Metasystematic Technology of Instruction, Student Research and Innovation

Dumitru BALANEL*

Abstract

The paper discusses training, student-centered, the equation of trening, equation of training with notes early, appropriate to Bologna process, ways to educate interest and research capabilities, innovation of students; studying the factors that determine the student make transition to self-knowledge accumulation, learn with satisfaction the research and innovation, transition from apperception to intuition. The author relies on metasystemic training technology, skills to work in real time, using student tesaurus from computer science, informatics and history of cybernetics; learn experience and performance of the most eminent personalities in the development of computer science and cybernetics, Norbert Wiener and Alain Turing, William Ross Ashby, others personalities, holding the Turing Award. Scientific education of students includes identifying scientific issues, enrollment of students in research. Identifying the scientific problems inherited as millennial problems in mathematics and computer science, current issues and future of science; incentives in applying forces young people to solve them. The enrollment of students in scientific work is done by conducting research with students on issues of university research in the scientific teams, scientific laboratories and simulators, training. The result of "triangle activity" is estimated by joint publications of teachers with students, performance places in competitions, scientific evidence recovered, performance and international awards.

Keywords: Bologna process, Education with the expected assesement of learning, equation of technology training early grades, Metasystemic Technology, instruction, student research, innovation, curriculum, thesaurus of student, thesaurus of curse, components and properties of components of metasystemic technology, intuition.

1. Education with the expected assesement of learning (Bologna process) is stable.

Studying the problem formalization author formulated the instructive training equation and the equation early training notes. The first is the traditional process proper degree, the second degree is suitable Bologna process.

The author has shown that traditional training process is unstable and the

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Bologna process is stable. The paper (within an article) is examined metasystem training, research and innovation to students.

In any learning process between the desired results and real notes is determined according to a report that says the student; student is in a state of psychological equilibrium - confident (if the training results equal to the desired match) or not (the results vary).

Results desire depends of level of notes in the current period, so

$$\mathbf{D_t = a + b*n_t} \quad , \tag{1}$$

where Dt is the desire, nt is the note, both in period t, the relationship between them is linear. Can achieve the desired grade from the relationship

$$P_t = a_1 + b_1 * n_t^e \tag{2}$$

where n_t^e is expected to score between period t.

To achieve desired results, of course, we have

$$\mathbf{D_t = P_t} \tag{3}$$

The expected and real notes are dependent on one another. One of the relationships of these notes is expressed by relation

$$n_t^e = n_{t-1} + \alpha(n_N - n_{t-1}) \qquad \mathbf{0< \alpha <1} \tag{4}$$

where nN is a desired note (not necessarily the maximum score), that the personality (student) considers himself normal. The constant α is a constant adjustment parameter, because personality can not jump from note actual to note desired.

One possibility is to consider nN normal note by note $\bar{n}$. In this case the relationship (5) has the form

$$n_t^e = n_{t-1} + \alpha(\bar{n} - n_{t-1}) \qquad \mathbf{0< \alpha <1} \tag{5}$$

Initial problem is expressed through the system of equations

$$\begin{cases} \mathbf{D_t = a+b*n_t} \\ P_t = a_1 - b_1\left[n_{t-1} + \alpha\left(\bar{n} - n_{t-1}\right)\right] \\ \mathbf{D_t = P_t} \end{cases} \tag{6}$$

Adjustment of real note and near its desired record is held by the adjustment coefficient α. Substituting the first two equations in the third achieve success:

$$a + b*n_t = a_1 + b_1 * p_{t-1} + b_1\alpha\bar{n} - b_1\alpha n_{t-1}, \tag{7}$$

$$bn_t - (b_1 - b_1\alpha)n_{t-1} = a_1 - a + b_1\alpha n \tag{8}$$

where

$$bn_t - b_1(1-\alpha)n_{t-1} = a_1 - a + b_1\alpha\bar{n} \tag{9}$$

which is the fundamental dynamics equation of technology training early grades (as anticipated).

General solution of inhomogeneous equation (10) consists of the sum of homogeneous equation solution (10)

$$bn_t - b_1(1-\alpha)n_{t-1} = 0 \tag{10}$$

and a particular solution of inhomogeneous solution.

The general solution of inhomogeneous equation is of form

$$n_t = A\left[\frac{b_1(1-\alpha)}{b}\right]^t \tag{11}$$

and a particular solution of inhomogeneous equation (9) is

$$\overline{n} = \frac{a_1 - a + b_1\alpha n}{b - b_1 + b_1\alpha}, \tag{12}$$

where $\overline{n}$ note the psychological balance is given to student (note which one receives is a note promise to others).

General solution of the equation of dynamic training process is expected notes)

$$n_t = A\left[\frac{b_1(1-\alpha)}{b}\right]^t + \overline{n} \tag{13}$$

if it knows no one can determine the constant:

$$A = \left(n_0 - \overline{n}\right)$$

and thus the complete solution of the equation (10) is

$$n_t = \left(n_0 - \overline{n}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t + \overline{n} \tag{14}$$

Note the condition of stability expected (desired) to write the relationship

$$|b_1(1-\alpha)| < |b_1| \tag{15}$$

Note that b1 (1-) is less than b1 , and subunit is always. This ensures stability of educational technology training early grades, including the Bologna process.

In this model, a type oscillatory dynamics remain convergent, convergence being assured by the relationship

$$\left|\frac{b_1(1-\alpha)}{b}\right| < \left|\frac{b_1}{b}\right| < 1.$$

An oscillating motion for this model is convergent, because the condition of relation (15) always occurs because > 0.

An explosive oscillating motion which in this case is rather slow because of the particular parameter is however close to 1. Indeed, the more is higher, with both 1 - is smaller, so it is likely that even if

$$|b_1(1-\alpha)| \le |b| \text{ , even if } |b_1| > |b| .$$

1.1. Evaluation of the education in Bologna proces.

Suppose that a group of students from an institution of higher education (eg, Academy of Economic Studies, Bucharest), studying under the Bologna Process was

established to study the course name, course content, time to study, form examination and evaluation of knowledge. Whether the name proposed for the study is "Data structures" [5].

Under existing technology for teaching preparation course provides a series of actions, which may include:

1. setting the course name and teacher, who will take over;
2. determining the number of hours for teaching, instructional, educational, developer of the course;
3. setting initial requirements to students;
   a. determining course content:
   b. concepts course - Lexis;
   c. definitions of concepts and treatment course - Explanatory dictionary of course;
   d. immanent relations between course concepts and interdisciplinary connections - Paradigm
4. thesaurus establish concentric developer that connect teacher and student thesaurus - Literature and teaching materials used in teaching the course;
5. determining the form of study: stationary, correspondence, distance education, etc. combined.
6. the content and form of assessment.
7. Determination by student attitude toward course and expected grade.
8. Establish common understanding by teachers and students the importance of the course and final grade for each student.

For example, the "Data structures" Syllabus of which is represented in Fig. May we have:

As embedded in all the above components are present in sillabus (Fig. 5).

Lexical Strand: Massive, matrix rare, article, file, database, storage, list, stack, queue, tree, tree B AVL tree (Lexis contains 12 terms).

Component Dictionary: definitions, models lexical (massive, matrix rare, article, file, database, storage, list, stack, queue, tree B, tree AVL) memory area (areas defined as areas of variation) of lexical address reference, contained context, defining abstract lexical models, presentation models lexical.

Component Paradigm: Addressing the components lexical, search lexical components, presentation components lexical models, components lexical classification criteria, the field definition area of memory, operating contextual operations: creation, traversal, insertion, deletion, concatenation, conversion aggregation, necessary relations, sufficient relations, necessary and sufficient for the components of the course, disciplinary relations.

In Syllabus dictionary components and Paradigm are shown by default, the bibliography.

Suppose that personality has previously received previous courses Notes: 7, 8 and 9. The next course, studying under the Bologna process hopes to sustain the note 8, to test whether the note "preparedness course" n_0 is known. Then as the fundamental equation of dynamic

$$bn_t - b_1(1-\alpha)n_{t-1} = a_1 - a + b_1\alpha\bar{n}$$

We have the solution

$$n_t = \left(n_0 - \bar{\bar{n}}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t + \bar{\bar{n}}$$

Whether note n0 = 7 (α = 0.7), note promised is = 8. $\left(n_0 - \bar{\bar{n}}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t = 0$

If the student keeps his word, then the coefficient α=1;

And $n_t = 8$.

If the student does not take the word, then received the note is correct:

THE BUCHAREST ACADEMY OF ECONOMIC STUDIES
Faculty: ECONOMIC CYBERNETICS, STATISTICS AND INFORMATICS
Chair: Economic Informatics
1 st cycle

SYLLABUS
Academic year: 2009-2010

Curse title	DATA STRUCTURES						
Course code		Numbers of point	5	Total	Lectures	Semi nar	Laboratory/ project
					(C)	(S)	(L/P)
				56	28	28	-
Faculty where delivered	ECONOMIC CYBERNETICS STATISTICS AND INFORMATICS				Year of study Semester		3 1
Specialization	ECONOMIC INFORMATICS						
Course type F-fundamental, S – specialized, C - complementary							5
Course curricular category C – compulsory, E – elective, F – free, S -special							S
Pre-register	Compulsory Recomended						
Learning objectives	Initializing, defining and use data structures adequately						
Course content (descriptors)	Basic concepts memory area, reffering adresses, consensual content, abstract data defining, models data classification entries, data presentation models, analytical, graphic, graph, textual						
	Sparks metrics and arrays, models, properties, operations –definitions, initializations						
	Traversals, updates, encoding with array, lists, aggregates lists, spark matrix, operations storing arrays into files, array operations libraries						
	Heterogeneous data structures, articles, files, database repository, internal encoding, searches, retrieval, reffering expression, aggregation.						
	Lists, stacks, queues, definition, models, analytical, graphics, textual,						
	Tree definition, models, analytical, graphics, textual, operations creation, traverion, insertion, deletion, concatenation, conversion, aggregation, B tree, AVI tree						
	Data structures optimization.						
	Object oriented data structure in complex applications						
	Using data structure in resource allocation and leveling process in complex process for developing economic problem oriented software						

Type of evaluation (E – exam, C – colloquium)		E
Estimate percentage	Final exam Project	50% 50%
Bibliografy	Cristian BOLOGA Algoritmi și structuri de date, Editura RISOPRINT, Cluj Napoca, 2006, ISBN 973-651-003-8, 323 pag.	
	I. Smeurean, I. Ivan, M. Dîrdală Limbajul C/C++ prin exemple, probleme, Ed. CISON, București, 1995	
	Ion IVAN, Cristian IONIȚĂ, Cătălin BOJA, Marius POPA, Adrian POCOYNICU, David MILODIN Practica dezvoltării modelare orientată pe structuri de date, Ed. ASE București, 2005 ISBN 973-904-630-0, 223 pag.	
	Mirela Gabriela VOICU Aplicații cu baze de date și structuri de date în Java, mediul de dezvoltare JBuilder, Ed. Universității de vest, 2007	
	Sumcycadra Scogita, Karl Phillip Korobkin C++ Object oriented data structure Springer, New York, 1994	
	William Font, William Topp Data structure with C++, Prontloc Hall Inc. New Jersey, 1996, ISBN 0-13-390938-5	
Instructors	Position, first name, surname	Signature
	PROF., DR. Ion IVAN	
Legend L – lecture, S – seminar, L/P – laboratory/project		

Fig. 1. Sillabus for curse Data structures.

$$n_t = \left(n_0 - \overline{n}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t + \overline{n} = (7-8)\left[\frac{8{,}4*(1-0.7)}{12}\right]^1 + 8 =$$

$$(-1)\left[\frac{8.4*0.3}{12}\right] + 8 = -0.21 + 8 = 8 - 0.21 = 7.79$$

Example 2. Whether note n0 = 5, note promised is = 9.

If the student keeps his word, then the coefficient α=1;

$$\left(n_0 - \overline{n}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t = 0 \quad \text{and} \quad n_t = 9.$$

If the student does not take the word, then received the note is correct:

$$n_t = \left(n_0 - \overline{n}\right)\left[\frac{b_1(1-\alpha)}{b}\right]^t + \overline{n} = (5-9)\left[\frac{6*(1-0.5)}{12}\right]^1 + 9 =$$

$$(-4)\left[\frac{3}{12}\right] + 9 = -1 + 9 = 9 - 1 = 8$$

Problem to be developed with consideration of all components interdependencies personality.

2. Metasystem

Definition 1. System is called ensemble composed of interdependent components, and combined and arranged in a certain order of an entity integrity. [Kondacov Logiceskii slovari, M., Nauka, 1971, p. 175}

Definition 2. Metasystem is a system of systems. [29 Баранова Е. А. Управленческое консультирование как элемент метасистемы управления, Автореферат канд. дисс. М., 2000]

Any update any optimization of the curriculum in computer science is

necessarily predicted by the rule of correspondence equivalent that any change in the content, form, action of any component based system teaching process triggers the need to change the functional and content of all other basic components of the system [7].

Theorem 1. The system, consisting of the main components of training as well as the - is the goal, St - structure, meth - methods, re - means, pr I - information processing, co - conditions, ti - time (terms)), members metasistem.

The demonstration is based on rule compliance and system definition equivalent. Indeed, since any change of one of these systems, components lead to change all the other main components-systems, result [c [systems-components alc [make up the; I them a system called metasistem.

It is established fact that changes in the metasystem are of three types:

- Changes in the same dominant - insignificant change metasystem, which does not exceed any basic component of metasystem;
- metasystem transition - changing metasystem, triggered by changing one or several basic components, resulting metasystem transition from one state to another and marked by metasystem transition from one dominant component to another;
- metasystem paradigm shift triggered by the simultaneous changing of all components metasystem.

Necessarly and sufficient conditions for change metasystem.

Definition 1. The minimum value of the variable, which triggered metasystem transition is called the threshold of change.

Theorem 2. Computer science curriculum (any discipline) requires optimization then and only then, when changes at least a basic component takes place by exceeding the threshold variation of the component.

Demonstration.

Necessity. If in a metasistem changes occur that exceed the variation of at least one basic components, then according to Rule compliance equivalent will trigger changes in proportion to other core components of the metasystem, which necessarily will trigger the transition of metasytem to another dominant system. Another demonstration of need we will achieve by means contrary.

Suppose we have a metasistem

$SA = <a, St, met, re, pr I, co, ti>$ (1)

(Where a - is the goal, St - structure, meth - methods, re - means, pr I - information processing, co - conditions, ti - time (terms)), to which one or all components of basic changes exceeding the threshold variation and metasystem remain without any change. In this case any change in any component of the base does not depend on other components, which can take place only if the variables corresponding components are completely independent. This can only happen if the system has degenerated into independent components. I assumed that metasystem as a system of

systems exist and we concluded that degenerated into independent components - that does not exist. The contradiction proves the theorem necessity.

Sufficiency. Assume that the change of one or several variables of a set of variables described by equation (1) leads to replacement of all the variables of the same set. Then defined system these variables make up a system. The theorem is proved.

2.1. Metasistem molding.

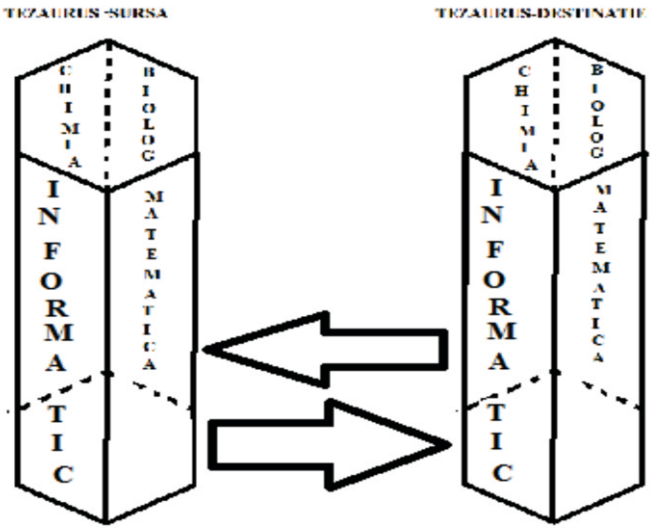
Computer science curriculum (source) and student knowledge (target) can be modeled using two metasystem; metasystemic exchange of information between source and target metasystem taking place by means of information capacity, which varies from one teacher to another, "cue" by V. F. Şatalov; increased teaching units of P. Erdniev; questions with multiple choice answers of education programmed; Based indicative action (ориентировочная основа действий-ООД) 1, 2 and 3 of P. Galperin, N. F.Talîzina (theory formation stages of mental actions); block method of Mary Scerbacova and others and so on.

2.2. Metasystem formal representation.

MetaSystem technology training, research and innovation of students formal can be represented as a function of process variables instructive:

SA = <a, St, met, re, pr I, co, ti, lev> (1) where - is the goal, St - structure, meth - methods, re - means, pr I - information processing, co - conditions, ti - time (terms) lev - level training (training, research, innovation). Obviously, the first 7 ingredients allowed by 3 levels of training.

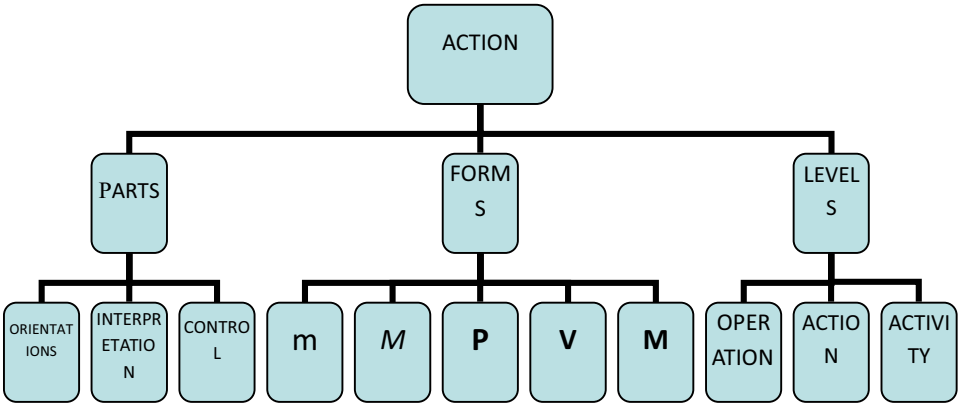
Figure 2. Model of instruction with thesaurus.



2. 3. Meta system components.

Metasystem real includes several components: м-material (object, subject, process); P- perceptual (feelings, emotions); V-audio (speech); M - materialized (habit, custom, skill, competence); M - Mental (concept, idea, knowledge, theory). 2.4. Shares of metasystem.

Shares of metasystem can be of different types:



where m - Action materialized; M -action material;P-action perceptive P, V - verbal action, M - mental action.

Shares materialized and material objects assume management training in the field of study - computer (programming language, computers, software, algorithms, systems, instrumentation and others); Perceptive action relates to management interface dialog with the educational process; verbal action relates to language training and in the activity; Mental action relates to the appropriation of concepts, ideas, theories.

Law regular updating of curriculum high school / university in computer science, is bazed on the fact that most sizes depending teaching is proportionate. For example, how much more time studying, the study results will be successful; the more knowledge the student has the better them into practice etc. Law regular updating of curriculum information is valid for any type of training and all ages because it is based on rule compliance equivalent to that "any change in the content, form, action of any component based system teaching process triggers the need to change the functional and content of all other core system "[1 M., 1980].

3. Metasystem technology of instruction, student resherch and inovation.

3.1. Metasystemic training Technology Balanel D.

[D. Bălănel scientific work] is a technology development of educational of

Johann Friedrich Herbart and use steps provided by Herbart:

clarity - to study lexical and dictionary discipline ("rest break. It mobilized the attention of students. Comes introduction of new materials")

Association - the association of new knowledge to the existing ones ("Association - a deepening ... link established between old and new");

System - the formation (hiperpropozitions) paradigm based on all the knowledge in the discipline of metasistem ("system - search results, definitions, laws based on new knowledge about old ideas." Students "are seeking abstracts, draw conclusions, determine ... ");

Method - associating knowledge discipline at all knowledge metasystem, identifying the links interdisciplinary, cross and utility of one or more subjects ("Method - Awareness movement, applying the acquired knowledge to new facts, events. The students' application of knowledge and skills" . Herbart emphasized that the teaching activity is carried out successfully if it is preceded by mastery of pedagogical theory. Masters education is acquired in teaching daily. [4] .

3.2. If Johann Friedrich Herbart used the concept of apperception as perception, recognition on the basis of previous experience, where metasystem training technology Balanel D. based on the synergistic effect triggers the mechanism of intuition - sense understanding of something, entering into the essence of something; direct conquest of truth without a preliminary logical reasoning.

D. Balanel metasystemic technology examines the teaching process in terms of cybernetic feedback loops using positive and negative regulation, management and, ultimately, the teaching process automation. Details of the invention belong to the author at the stage of registration and registration.

Metasystemic training technology include skills to work in real time, using student tesaurus from computer science, informatics and history of cybernetics; learn experience and performance of the most eminent personalities in the development of computer science and cybernetics, Norbert Wiener and Alain Turing, William Ross Ashby, Simon, Hamming, Newell and others personalities, holding the Alain Turing, John von Neumann and others Awards. Scientific education of students include identifying scientific issues, enrollment of students in research. Identifying the scientific problems inherited as millennial problems in mathematics and computer science, current issues and future of science; incentives in applying forces young people to solve them. The enrollment of students in scientific work is done by conducting research with students on issues of university research in the scientific teams, scientific laboratories and simulators, training.

Metasystemic Tehnology D. Balanel is method of instruction provides that the student can apply self-instruction, research or innovation since exceedances of knowledge of 70% of the studied material.

Metasystemic training technology D. Balanel provides skills working at all levels of students in real time and in scientific research.

Metasystemic training technology D. Balanel to the innovation provides specialized training content, forms of activity, based on research and innovation. Metasystemic training technology D. Balanel is conducted by regularly updating the law to computer science curriculum.

3.2. Lav of periodical refresh of curriculum of informatikc.

Is known that in the educational process operates with discrete sizes. Therefore, the variation of the training components can be determined from the equation in finite differences, which reflects the difference between the current state of knowledge - science metasystem (SA1) and metasystem (condition of the) teaching (Sa2)

SA1 - SA2 = <a1, St1, met1, re1, pr I1, co1, ti1> - <a2, St2, met2, re2, pr I2, co2, ti2> (2)

where - it is the goal, St - structure, meth - methods, re - means, pr I - information processing, co - conditions, ti - time (terms).

After transformations identical relationship, expressing the need to optimize the curriculum will take shape

SA1 (a1, St1, met1, re1, pr I1, CO1, ti1) - SA2 (a2, St2, met2, re2, pr I2, co2, Ti2) = σ1 * (a1, a2) + σ2 * (St1-St2) + σ3 * ((met1-met2) + σ4 * ((re1- re2) + σ5 * (pr I1- pr I2) + σ6 * (co1- co2) + σ7 * (ti1- ti2,) (3)

where each bracket can be zero or one. Nonzero number parentheses indicate how many variables have changed, σi - change value component. Equation (3) represents the fundamental law of dynamics equation curriculum. The threshold variation is formed according to the theory of innovation (diffusion of innovations [11]) that a relatively new technology is accepted that reached a significant number of followers of his and initiated significant progress that he has reached a certain percentage (over 15 %). Undoubtedly, making decisions for the long term is not sufficient assessment of external indicators of computerization universities also must register the internal features of environmental education and training models / specific technology development (see, eg [metasystemic technology D. Balanel] model cluster [28]). The first square bracket contains author's note.

Law optimize the regular curriculum in computer science (or any other curriculum) will have the form:

σ1 * (a1 a2) + σ2 * (St1-St2) + σ3 * (met1-met2) + σ4 * (re1- re2) + σ5 * (pr pr I1- I2) + σ6 * (co1- co2) + σ7 * (ti1- Ti2) = n * σAB, (4)

where n> 1 σAB - metasystem variation threshold that triggers the transition metasystem (> 15%), σ1 - procntul change, 0 <= σ1 <= 100.

Theorem 3. To optimize the structure of the teaching process is applicable metasystem.

Proof of the theorem is reduced to the proof of the theorem 1 and 2 and not bring lack of space.

3.3. Optimization of metods.

Since training builds on the achievements of science, transforms and adapts them to be accessible to young people at different ages to achieve comprehensive modernization of informatics high school / university it is necessary to take into account the results of recent years pedagogical experiments.

There have been a series of experiments examined pedagogical content on modernizing informatics high school / university, among which may be mentioned those containing brief history of the development of science degree courses.

3.4. Optimization means teaching process.

Curriculumul optimizations often will be done within the metasystem teaching process. Because each time one of metasystem components will be dominant, then change the dominant component of the educational process metasystem called metasystem transition will achieve system optimization teaching. Each metasystem transition to teaching process, which will bring in changes in one or several core components of the teaching process metasystem (which changes the threshold metasystem -Only and evolutionary changes) will not necessarily result in metasystem transition; schinbările exceeding the threshold triggers metasystem transition metasystem.

3.5. Optimizing the computer training purpose.

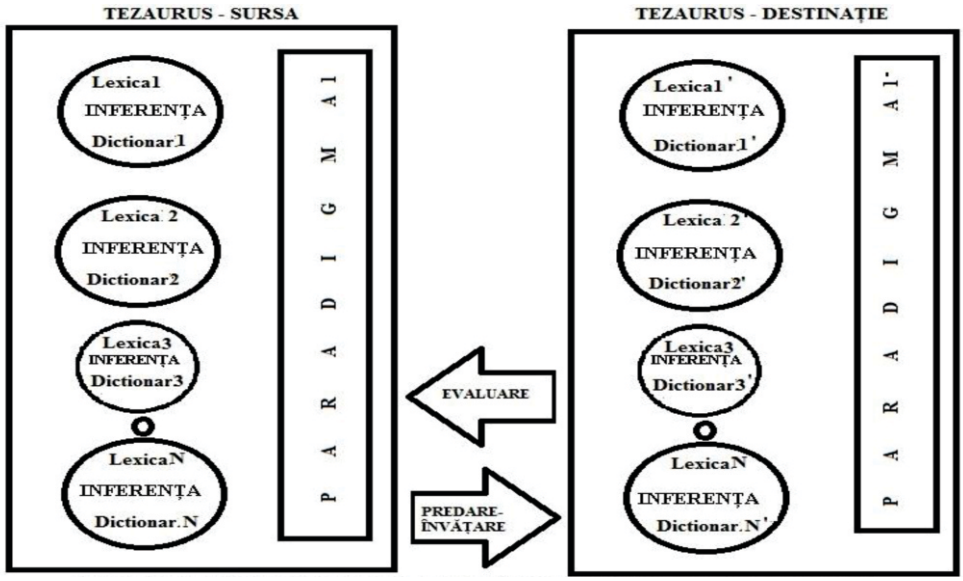
The purpose of the computer training evolved depending on the achievements of hardware, software, and made available at BRAIN development of science and computer engineering. Among them were "Programming - literacy second", "information society", "society based on knowledge", "1 student: 1 computer" Web 2.0 Education 2.0 "skills working in real time" on Informatics and so on

3.6. Optimizing the structure: put in circulation the notion of didactic knowledge metasistem student.

Definition 2. Metasystem summary of the student's knowledge is knowledge model student, under, when he studied a system of academic disciplines. Each discipline should be a system of knowledge. In this case the student to manage the accumulated knowledge systems used unconsciously (or being trained for this) a metasistem conducted by metacunoasterea to. Metasystem student training and instruction using this metasistem (metacunoaşterea) training and education is the result of work performed by teachers. [D. Balanel technology training metasystemic stored at IES, 15/08/2013]

Metasystem based on science curriculum may include HARDWARE, SOFTWAFE and BRAINWARE; relative to base elements include computer electronics, photonics, biological, atomic complex multicomputer and supercomputers. And other criteria can be used to optimize the computer curriculum.

Fig. 3. Model of Metasystemic technology of instruction, student reshearch and inovation.



3.7. Optimization methods of training: pedagogical experiments in recent years.

Because training is based on the achievements of science, transforms and adapts them to reach students at different ages to achieve comprehensive modernization of university computer science it is necessary to take into account the results of recent years pedagogical experiments. There were examined a series of experiments pedagodice on upgrading university computer contents, among which may be mentioned those containing short history of computer implementation rate in different specialties.

As in previous periods, the period of development of computer science and ICT is closely linked to the development of the Internet [9, 17, 26, p. 33]. Subsequent changes in universities can be coerate as a transition model "one student - one computer, 1: 1" [26], the educational process in TIC- rich learning environment [27, 28], the e-learning technologies [25] and Web 2.0 services [6], [8, 9, 10, 24], education 2.0 (Chronicle, online education, network creative teachers, schools Planet [17] and others). All the more so when used massive weeping mobiles Samsung S4 class and others leading performance and powerful. This, according to the equation early training

notes [2], necessarily lead to increasing students' grades objectives and in terms of metasystem training technology D. Balanel - to increase the quantitative and qualitative skills of students; Perspective requires implementations, new innovations, long life.

Human personality is the subject of several research disciplines. Human personality is studied in psychology, pedagogy and others scientific domains. It is known that the structure of human personality is made up of several components: orientation, experience, features of mental processes, biochemical properties (Table 1 and Table 2).

Table 1. PERSONALITY

PERSONALITY			
Curent state	Orientation	Experience	Guideline features psychological processes
Formation	Education	Training	Exercise
Result	A new guidance	A new level of experience.	A new level of mental processes specifics

Table 2. Personality characteristics

Orientation includes: • beliefs; • world outlook; • ideals; • trends; • interest; • desires. .	Experience includes: • skills; • habits; • abilities; • knowledgs.	Peculiarities of psychological processes include: • attention; • will; • feelings; • perception; • thinking; • senses; • emotions; • memory.

		Biochemical properties include: 1. temperament; 2. age; 3. sex.

Build complete model of personality under training need to take into account the mutual influence of personality components. That interrelationship between orientation, experience and features psihifiziologice. These dependencies require a quantitative study. But with some precision can be expected to cause addiction note previous personality notes, the amount of information, the new course curriculum, which will be studied, the personality experience in the field studied, the psychophysical characteristics of the personality. Influences can be both positive - acceleration, as well as negative - which encumbers.

Information.

Most dynamic component of personality is “experience”. Training teachers on her work during training. But that the “experience” is achieved through parallel action on the direction and specifics psychological processes. Standing person acting on information of different complexity, from different sources.

Information is determined by the following features: time, space, storage media, data and structure.

Table 3.

I N F O R M A T I O N				
Time	Space	Storage media	Data	Structure

A component “experience” of Structure "Personality" interacts with the component ”Data” of structure "Information." As a result of this interaction is formed one of different levels of ownership of knowledge, that the result is assessed by checking different notes.

Table 4. Levels of ownership of knowledge

Difference	Memorizing	Understanding	Application	Transfer (**reshearch**)	Innovation (**Intuitio**).
Person can distinguish objects subject gave similar	Person can replicate the definition, the formula law may determine the unit size, they write notation.	Person can bring their own examples from every law or rule, to confirm his conclusions demonstrations, the relationship itself cause - result from events.	Person can apply knowledge to solve problems similar to those examined. (Apperception)	Person can apply knowledge to solve problems creatively in existent paradigme.	Person can apply knowledge to solve problems creatively in new paradigm.

- Interaction between personality and information is in time. Time to education is conditioned by the fact, established in research teaching that information, to acquire knowledge of personality with a certain speed (not currently) - the bit rate of 10-3 per sec. With this speed information, knowledge passes from operative memory in short-lasting memory of the personality. Therefore the training process in general, the Bologna process in particular, requires knowledge sharing in hours, according to a study plan and a timetable.
- Hypothesis 1. Because the time difference while teaching and appropriating of information can be formalized instructional process using finite difference equations Training can take place in a given space – auditorium, websites, skype, etc. which are coordinated schedule.
- Interaction component "experience" Personality structure with the structure of the Information Storage Media components takes place through different information carriers, information resources and educational materials. The quality of this interaction is quite important, especially for Bologna process.
- Interaction component "experience" component of personality with "structure" of information contributes to the formation / field of study paradigm shift.
- There are important interactions under "Orientation" personality structure with components "Information". These influences form correlation α, $0 < \alpha \leq 1$.

The Bologna process is seen as a learning process with expected results. In this process are determined in advance by the standard curriculum, expected results, expected on the field under study. Currently setting the standard curriculum is a particular problem.

Hypothesis 2. Curriculum content standards can be formed, using the notion of thesaurus of the domain of objects of standard curriculum. In work [1, pag. 8-9 Balanel Autofererat] it concludes that the domain model objects, appropriated to education can be represented as consisting of components, shown in Figure 1.

Thesaurus is represented as "all the knowledge accumulated by a person or group" [2] and include: lexical, dictionary and paradigm (Fig. 2).

Is that all the vocabulary words of the language information, including lexeme, identify, integers, two-letter symbols, musical symbols, pseudo-graphic symbols and a depending on the alphabet used.

Explanatory dictionary is determined as the set, allowing identical transformations and ensure compliance between words/concepts natural and scientific language.

Paradigm is the meaning of many immanent relations, consists of concepts, words, independent of context.

Research shows, that Lexis can serve as indicative no. 1 action, explanatory Dictionary - as the Indicative no. 2 and the Paradigm - as the Indicative no. 3 action. [1, стр. 10-11].

Figure 1. Structure of domain objects.

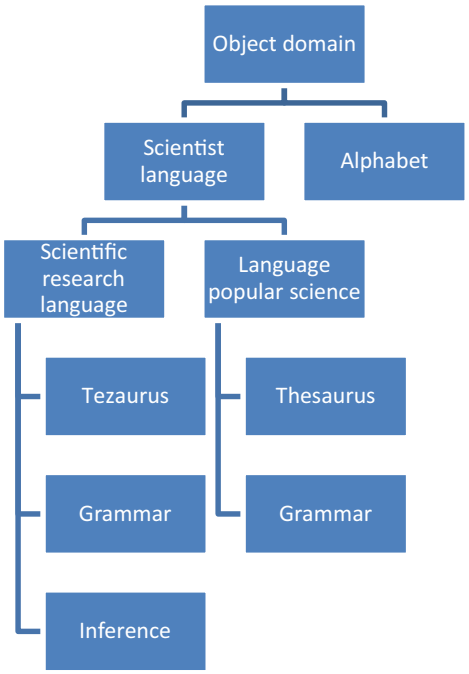
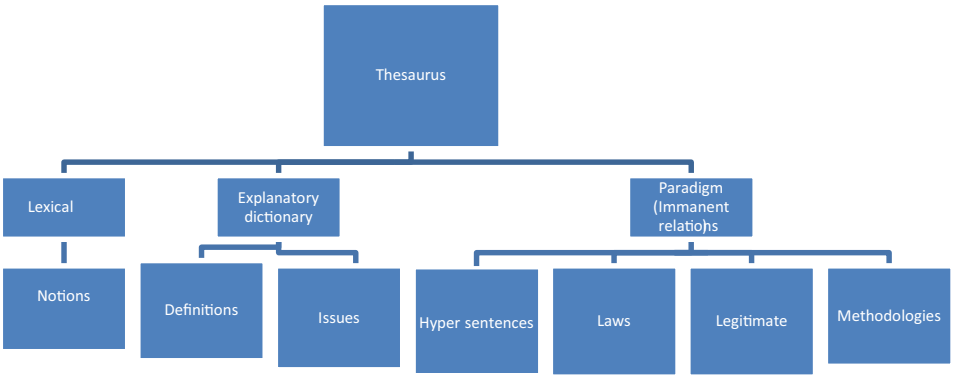


Figure 2. Thesaurus structure of domain objects.



3.8. Optimization means teaching process.

The means used for teaching purpose system must be targeted to the goal. Examiinate system means teachers are broadly: include material resources (equipment, furniture, halls, teaching materials, schedule lessons, computers and so on. A. M. D.), For teaching; financial resources, personnel (qualified teachers), natural languages (dialogue) and formal.

Obviously, upgrading the computer curricimilui school should be based on the principles of pedagogical and psychological, to harmonize with them. These Principles should necessarily be included in the metasystem teacher, actor training in computer science.

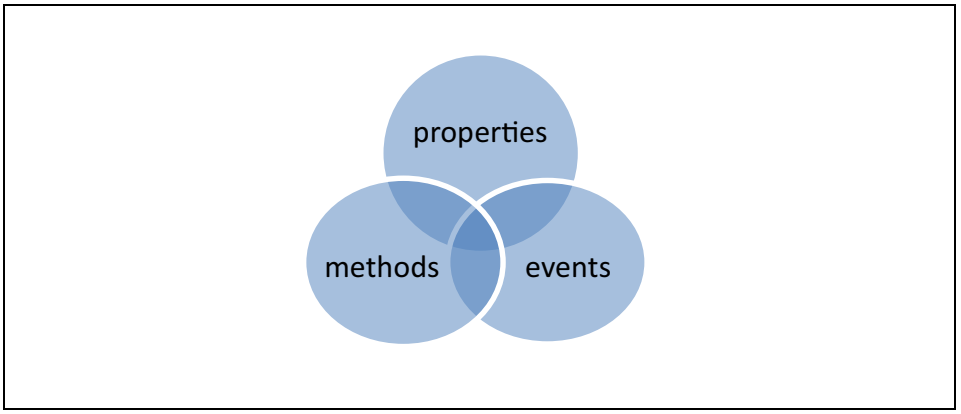
All parts meet in the above lists [2].

All components indicated will change students' learning motivation informatics, for reasons that are decisive in the fundamental equation of dynamic training, was published [3, p. 262-269].

In terms of content is expected excenged Pascal programming language with Visual Basic programming language, which is part of integrated applications studied and applied by students - MS Office applications. Often optimizations curriculum will be achieved within the metasystem teaching process. Because each time one of metasystem components will be dominant, dominant metasystem components when changing the teaching process, called metasystem transition will achieve system optimization teaching. Each metasystem transition teaching process that will bring the change of one or several core components of the teaching process metasystem (which changes the threshold metasystem -Only and evolutionary changes) will necessarily lead to metasystem transition.

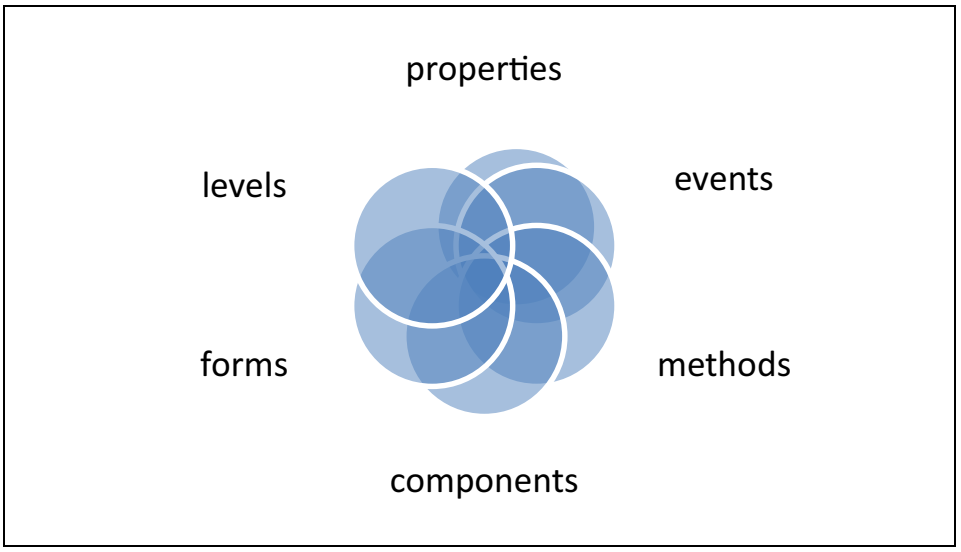
Representing knowledge about structured objects shown by the interaction properties, methods and events objectively

Figure 1. Structured object knowledge representation method.



Structured objects, taken initially as an element in 3D space knowledge representation becomes Meta-system composed of six systems (Fig. 2).

Figure 2. The components of the metasystem knowledge representation method for 3D spaces.



3.9. Methods of knowledge representation.

In order to store the knowledge in the intelligent systems it is needed to formalize it in a knowledge representation method. In [1] are described the following methods of representation of knowledge: Method of production rules, semantic networks method,

the method object-attribute-value triples, scheme, teaching method and scenarios, methods based on logic (propositional calculation, calculation predicate) method structured objects, neural network approach.

In [1], p. 109 it is also stated that: "In addition to these ones, there are other methods often used in developing expert systems management: scenarios, lists, decision tables, decision trees, restrictions, stochastic Petri nets, neuronal networks, etc.".

In [1], p. 107 it is stated that: "Professor Louis Pau introduces a very useful classification of knowledge representation formalisms that is presented in Table 1, but without the last column, as it is ours.

Table 1. The classification of the main methods of knowledge representation [1], which is added to the 3D Space column.

	Semantic Networks [6]	Rules [7]	Logic [8]	Frames / objects [10]	3D Space
Field	units/arcs	Facts	Certainty	Frames / objects	Spaces
Action	Nodes / arcs, graphs	Rules of inference	Rules validation	Frames / objects	Transitions
Control	Units / arcs, graphs	meta-rules.	Meta-knowledge inference engine	Attachment procedural inferences	Heritage objects. An inference engine order

Judging about the teacher Louis Pau's classification, we concluded that this table has a classification which may contain changes in the number of columns, as well as in the number of rows of the table.

The concept, which was taken as the basis for a new classification is the following. Knowledge representation methods are used to store knowledge. Subsequently formalized knowledge is used for searching and processing computer. Knowledge processing will be done by a programming language. Programming languages based on formal languages, generated by formal grammars. It makes the following assumption.

Update meta-system component that determines the quality of the transition moment is achieved by meta-system.

3.9. Optimization of the time. Pedagogical principles.

One of the main criteria of the training is to track and monitor computer time. Real time indication of activity as students depends on skills training and education of interest to students to computer science and communication technologies. Under this optimization curricilumului will consider the inclusion in the curriculum informaţiilolr about e-technologies (e-learning - the purpose and means of training, e-banking, e-mail, e-government etc). The curriculum also will enter information about teleworking (telework, casual, semi-furnished, at home, with total mobility with random schedule) teleactivities, telemedicine, teleeducaţia, virtual university, cibermarketing and others. a. optimization trends in the teaching process.

Hypothesis 1. Usually all curriculum optimizations have as a result save time.

Pedagogical principle essential to educate creative personalities are the following: How much more esteem for the combined entity with as many requirements to the person. Creative conditions are strictly individual. For example, Cimarosa search for reasons including amusements and noise works great. Russo beautiful deep thought only the sun, picking flowers. Amper is animated only standing and Deckart - is lying. Milton composing his lyrics, throwing his head back. Haidn admitted that he can not write his horus ring with precious stones, donated by Friedrich II. Bench fashion favorite Einstein was a leather jacket, wearing on the body or a nightgown and barefoot shoes. Tolstoy barefoot flail not for originality - that disadvantage him in the eyes of those present. Arturo Rosenblat illuminates working 15 to 16 hours until after midnight. N. Wiener work the morning after awakening, after working 14 hour fades, and when it gets dark creator can not work. The main condition of creative work - internal and external freedom.

3.10. Optimizing training in computer science: paradigm shift.

As mentioned above some tweaking of the curriculum will be possible through metasystem transition teaching process.

Each metasystem transition to teaching process, which will bring you to change all the basic components of the educational process metasystem (changes exceeding the threshold metasystem -Only and revolutionary changes) will necessarily lead to changing the development paradigm of the metasystem.

The law establishes optimizing curriculum and curriculum change direction - null brackets.

4. CONCLUSIONS.

1.Bologna Process can be examined using a mathematical model that allows formalizing this process and predict behavior.

2.Bologna Process can be considered as an educational process with expected results.

Mathematical model of the Bologna process can be obtained as a result of interaction of structures "personality" and "information".

3.Curriculum content standards can be formed, using the notion of thesaurus of the domain of objects of standard curriculum.

4.The mathematical model of the Bologna process allows the anticipated results constitute the fundamental equation of dynamics of technology training early grades, according to Bologna.

Is showed the hypothesis that fixed radius circle area of knowdlege devepelovment can be implemented with a fixed steering vector, followed by other vectors, Which Taken together, form a chain Marcov.

5.Solution fundamental of equation of dynamic instruction early grades is quite stable, allowing to define the Bologna process as efficient and stable educational technology.

Thus, the laws in force when using the education, student research and innovation in academic (teaching) studies are as follows:

6.Metasystem appears when used at the same time more than one system, according to the first theorem of Gödel's completeness;

7.In the metasystem, built on the basis of systems consisting of a necessary and sufficient systems possible conclusion proposals covering the concept of systems components and proof of their truth;

8.Transit metasystems in other state is possible, therefore metasystem has a hierarchical structure, and each time one of the systems is preferred in this metasystem;

9.In the metasystem work a synergistic effect;

10.Conclusion hipersentenses may lead to a change in the paradigm of the subject area, usually in conjunction with transit metasystem.

11.Classification metasystem performed by multicriterial classification.

12.The following metasystem are the levels of shell, object environment composed metasystem, its shell, which together are a chain of feedback backtraking hierarchically higher metasystem. The highest level of metasystem is the chaos. Laws of the highest level described by the theory of chaos. At the highest level of metasystem is defined the largest level of synergies.

13.Crushing metasystems lost synergetic meta-information, and laws relating the components of the system metasystem.

14.Any optimization of curriculum is determined by the rule about echivalent corresponding.

15.In the process of passinng to knovledge society loss the optimal functioning of curriculum in the universities.

16.The contradictions between pedagogical principles and state of science make necesary the optimization of curriculum.

17.For optimization of curriculum and didactical process can utilize the metasistem.

SA = < a, St, met, re, pr I, co, ti>,

where a – goal, St – structure, met – metods, re – means, pr I – treatment of information, co – conditions, ti – interval of time.

18.Fundamental dinamiks law of ccurriculum have a form

SA1(a1, St1, met1, re1, pr I1, co1, ti1) – SA2(a2, St2, met2, re2, pr I2, co2, ti2) = σ1* (a1-a2)+ σ2* (St1-St2)+ σ3*((met1-met2)+ σ4*((re1- re2)+ σ5*(pr I1- pr I2)+ σ6*(co1- co2,)+ σ7*(ti1- ti2,)

19.Periodical optimization law of curriculum for informatics (and for others discipline) can have a form:

σ1* (a1-a2)+σ2* (St1-St2)+ σ3*(met1-met2)+ σ4*(re1- re2)+ σ5*(pr I1- pr I2)+ σ6*(co1- co2)+ σ7*(ti1- ti2) = n* σAB ,

where n >1, σAB – level of changs in metasystem, that run the transition of metasystem in other state (>15%), 0<=σi<<=100 (%).

20.For optimizing structure of didactic process it is aplicable constructive crash of precedent state of metasistem.

21.Law of optimization of curriculum indicate and direction of modifications – the nor aqual to zero paranteses.

22.As rule, all optimizations of curriculum can economize time.

23.Curriculumfor for informatics in university finishing with propedeutics of expert sistems in speciality.

24.In the classification methods of knowledge representation it is necessary to make formal grammar.

The representation of knowledge by the method space 3D as a symbol originally x0 is to represent knowledge that can be used objectively, as a lot of elements-terminal serves crowd 3D (parts & shapes & levels) as factors terminal - set of transactions, as well as lots of rules - set of inference engine order 1.

25.According to the Gödel's theorem about incompleteness within a knowledge-level representation can be refined such knowledge, direct and inverse assertion that the truth about the object, its parts or components of their relationship can not be demonstrated at the level of representation of knowledge.

26.The classification is the result of logical operations and sharing objects into classes related to the system and it differs in the criteria we are interested in. The quality classification system does not change. The mono-criteria classification is usually used for static structural systems. The multi-criteria classification can be used for both processes, for the objects and structural static and dynamic events.

27.The knowledge representation method can be performed simultaneously with 3D multi-criteria classification of objects. The knowledge representation of an object is the determined object associated with the object sought. It examines current definitions of objects. The dependency is established between these objects and objects in order to

generalize the orders. The system elements (and their corresponding criteria) are in constant interaction, which each takes place in the so-called rule of correspondence of balance. This rule states that any change in any of the component of the system leads to functional and content changes of other essential components of the system.

28.Metasystemic training technology include skills to work in real time, using student tesaurus from computer science, informatics and history of cybernetics; learn experience and performance of the most eminent personalities in the development of computer science and cybernetics, Norbert Wiener and Alain Turing, William Ross Ashby, Simon, Hamming, Newell and others personalities, holding the Alain Turing, John von Neumann and others Awards. Scientific education of students include identifying scientific issues, enrollment of students in research. Identifying the scientific problems inherited as millennial problems in mathematics and computer science, current issues and future of science; incentives in applying forces young people to solve them. The enrollment of students in scientific work is done by conducting research with students on issues of university research in the scientific teams, scientific laboratories and simulators, training.

29.The content of education, forming of research skils and inovations methods can operate using 3-D method of metasystem knowledge representation method for 3D spaces.

30.Confidence, competences to work in real time and intuition – the results of Metasystemic Technology of instruction, student research and innovation.

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