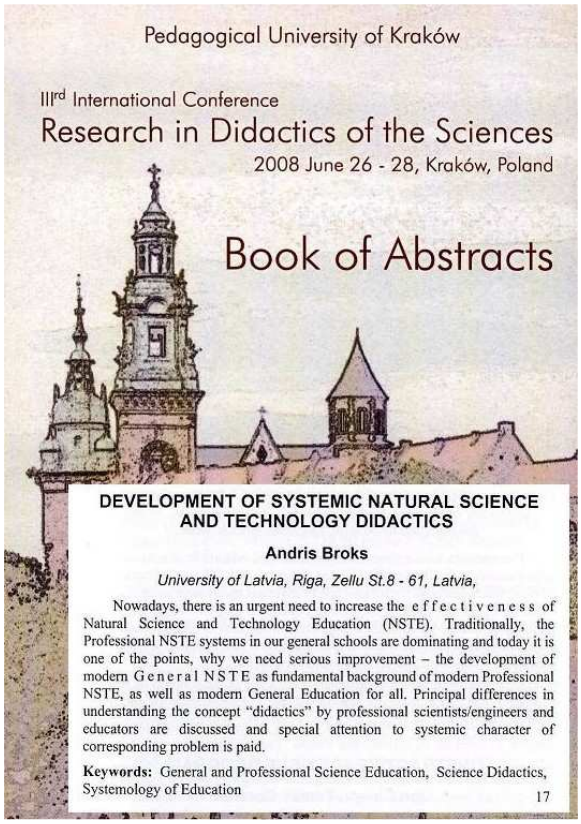

Hello my dear colleagues,
participants and not only participants of this particular conference!

Greetings from Latvia,
from the University of Latvia, from Riga city !