

# Third millennium: the driving contradiction and other problems of education

Nikolai, Khomenko, Canada  
Murashlovska Ingrida, Latvia

Contact: Nikolai.Khomenko@gmail.com

*...Specialization was the key to solving many problems, and we used this key to open door after door, and went ahead, not caring that somewhere behind us doors were slamming shut...*

*This is the era in which scientific methods of professional selection flourish, the era of narrow and super-narrow specialization – and suddenly a person appears who claims that specialization should be completely replaced with training universal professionals...*

*...He was invited to UNESCO, to an office with the strange name of “Committee of the Seventeenth Overthrow”. A polite and imperturbable official announced that the committee was willing to finance his project. “Over the three millennia,” the official said, “science considerably changed its fundamental views sixteen times. Geocentric system of the world was replaced with heliocentric, quantum physics acknowledged postulates that could not be imagined in classic physics. And so on. The seventeenth overthrow is entirely possible, and our purpose lies in supporting projects that contradict the contemporary scientific views but are not without internal logic and are directed to the greater good of humanity. The project of training universal professionals satisfies these requirements. This is the first project our committee decided to support.*

G. Altov. The Third Millennium.  
(Science fiction novel)

**Genrich Saulovich Altshuller** (Science fiction writer’s nickname – G. Altov) is the author of the *Theory of Solving Inventive Problems (TRIZ)*, as well as a science fiction writer. In his novel *The Third Millennium*, he described a strange school where broad specialists were being trained. The teaching method in this school was also unusual; however, in the novel everything seemed logical and valid enough.

About fifteen years after the novel came out, many participants of the TRIZ-movement saw that TRIZ had already grown beyond the framework of a purely engineering discipline that engaged only in solving engineering problems and begun transforming into the general theory of

powerful thinking (OTSM), as G.S. Altshuller called it then. In his presentations at TRIZ-conferences he repeatedly noted that it was now the time for developing new training programs that could allow - not only for people not involved in technical studies but also for young children - to master new technologies of problem solving. This is approximately the time when the term "TRIZ-pedagogic" appeared. Many TRIZ-specialists began working with schoolchildren in the mid-80s, and later the age of the trainees dropped to preschool. First long-term (5-10 years) experiments with schoolchildren and preschoolers started yielding interesting results: the children demonstrated interest for studying and reading books, and reacted to problem situations calmer than other kids of their age. This gave inspiration to many new followers of TRIZ-pedagogic to develop training programs for children of different ages. In Ulyanovsk (Tatiana Sidorchuk is a scientific director of the experiment), for example, programs for developing imagination and teaching the basics of TRIZ were implemented not only in pedagogical colleges but also in kindergartens. Many of those who were in school at that time have already finished university by now; some of them became teachers, but the debates about the nature of TRIZ-pedagogic are still continuing.

First of all, of course, the purpose of the TRIZ-pedagogic is the development of systematic thinking. It seems that by now everyone has agreed with that. Fewer pedagogues agree that another, no less important goal of growing TRIZ-pedagogic should become teaching to children the technologies for solving contradictions, both individual and aggregate. These technologies are now more often disappearing from school programs or are given very little space. Sometimes one hears that contradictions are much too complex topic even for adults, and it is better to postpone it...

Before contesting this opinion or agreeing with it, let us examine the reasons for it. The search for the age of the most flexible thinking has led to attempts of teaching TRIZ in grade school and kindergarten. However, as opposed to the adult audience, children have their own psychological peculiarities and a lower level of knowledge. Thus, contradictions, connected to using adult methods in training children, have emerged. Another source of problems is the way TRIZ interacts with other subjects taught in schools. The possibilities OTSM-TRIZ presents for the development of powerful thinking were quickly noticed by the teachers of other subjects. However, because of the rigid structure of any subject and the way it is taught, OTSM-TRIZ came to be used only as a useful addition to the main subject – to increase the general involvement of the children, as a source of non-traditional problems or interesting forms of work. Elements of TRIZ became, in a way, sweet raisins in the meager bread of pedagogic. A more deep integration of TRIZ into school subjects, which would contribute to the effective development of a new style of thinking, required substantive changes not only in the structure of a lecture or contents of a subject, but also in the whole subject-lecture system as such. One can say that the arrival of TRIZ into schools has created many new problems, solving which was not limited to implementing TRIZ as the new discipline. In this situation, a sound question was asked: is this problem worth solving? Perhaps, it can be postponed? Or, perhaps, everything can be left as is?

Let us now look at the reasons that suggest that there is a necessity for teaching contradictions in TRIZ-pedagogic.

The topic “Contradiction” helps to better the educational system and organize it in a more purposeful fashion. After all, all other instruments of TRIZ and imagination development are meant precisely to teach the students to effectively solve difficult problems – the very purpose for which TRIZ and OTSM were created. This is the first reason.

The second reason for the necessity of contradictions is based on one of the three postulates of TRIZ: a problem is difficult because it contains a contradiction. Solving a difficult problem means resolving the contradiction. And while the two other postulates (the existence of objective laws of system development and the necessity for taking into account and using specific resources in the specific problem situation) do appear in the school programs in one form or another, sometimes even without the developers of the programs realizing the fact, the postulate that poses a contradiction as the original cause of a complex problem is often forgotten. At the same time, it must be noted that contradictions do differ, and much depends on how accurately the contradiction is selected. OTSM-TRIZ usually divides the contradictions into several types.

After closely examining and analyzing a large number of various problems, researchers established another type of contradiction – a contradiction against laws of nature and universe. In the end of the 80s, when the first version of the computer program created on the basis of the Algorithm of Solving Inventive Problems (ARIZ) – which helped its user to formulate contradictions – was being developed, this type originally emerged as an addition to the other types of contradictions. However, over the following years it became completely clear that the contradiction against the laws of nature and universe lies in the basis of any problem, regardless of its subject area. Strangely enough, this realization allowed organizing the process of problem solving more effectively, since in order to solve any problem we had to “transgress” an objective law. This meant that, first of all, we had to concentrate on the data that was connected to this law and use it to solve the problem, in order to “circumvent” the law and reach the desired result.

These two reasons are enough to move the technologies of solving contradictions to the forefront of TRIZ-pedagogic, all the more so because the models used for it are sufficiently universal and can be used for studying other subjects in kindergarten, school, college, and so on.

However, we already mentioned the problems that arise when TRIZ is used in other school subjects. Here, then, is the question of the boundaries of the TRIZ-pedagogic. Is it one of the programs, on level with other school subjects, or does it extend further, penetrating the whole education system? In other words, how far should the TRIZ-pedagogic reach? Obviously, integrating TRIZ into other subjects creates more favourable conditions for teaching TRIZ; but is it more favourable for education as such? Based on this question, it is worthwhile to explore what problems in education TRIZ-pedagogic is capable of solving.

It is known that the purpose of education is forming the individual. At all times society strived to form in the young generations those features that were necessary for living in this society. Admittedly, the conceptions of the concrete features and the methods of forming them changed with time. How is the third millennium, which has already arrived, peculiar?

The amount of data in the world is increasing with great swiftness; the speed with which professional data become old is increasing. Educational institutions have long been giving outdated information to their students, who, after entering the “real” life, have to learn again and to continue doing so for their entire lives in order to remain professionals in their fields. However, even fields come to replace one another. The famous quote from *Through the Looking-Glass* comes to mind, with the Red Queen exclaiming: “Now, *here*, you see, it takes all the running *you* can do, to keep in the same place.” One of the contradictions that will guide the development of pedagogy in the third millennium can be formulated, if one adheres to the TRIZ-rule of intensifying contradictions (one of the rules in the technology of resolving contradictions), in the following way: pedagogues should teach their students to survive in the world of which they have no conception. We believe that this contradiction drives evolution of educational system and pedagogy.

This contradiction forces one to reject the habitual method of grafting onto the next generation one’s own values, behaviour patterns, and knowledge – which is of what the transfer of experience consists. This method gives up its place to the view of education as forming an individual who is able to independently obtain new data and efficiently correct the available worldview in accordance with the newly received data.

Education takes place on the intersection of two images: the image of the world around us and the image of the world of our desires. Any image of the existing world is needed only in conjunction with the image of desires, only in interaction with it. In traditional education, the problem of creating the image of desires is solved superficially, primarily through discussion. Meanwhile, it is necessary to not only move from identifying individual desires to constructing a system of desires (system of values as well), but also to transform the educational activity in such a way that it would call forth a more active interaction between the image of the world and the image of desires.

This is where a strategic problem arises. At school we study individual subjects – physics, mathematics, literature – each of which presents its own worldview. Furthermore, in real life our desires are often more complicated than calculating the area of a parallelepiped or using a quote from a classical work. If these complex desires are followed, the individual worldviews are transformed, since desire interacts with several images at the same time – physical, mathematical, fictional, ethical, and others. Images cease being flat and parallel – one must become both a sub- and a super-system for another, while the other will use some resource from a third one, and so on. In real conditions we have to work with a web of interweaving images.

Following the impulse of desire, a person must move along with web, reach a particular knot and transform it in order to bring the desire into reality. For that, he or she also needs the image of the methods of transformation.

Data is necessary to picture the web of images with all the connections, to determine the knot, changing which will bring the necessary desire into being, and to orient oneself in the methods of inducing changes.

Activity is really a journey along the web of images and transforming the necessary knot.

For activity, another image is necessary – the image of the person's potential, pointing to the possibility of practically carrying out a particular activity with the available resources of the person. These can be physical, psychological, social resources, including the ones hidden in the subconscious. The image of possibilities forces us to either transform something within ourselves, in order to increase the potential, or to relinquish the desire, and, again, transform ourselves in such a way that the unattained desire does not cause inner conflicts.

The conventional convenience of the former pedagogic was the stability of all images. It allowed organizing the educational process as a transfer of the known typical combinations of desires-data-potential. The increasing speed of changes not only lowers the value of the existing knowledge, but also engenders the previously unknown desires and possibilities. Thus, in order for an individual to be successful in the swiftly changing world, he or she must be able to coordinate dynamic images of knowledge, desires, and possibilities and control them.

In this presentation, education means bringing an individual to know the constantly changing web of images – image of desires, varying images of the world (through the prism of various subjects), image of possibilities – and to carry out transformational activity in the world around and within him/her. In this web, contradictions constantly emerge as a result of discrepancies between:

- The image of desires and the image of the world
- The image of desires and the image of the possibilities
- Various images of the worlds: physical – economical – ethical
- The components of one particular image of the world
- The image of the world and the image of the ways of transforming it
- All images and the image of one's own potential for knowing and transforming them
- The image of possibilities and the image of the methods for transforming them
- The image of desires and the image of the methods for transforming them

Therefore, the ability to remove these discrepancies or resolve contradiction becomes an essential component of education.

Resolving contradictions always means substantial changes.

Realizing one's desires leads to transformation of oneself and the world around. Some of the images, at this point, become unusable and have to be rebuilt. This is where the need emerges for a meta-image – an image of destroying and creating images that could perform the function of system-forming within the web of images.

Therefore, the basic features of the future pedagogic consist in teaching through recognizing the web of dynamic internal and external images, through transformational activity in the internal and external worlds, through removing discrepancies in the web of images, through destroying them and creating new images and webs.

Today's educational system is not ready to make this model reality. School children study objective laws of the world around them, but fail to reach systematic images of the world in different areas – images do not form a web, the web is not claimed since the web of desires is disconnected. Moving along the web and carrying out transformations is difficult since the ability to remove contradictions within the web is absent. Furthermore, school not only does not form this ability – along with the ability to destroy and create new images and webs – but has very little notion of their necessity.

OTSM-TRIZ is necessary in education not to complement the existing programs (of course it could be done), but it is better to re-build education. The necessity of such reconstruction is shown with the passage of time.

We think that these aspects – development of a poly-system of the dynamically changing world images, as well as the ability to resolve various types of contradictions – will eventually take the leading place in pedagogic and education of the third millennium. Educational systems that train broad universals will replace the narrow specialists of the past century. They will produce specialists capable of entering quickly into the newly appearing subject areas and becoming high-class specialists in these areas without losing the ability to transform their thinking in accordance with the emerging and rapidly changing images of the world.

The task of training such specialists is, in our opinion, the main purpose of the pedagogic described by G.S. Altshuler in his science fiction novel *The Third Millennium*.

Evidently, this is what should become the essence of the newly emerging OTSM-TRIZ-pedagogic, expansion of which will cause the inevitable transformation of the entire educational system, with the other achievements of TRIZ- and OTSM-pedagogic assisting with these transformations. They will become integral equipment of pedagogues, whose work will be proceeding among the flows of pedagogical problems. The project “Jonathan Livingston” ([www.jlproj.org](http://www.jlproj.org) ; [www.jlproj.ru](http://www.jlproj.ru) ; [www.volga-triz.ru](http://www.volga-triz.ru) and [www.trizminsk.org](http://www.trizminsk.org) ) is dedicated to comprehending what and how should be taking place on this path; it strives to unite the divided forces of the leaders of OTSM-TRIZ-pedagogic in order to solve these complex problems.

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