

# **A new type of thinking for Sustainable Development: its conception, diagnostics and associated technology**

## **Introduction**

Sustainable Development could be described as a way of development which does not destroy its preconditions and conditions (A.B. Veber, 1998). All large scale Human actions should be planned in the frames of this way. According to the Russian proverb--“don't cut the branch of the tree you are sitting on”--people need to improve their traditional ways of thinking in order to better build strategies to develop any system at any level of its connection to the entire World. The more significant factors, conditions, and their connections we take into account, the better would be our strategies for development and solving problems. That means such thinking should operate with categories that consider the whole World as a system. Systems thinking is not only a thinking method for considering each subject as a system or including it in a system. This is systems thinking implemented to the whole World. That way the systems thinking gains a new quality based on understanding of insularity of our World. Insularity means here that all recourses are limited and all wastes do not disappear. Laws of systems interactions change in the huge planetary scales in the same way as the laws of Euclidean Geometry change to the laws of Lobachevsky Geometry, laws of Newton Mechanics change to the laws of Einstein's Theory of Relativity.

This way of Thinking is called global thinking because it operates with global scale objects and phenomena. It claims to be a toolkit for the new field of knowledge called Globalistics. I should state the difference between Globalistics and Globalization. Globalistics explores different sides of the World as whole system. One of the goals of Globalistics is to overcome the negative sides of the Globalization process. The main goal of Globalistics is Sustainable Development. The first step of this goal is overcoming Global Problems – current and possible. Traditional methods of problem solving now are not effective on a planetary scale. One of the solutions of that problem became the conception of global education founded by R.Hanvey.

Researchers define global thinking (GT) as the ability to think by the categories of holistic world, of the planet, and to perceive the world as a system of systems and as a system of multilevel interdependences. (I.U. Alexashina,1996, R.Hanvey, 1982, etc.)

As courses for Global Education multiply, it is becoming more and more clear that it is important to direct the Global Education process not only for global literacy and global world view but also for global thinking development.

First a person accumulates global literacy, then its quantity turns into a new quality – systematization of global knowledge is over, and the global world outlook is built up. Gradually operating with the global world outlook – placing all new information in it or rebuilding it because of new information – train the thinking structures until they turn into new quality of thinking. On this stage thinking becomes global and able to operate successfully with global systems.

## **The nature and parameters of global thinking**

The structure of thinking becomes a system containing many types of thinking: logical, lateral, critical, etc. The different types of thinking in this system includes the higher level of universality thinking that could be reached. Thinking becomes universal, that is global. There is another one known type of thinking that claims to be universal – creative thinking which could be concluded by considering the nature of creativity by a row of researchers (J.P.Gilford,1967, E.P.Torrance,1988, E. de Bono, 1997, etc.) and according to the philosophical principle of the interconnectedness and likeness of a person and the universe (VernadskyV.I.,1967, T. de Sharden,1987, etc.)

As I wanted to find out the nature of global thinking (GT), I compared it with the creative thinking and concluded that the global thinking could be define as creative thinking which became systems thinking via operating with the whole World categories (concepts might be applied to the entire World as a whole system). This new content of concept GT was the base of

GT parameters I derived in research. They are connected with the creative potential development depends on intellectual-personal qualities of a person. Parameters of GT – integrity, dynamics and alternativity could be founded on those qualities. R. Hanvey’s dimensions could be deduced from these parameters as well as all of similar dimensions in the other conceptions of Global Education which depend on historical context.

Integrity means:

- multilevel interconnectedness of the considered system to other systems (and finally to the entire World);

Dynamic means:

- dynamic of development of that system by its inner potential of development and of its interactions with other systems (and with the entire World);

Alternativity means:

- alternatives of ways of a system's development at each bifurcation point in context of development (inner and outer).

That system of parameters is complete and each parameter is essential which is proved in research. Such structure of thinking could give the birth to strategies of different systems development or problems solving which could be characterized with the same parameters. Such strategies should provide Sustainable Development.

### The scale for valuation of global thinking process

I calibrated GT parameters by levels of development and build up a scale of GT for its diagnostic.

(Table illustrates 4 levels of each parameter and common 5<sup>th</sup> level for whole system of parameters “integrity-dynamic-alternativity”. Inter relationship between parameters increase with the development of GT in each parameter. Consideration of parameters as independent becomes difficult. That is why the 5<sup>th</sup> level belongs to whole system of parameters).

I	INTEGRITY (interconnectedness in space)
0	Objects and systems in the world mostly is not connected
1	Strong interconnections between subjects and the other simple connections are taking into account
2	Lateral interconnections between subjects and the other not simple connections are taking into account
3	Multilevel interconnections between subjects are taking into account
4	The model of the world became a whole system where all objects and facts belong to definite place. Skills to build up the scheme of interconnections between any objects and facts
II	DYNAMIC (interconnectedness in time, interdependence; the opposite from static, stereotypic; includes mobility, flexibility, ability to interact, reflexivity)
0	There are no movements and changes in the world except of movements of objects
1	Synergetic development of different systems is taking into account
2	Development by material, energetic and informational interaction between systems is taking into account (including dialog and reflexivity)
3	Multilevel interdependences are taking into account
4	The model of the world became a whole process of multilevel and multispeed of development of all systems. Skills to build up the scheme of interdependences between any objects and facts
III	ALTERNATIVITY (interconnectedness in cause; various vision of problems)
0	Only one function of multifunctional object, one solution of complicated problem is taking into account without causes and effects of that solution
1	There are several variants of solutions (could be considered with strong causes and effects)

2	There are different types of variants of solutions (could be considered with strong and lateral causes and effects)
3	Skill to find all alternative points in solution important in context of situation
4	Alternativity as the principle of world development, of development of all its objects and processes. Skills to build up the spectrum of variants of solutions for any alternative point of problem and prove the choice of the way to the solution

## 5. INTEGRITY - DYNAMIC –ALTERNATIVITY.

Perception of the world as a holistic system - alternative process with multilevel interdependences of all objects, facts and processes, vision of the pattern of strong and lateral interconnectedness of possible causes and effects of problems, spectrums of its possible solutions, taking into account their interdependence. Developed responsibility of making solutions is the effect of that perception.

GT level may be found as the sum of rates in each parameter (from 0 to 15) or as the arithmetic mean (from 0 to 5). GT is developed if it achieves 3d level because this is the lowest level when thinking begins to operate with systems which gives opportunity to solve effective large scale multilevel problems (including global problems).

Transition from one level to the next means transforming quantity accumulation to the new quality. Each level of each parameter might be calibrated by quantity units if needed.

### **Connection of global thinking to personal parameters**

Intellectual quality, creativity and GT are interconnected but orthogonal factors. There is a correlation between development of GT and values of IQ and CR. These values determinate potential maximum of GT. Motivation, influence of EP and the other possible factors determinates how that potential will be used.

High school age is the first time when a person assembles his/her own Worldview. That means he/she is able to build an own opinion for each subject and process in the World. This period of time is best for GT development by building holistic world outlook. It had been found theoretically and confirmed experimentally.

A special technology of GT development allows to increase it in 9<sup>th</sup> grade up to the level of 11<sup>th</sup> grade. Description of technology will be given later.

### **Alternative system of parameters for global thinking**

Consideration of work mechanism of system with three found parameters gives the vision of that process from the other point of view and allows build up the other model with the other parameters:

1. width of the potential “vision” field (global and glocal integrity) (Glocal means local manifestations of global laws, by W. Rudometoff and R.Robertson)
2. skills of the orientation in that field (interactivity skills in dialogue with the World; sensitivity to the problem which responsible for the choice of alternative points and the choice of further directions to the solution).

Two models of GT process allowed us to explore the conditions of GT development in Educational Process (EP). The structure of the first model reflects the structure of the Educational Environment (EE) described in the research work of S.V. Tarasov, and the second – in the research work of V.N. Druzhinin.

Interaction between a person’s structures of thinking and the World defines genesis and process of functioning GT. In that process structures of thinking becomes the same with structures of the World as a whole system. Thinking process becomes integrative, dynamic and alternative while creating a model of the World. That means thinking becomes global.

This process reflects the above-mentioned principle of unity and likeness of a man and the World described by many ancient and contemporary philosophers. So the EE should have the same structure to be included to that process as a middle part - link in the system “a person – the World”. This determinates condition of GT development in EE.

### Connection of global thinking to educational process' parameters

Then I considered what students need to develop integrity, dynamic and alternativity of thinking. The result was they need the integrated, dynamic and variable content of the educational program with technologies of creativity, self-organization ability and activity development.

Integrative process in education reflects the integrative processes in all spheres of the contemporary world.

Analysis of the literature of the integrative process in education allows us to determinate the 4 stages of that process. On the last stage forms the holistic system – educational environment with the following characteristics:

- unity of values and senses of curricular and extracurricular education worked out during the process of coordination;
- completing, correcting and stimulating each kind of education the other in programs development as a result of interaction of all the subjects of EP;
- mobility and flexibility, opportunity of variation in depending of variable conditions (for example it could be forming of interdisciplinary lessons and modules of interdisciplinary courses).

To find out the impact of 3 components to the global-orientated EP I created and used the method of comparing of EP in different kinds of St. Petersburg's schools. Measurement of the personal level of GT of each student allows find the average value of GT in each school and compare these values in different ways.

### Conditions for global thinking development

The comparison proved the theoretical conclusions of the effect of considered components of EP to GT development and allow to find how GT development depends on system of personal parameters and parameters of EP. In all 8 cases with combinations from these parameters forming the Global World Outlook is possible. Gifted students with high intellect and creativity could form GT structures.

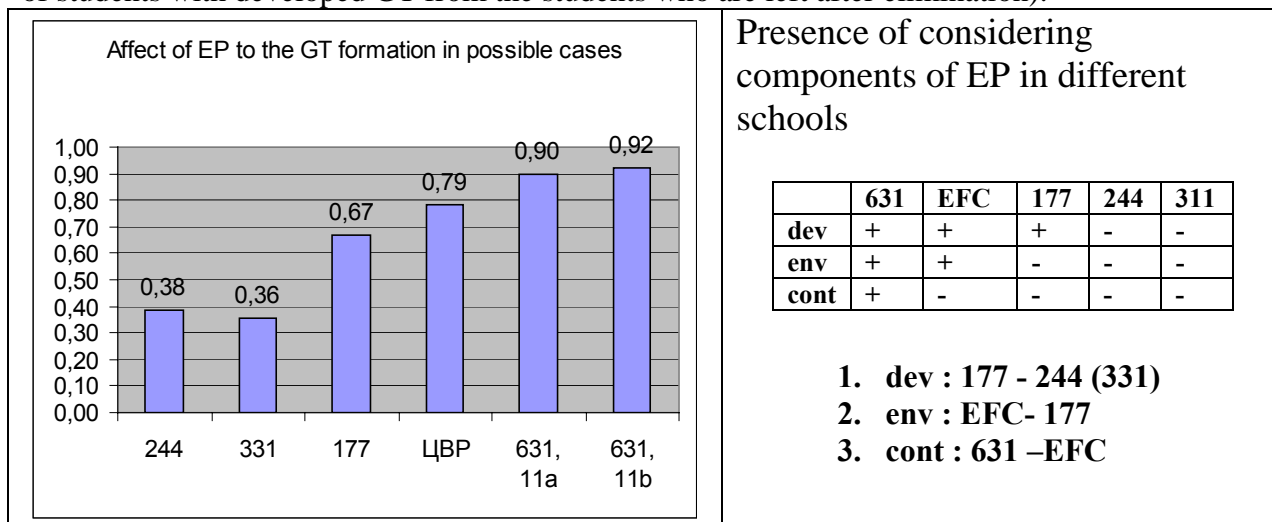
№	Personal Parameters			+EP Parametres			= structures of the World Perception		
	M	IQ	CR	env	cont	dev	GO	GT	GP
1	+	+	+	-	-	-	+	+	+
2	+	+	-	-	-	+	+	+	+
3	+	-	+	-	+	-	+	-	+
4	+	-	-	-	+	+	+	-	-
5	-	+	+	+	-	-	+	+	+
6	-	+	-	+	-	+	+	+	+
7	-	-	+	+	+	-	+	-	+
8	-	-	-	+	+	+	+	-	-

**M-** motivation for solving problems in effective way;  
**IQ-** general intelligence;  
**CR** – general creativity;  
**env**-Educational Environment with unity of values and meanings;  
**cont-** global-oriented content of programs;  
**dev-** using educational technologies for creativity development;  
**GO**–Global World Outlook;  
**GT** - Global Thinking;  
**GP**–Global World Perception.

Interconnectedness between 8 considered cases is described in the attachment to the manuscript where GT is considered as a multivariable function.

### Measurement of global thinking growth by impact of education

To explore the effect of EP to GT development was important to eliminate effects of personal parameters to its development. That was made by eliminating from whole amount students whose personal parameters were high enough to develop GT without EP, and students whose personal parameters were not enough for its development even with help of EP. That allowed us to evaluate effect to GT development of EP in each of considered schools which (by percentage of students with developed GT from the students who are left after elimination).



Experimental results showed that considered pedagogical conditions effect to GT development but does not allow yet manage this process. Consideration of the mechanism of GT development allowed conclude that in considered pedagogical conditions the structures of GT would develop only by building up Global Worldview. The process of GT development goes slowly because of age peculiarities and inertia of the EP effect to the structures of thinking. Special educational technology for GT development allows enhance this process.

### The method of diagnostic of global thinking

Diagnostic of GT is developed on principles of G.Altshouller and E. de Bono creative thinking investigation. They found that exploration the nature of spontaneous process of creation allows bring them into practice. Understanding of advantage of creative thinking and theoretical knowledge of its methods is not enough for the development of its structures. It is necessary a row of practical tasks. GT development has the same consistent pattern. To have knowledge of global problems even detailed and systematic is not enough for GT development. It needs practice of solving large scale and whole world problems (as a training tasks). This statement was confirmed by experiment. The analysis of solutions could help to interpret on GT scale according to one of its levels on each of parameters and then the level of GT could be qualify.

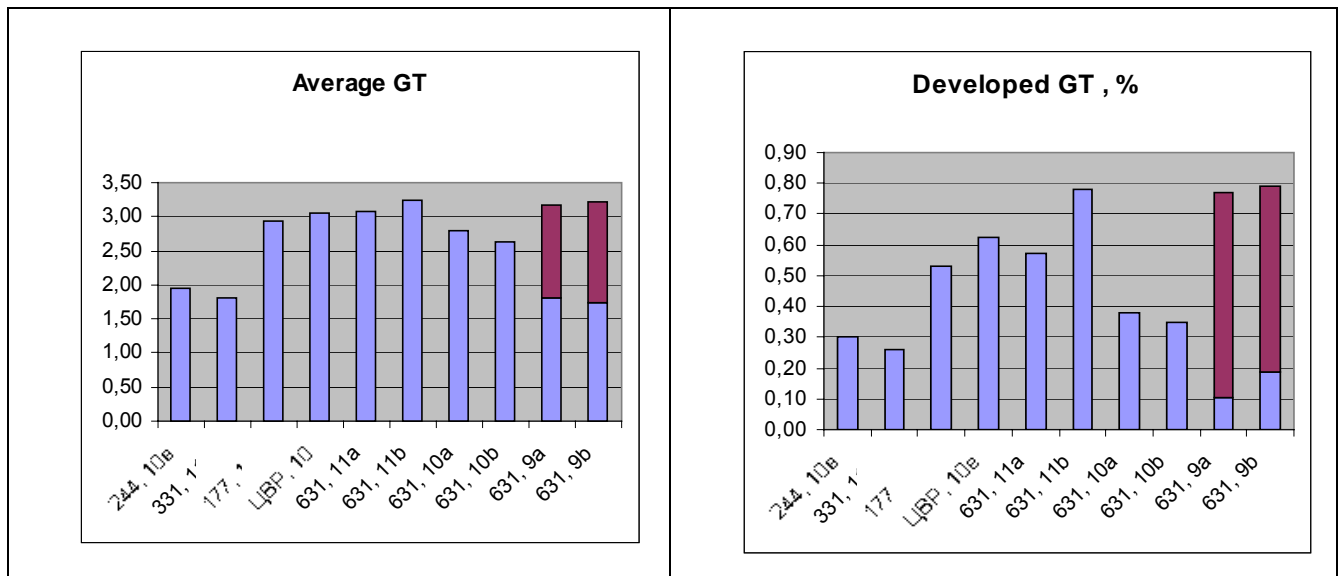
The principles of organization of GT competitions, possible versions of competitions with task contents, principles and examples of interpretation solutions of tasks on GT scale, review of the most common and interesting answers with analysis of solutions obtained in the experiment are attached to the manuscript.

### Educational technology for global thinking development

Technology of GT development consists of rows of tasks similar to tasks in diagnostic and special tasks for integrity, dynamic and alternativity development. Diagnostic results allow to control and manage each step on personal development of GT and to plan the next step or row of tasks. So the process of GT development is based on interaction between task solutions and

diagnostic. To get the most exact results of measurement, diagnostic could be the same before and after workshop with technology implementing. The content of technology with variable task versions is attached to the manuscript.

These diagrams demonstrate increased level of the GT of students participated in workshops for GT development (red color of columns) in comparing with others.



### Conclusion

The results of this research could be applicable to students' GT development in any school, college or university. It is necessary to take into account personal parameters and age of students and build up EP with required components. Diagnostics at each stage of workshop for global thinking development makes possible to manage this process.