

Education with the Expected Assessment of Learning

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Abstract: *In this paper is builded from the theoretical view technology of education under the Bologna process. To this end, is examined the interaction between structures "personality" and "information", in the training-directed education, anchored to note anticipated. The notes anticipated training is considered to be appropriate training of Bologna. The author proposes to use a training curriculum content standards for the training of notes anticipated, according to the Bologna process. The author considers that the standard curricular should include components thesaurus, called lexical, dictionary and paradigm. Finally conclusions are functioning model lists of notes anticipated. The notion of "information equation" AND DINAMIC ECUATION OF LEARNING is including into the science first. It shows high stability of the solution of equation with training notes anticipatted, wich describes the Bologna process.*

Keywords: *Bologna process, dynamic equation of learning, personality, information, information equation anchored to note anticipate.*

1. Introduction. Personality and information.

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			
Current 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; • knowledge.	Peculiarities of psychological processes include: • attention; • will; • feelings; • perception; • thinking; • senses;
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		<ul style="list-style-type: none"> • emotions; • memory. Biochemical properties include: <ul style="list-style-type: none"> • temperament; • age; • sex.
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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 psihifiziologic. 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. Information

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

We note with mij personality structure components, ti note with information structure components. The interaction between *personality* and *information* structures are represented by expression (1).

$$\begin{pmatrix} m11..m12..m13.....m1k \\ m21..m22..m23.....m2k \\ m31..m32..m33.....m3k \\ \\ mn1..mn2..mn3.....mnk \end{pmatrix} * (t1..t2....) \rightarrow m11* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& m12* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& \dots \& m1k * \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& \\
 m21* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& m22* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& \dots \& m2k * \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& m31* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& m32* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& \dots \& m3k * \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \dots \& \\
 mn1* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& mn2* \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \& \dots \& mnk * \begin{pmatrix} t1 \\ t2 \\ t3 \\ \dots \\ tn \end{pmatrix} \tag{1}$$

- ✓ A component “*experience*” of Structure “*Personality*” interacts with the component “*Data*” of structure “*Information*.” As a result of this interaction is formed 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
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.	Person can apply knowledge to solve problems creatively.

- ✓ 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 / sec. With this speed information, knowledge passes from operative memory, 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.
- ✓ 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] 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,

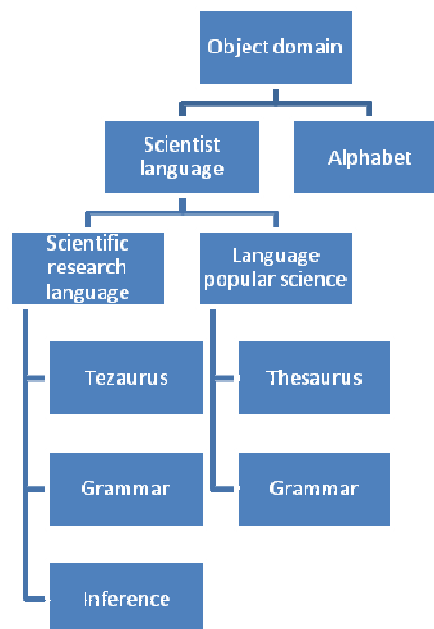


Fig. 1. Structure of domain objects independent of context

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, crp. 10-11].

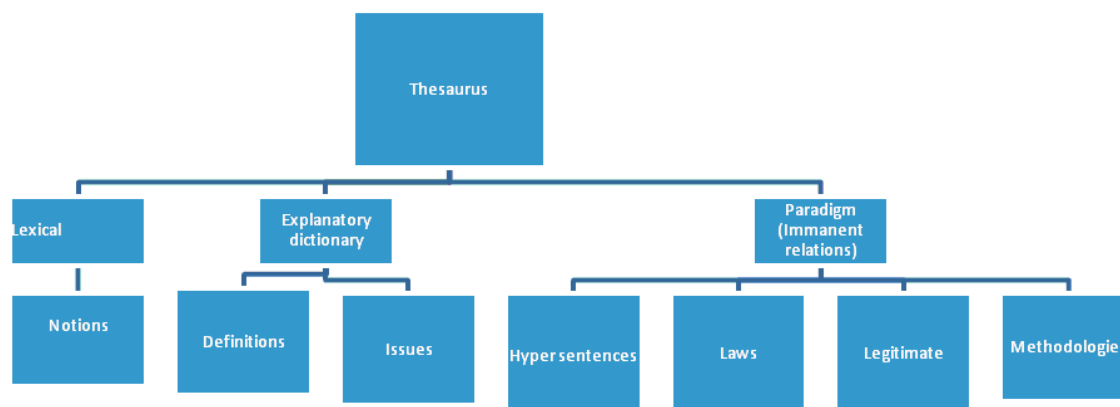


Fig. 2. Thesaurus structure of domain objects

2. Directing the training process

Problem and conducted instructional process and use information in the process variables were studied:

- conception Gherbart
- behavioriste conception (B. F. Schiner)
- concept of associative-reflexive (N. Mencinscaia, Iu. Samarina)
- training on the stages theory of mental actions (P. Ia. Galperin, NF Talîzina).

In this paper we refer only mentioned the first and last of those.

2.1. Concept Gherbart

In training after conception Gherbart distinguish four stages:

Combination: from a representation of an object is passed to another phenomenon, linked by a relationship with already known representations of the user.

Clarity: Standby to focus on the representation given its deep examination.

Method: what is learned is applied to new facts, events, questions. Knowledge, acquired before the bridge becomes a tool for implementing the practice. In this case, requires creative attitude, extensive use of existing alliances, we need the ability to think creatively.

System takes place at the link between knowledge already acquired, determining where each November representation relative to other representations and the set of representations in general, pairings and removes unnecessary links.

So, to pass through stages Gherbart occurs:

- Consideration of 'inside';
- Examination of relations with other concepts;
- Consideration of 'outside';
- Regularities concept and application methods.

During the first stage using variable information, this passes information to the end of phase constant. During the second staple working with constant information, which passes information to the end stage conditional variable; During the third stage of working with conditional variable information, passing the information parameters. In the fourth stage working with parametric information. Also necessary to mention that during stages Association and working method, using the spontaneity, arbitrarily. During stages clarity and handling system is used.

2.2. Theory about the formation of mental actions on stage (P. Ia. Galperin, NF Talízina).

According to this theory [4] mental actions training takes place according to the following steps:

- S₁ creating training grounds;
- S₂ composition scheme, i.e., action orientation;
- S₃ performance of real action;
- S₄ rule described action done with forfeiture need stage 2;
- S₅ action occurs with rule in mind;
- S₆ total refusal to rule in mind, in abbreviated form action (internalization).

The last of these theories development occurs at the boundary area for further development, which has no direction, but a range.



Fig. 3. Development zone of personality in Bologna Process

This theory is based on research findings related to studying the influence of logical arrangement of material on the ownership. Gavurin, Donahue (1961) concluded that the logical order of the material leads to better assimilation. [3, pag. 281] November showed the hypothesis that fixed radius circle area can be implemented with a fixed steering vector, followed by other vectors, which taken together, form a **chain Marcov**.

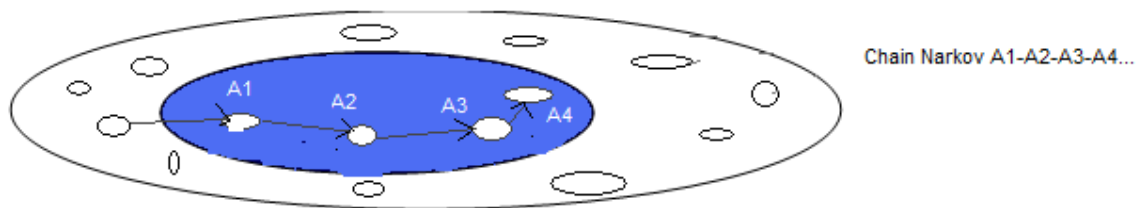


Fig. 4. Development strategies in Bologna process

Moving into the unknown zone on the A1A2 vector is done by solving an equation information [7, 8, 9, 10, 11, 12, 13].

Using vector instead of the circle would allow:

- Determination of the variable information;
- Movement and transformations of the same information;
- Formalize knowledge.

In this paper we examine the question of knowledge formalization. To this end it is proposed formalization of knowledge acquired in the form of a standard curriculum, under the Bologna process. The standard requires evidence of a priori knowledge, skills, abilities, education and training proposed.

3. Education with the expected assessment of learning – reaching mandatory learning outcomes

One consists of contemporary educational technology training to achieve expected results. Research results are known, made by applying this technology to teach mathematics Aurelia Railean (Moldova), V. Firsov (Moscow) and other researchers. But instructive technology achieving anticipated results not having a proper formalization. Therefore the questions about the formalization of educational technology are examined in the early results of the communication.

Whether we have a technology training to achieve expected results. We analyze the essence of the problem to make this technology dependency. In any learning process between the desired results and is determined according to a report that says the student is in a state of psychological equilibrium (if the training results and the desired match) or not (the results vary). Results desire depends of level of notes in the current period, so:

$$\mathbf{D}_t = \mathbf{a} + \mathbf{b} * \mathbf{n}_t, \quad (2)$$

where:

\mathbf{D}_t is the desire,

\mathbf{n}_t is the note, both in t , the relationship between them is linear.

Can achieve the desired grade can express the relationship

$$P_t = a_1 + b_1 * n_t^e, \quad (3)$$

where:

n_t^e is expected to score between period t .

To achieve desired results in tonnes, of course, we have

$$\mathbf{D}_t = \mathbf{P}_t \quad (4)$$

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

$$n_t^e = n_{t-1} + \alpha(n_N - n_{t-1}) \quad 0 < \alpha < 1 \quad (5)$$

where:

n_N 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 n_N equal with \bar{n} - average of notes. In this case the relationship (5) has the form:

$$n_t^e = n_{t-1} + \alpha(\bar{n} - n_{t-1}) \quad 0 < \alpha < 1 \quad (6)$$

Initial problem is expressed through the system of equations

$$\mathbf{D}_t = \mathbf{a} + \mathbf{b} * \mathbf{n}_t$$

$$P_t = a_1 - b_1 \left[n_{t-1} + \alpha \left(\bar{n} - n_{t-1} \right) \right] \quad (7)$$

$$\mathbf{D}_t = \mathbf{P}_t$$

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

$$a + b * n_t = a_1 + b_1 * p_{t-1} + b_1 \alpha \bar{n} - b_1 \alpha n_{t-1}, \quad (8)$$

$$b n_t - (b_1 - b_1 \alpha) n_{t-1} = a_1 - a + b_1 \alpha \bar{n} \quad (9)$$

where:

$$b n_t - b_1 (1 - \alpha) n_{t-1} = a_1 - a + b_1 \alpha \bar{n} \quad (10)$$

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

General solution of inhomogeneous equation (11) consists of the sum of homogeneous equation solution

$$b n_t - b_1 (1 - \alpha) n_{t-1} = 0 \quad (11)$$

I have a particular solution of inhomogeneous solution.

The general solution of inhomogeneous equation is of form

$$n_t = A \left[\frac{b_1 (1 - \alpha)}{b} \right]^t \quad (12)$$

and a particular solution of inhomogeneous equation (10) is

$$\bar{n} = \frac{a_1 - a + b_1 \alpha \bar{n}}{b - b_1 + b_1 \alpha} \quad (13)$$

where

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

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

$$n_t = A \left[\frac{b_1 (1 - \alpha)}{b} \right]^t + \bar{n} \quad (14)$$

if it knows n_0 one can determine the constant:

$$A = (n_0 - \bar{n})$$

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

$$n_t = (n_0 - \bar{n}) \left[\frac{b_1 (1 - \alpha)}{b} \right]^t + \bar{n} \quad (15)$$

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

$$|b_1 (1 - \alpha)| < |b_1| \quad (16)$$

Note that $b_1 (1 - \alpha)$ is less than b_1 , and α 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 (16) always occurs because $\alpha > 0$.

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

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

4. Evaluation of the education in Bologna proces

Evaluation took place on several groups of students in Moldova. 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:

- E₁. setting the course name and teacher, who will take over;
- E₂ determining the number of hours for teaching, instructional, educational, developer of the course;
- E₃ 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
- E₄ thesaurus establish concentric developer that connect teacher and student thesaurus - Literature and teaching materials used in teaching the course;
- E₅ determining the form of study: stationary, correspondence, distance education, etc. combined.
- E₆ the content and form of assessment.
- E₇ Determination by student attitude toward course and expected grade.
- E₈. 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. 5 we have: As embedded in all the above components are present in Syllabus (Fig. 5).

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

SYLLABUS
academic year: 2009-2010

Course title		DATA STRUCTURES					
Course code	0100101OS311220L	Numbers of points	5	Hours per semester			
				Total	Lectures (C)	Seminar (S)	Laboratory/project work (L/P)
Faculty where delivered		ECONOMIC CYBERNETICS, STATISTICS AND INFORMATICS			Year of study		3
Specialisation		ECONOMIC INFORMATICS			Semester		1
Course type: F – fundamental, S – specialised, C – complementary							S
Course curricular category: C – compulsory, E – elective, F – free, S – special							C
Pre-requisites		Compulsory					
		Recommended					
Learning objectives		Initiation in defining and using data structures adequately.					
Course contents (descriptors)		<ul style="list-style-type: none"> Basic concepts: memory areas, referring address, contextual content, abstract data defining models, data classification criteria, data presentation models analytical, graphic, graph, textual Sparse matrices and arrays: models, properties, operations – definitions, initializations, traversals, updates; sparse matrix: encoding with arrays, lists, aggregated lists, sparse matrix operations; storing arrays into files, generalizations; array operations libraries; Heterogeneous data structures: articles, files, databases, repository; internal encoding, searches, retrieval, traversal; referring expressions, aggregation; Lists, stacks, queues: definition, models: analytical, graphic, textual; operations: creation, traversal, insertion, deletion, concatenation, conversion, aggregation; Trees: definition, models: analytical, graphic, textual; operations: creation, traversal, insertion, deletion, concatenation, conversion, aggregation; B trees, AVL trees; Data structures optimizations; Object oriented data structures in complex applications; Using data structures as resource allocation and leveling process in complex projects for developing economic problems oriented software 					
Type of assessment (E – exam, A – continuous assessment, C – colloquium)						E	
Assessment percentage		Final exam/assessment paper				50%	
		Projects/Essay(s) + attendance				50%	
Bibliography		<ul style="list-style-type: none"> Cristian BOLOGA - <i>Algoritmi și structuri de date</i>, Editura RISOPRINT, Cluj-Napoca, 2005, ISBN 973-651-003-8, 323pg. I.Smeureanu, I. Ivan, M. Dărdală, <i>Limbaajul C/C++ prin exemple probleme</i>, Ed.CISON, București, 1995 Ion IVAN, Cristian IONITA, Cătălin BOJA, Marius POPA, Adrian POCOVNICU, Daniel MILODIN - <i>Practica dezvoltării software orientată pe structuri de date</i>, Editura ASE, București, 2005, ISBN 973 - 594-630-0, 223 pg. Mirela Cărmel VOICU – <i>Aplicații cu baze de date și structuri de date în Java utilizând mediul de dezvoltare JBuilder</i>, Ed. Universității de Vest, 2007 Saumeyendra Sengupta, Carl Phillip Korobkin - <i>C++ Object Oriented Data Structures</i>, Springer Verlag, New York, 1994 William Ford, William Topp – <i>Data Structures with C++</i>, Prentice Hall Inc., New Jersey, 1996, ISBN 0-13-320938-5. 					
Instructors		Position, title, first name, surname				Signature	
		Prof. Dr. Ion IVAN					
Legend: L – lecture; S – seminar; L/P – laboratory/project work.							

Fig. 5. Syllabus for course Data structures

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

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

Whether note $n_0 = 7$ ($\alpha = 0.7$), note promised is = 8.

If the personality keeps his word, then the coefficient $\alpha=1$; $\left(n_0 - \bar{n} \right) \left[\frac{b_1(1 - \alpha)}{b} \right]^t = 0$

And $n_t = 8$.

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

$$n_t = \left(n_0 - \bar{n} \right) \left[\frac{b_1(1 - \alpha)}{b} \right]^t + \bar{n} = (7 - 8) \left[\frac{8.4 * (1 - 0.7)}{12} \right]^1 + 8 =$$

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

Example 2. Whether note $n_0 = 5$, note promised is = 9.

If the student keeps his word, then the coefficient $\alpha=1$; $\left(n_0 - \bar{n} \right) \left[\frac{b_1(1 - \alpha)}{b} \right]^t = 0$

and $n_t = 9$.

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

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

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

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

5. Conclusions

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

Bologna Process is considered as an educational process with expected results. Mathematical model of the Bologna process is obtained as a result of interaction of structures "*personality*" and "*information*".

Curriculum content standards are formed, using the notion of thesaurus of the domain of objects of standard curriculum.

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 that fixed radius circle area is implemented with a fixed steering vector, followed by other vectors, Which Taken together, form a chain Marcov.

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

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