Innovative-Didactic Program Complex and New Formalized Model of Education

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ABSTRACT

In this work on the example of educational system of Uzbekistan the new paradigm of education is substantiated in the following edition: education through all life. The formalized model presented in this paper in compliance with this paradigm reflects multi-component system, multi-variant approaches and cyclicity of educational process in a modern society. The examples of educational processes which are modelled within the framework of proposed formalized model of education are presented.

Keywords: paradigm, education, formalized model, reproduction of knowledge, innovative-didactic program complexes, pentanom.

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1. INTRODUCTION

It is difficult to overestimate value of educational system in a modern society. The comprehension of the importance of effective educational system was the reason for acceptance of strategic concepts of development of educational system in a number of the countries. For example, in the year 2000 in USA *"The national plan for development of educational technologies"* was accepted, in Russian Federation there are consistently implemented programs such as *"The doctrine of national education"* and the task program "*The program of creation of the common information environment of education system*". In Europe, alongside with realization of similar national programs, there are also the results of transnational projects initiated by special educational funds of the European commission which are accepted, carried out and successfully realized. The special consideration is given to the problems of education in Uzbekistan where on the basis of *"The Law on education"* and *"The national program*

on professional training of specialists", the reform of education system which was firstly created in the Soviet period is consistently implemented and its results have received positive appraisal of a wide range of politicians and experts. Undoubtedly, the education systems have general and local problems, both of conceptual and instrumental character.

It is necessary to attribute to the conceptual problems, alongside with development of concrete innovational techniques of training, problems of updating and comprehension of a paradigm of education, and also a problem of creation of adequate models of education having general and/or national character. The spectrum of instrumental problems of education, obviously, is much wider and captures individual methodology of teaching, issues of development of normative documents, the academic-methodological literature, questions of hardware, software in conditions of e-learning, - in general, everything that provides educational process in a view of application of innovational and information technologies. In the present work some approaches to the solution of these problems are presented.

2.   A NEW PARADIGM OF EDUCATION

A number of sociologists are inclined to call the modern phase of development of our society as "postindustrial", in which one of most important values is *information*. Namely the prompt access to the necessary information, as a rule, is capable to lead to the success, both in technical and humanitarian projects. From the other hand unbiased interference and interdependence of national economies, globalization processes, and a relative transparency of borders in regards of financial streams and information flows, expansion of opportunities for free choice of place for residence states for an education system of any country the requirement for "mobility of trainees". This requirement is stipulated also by intensity of updating of knowledge itself. As it is highlighted in Starodubtsev (2002), "… in the nearest future in many developed countries of the world a person should change, within the active period of its life, several (up to 5) fields of professional activity. By some estimations, 80 % of knowledge which are required to today's graduates of high schools, not known to anybody yet … It is possible to ascertain, that formation of a new educational paradigm has already began: from education for the whole life, to education throughout the whole life ". In this connection it appears to us that the new paradigm of education looks more laconic in the following edition education through all life.

Besides the stated arguments this paradigm, in our opinion, obtains one more motivation for its acceptance in connection with new financial, or to be more exact the economic crisis. Thus the stagnation of certain economies, omnipresent reduction of workplaces leads to the simple conclusion: *modern experts should have knowledge and skills on forecasting economic cataclysms and their anticipation, efficient modernization of the established production cycles, the fastest adjustment of manufacture of completely new goods and services, and also in mastering of new specialities.*

The requirement "mobility of trainees" presupposes not only inculcation to the trainees the skills on independent acquisition of new knowledge or long-standing skills on self-education, but also inculcation to them, at all levels of education, skills on *reproduction of knowledge*. It is obvious, that such property of reproductive ability of trainees in most cases assumes "re-discovery" from students with the help of a teacher through specially prepared dialogues or educational tasks of already known truths. However, such initiation of creativity in the process of education, with the lapse of time results in formation of skills on generation of completely new knowledge. Thus, in contrast to the author Starodubtsev (2002), we assume the presence in the innovational component, realizing a similar paradigm, the properties on activization of trainees not only with the purpose of mastering the increasing volumes of knowledge, but also *to formation of properties of reproductive ability of knowledge*.

In the conditions individual or elite training it is possible to state and solve a similar task with a higher probability of success. However, in the conditions of mass education when the goal of preparation of significant amount of experts is put, the development of effective tools on which it was spoken earlier is necessary. In our opinion, to such tools it is possible to attribute *innovative - didactic program complexes* (see Yuldashev (2006)).

3.   A PARADIGM *EDUCATION THROUGH ALL LIFE* AND STRUCTURAL MODEL OF EDUCATION

Prior to give the description of structural model of education which corresponds to the paradigm *education through all life,* lets briefly describe the Innovative - Didactic Program Complexes (IDPC). *The main purpose* of IDPC is provision of effective educational process at studying of specific subject. IDPC includes the following mandatory components:

- The standard set of normative-methodological materials in electronic and printed forms;
- The innovational component;
- The complete set of study-methodological materials in electronic form;
- Material and technical basis;
- The Web-oriented software.

In Yuldashev (2006) , the description of constituent components of IDPC is provided as well as their functional filling. From here on the object of training is "the reasonable person", capable to acquire knowledge from a certain set A and to learn skills from set B. Sets A and B are considered non-empty, are concretized individually and change in time. Acquisition of knowledge and/or mastering of skills we shall call *educational process*.

In the basis of new model following thesis G lays: *"The reasonable person" during his whole life participates in educational process.*

Definition 1. "The reasonable person " or object of training in respect of whom thesis G will be executed to refer as *the student*.

Definition 2. Student who prepares, organizes and conducts educational process refer to as *the teacher*.

Definition 3. *Qualified professional* (QP) we shall call a student who has acquired such sets as A and B and they can not be enlarged for him further or are sufficient for satisfaction of his needs.

Definition 4. *Socially active citizen* (SAC) is a student bringing the gratuitous contribution to the decision of essential problems of society and its separate members.

Below, at the description of the formalized model of education we shall assume familiarity with the elementary mathematical notations within the framework of traditional university courses of higher mathematics.

A mark │ (vertical line) is used to mean "or", the mark ∨ means the possibility of presence in the construction of the kind K1∨K2, both or one of these components, and the combined mark :: = (double colon and equal) is used in a sense "by definition is". With help of the introduced notations the model of education which corresponds to the paradigm *education through all life* can be presented as the following scheme:

$$\text{<the teacher>} \to \text{<IDPC>} \to \text{<the student>} \to \text{<QP} \lor \text{SAC>} . \qquad (1)$$
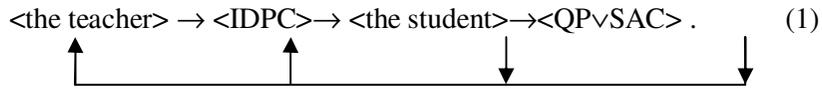
This scheme takes in account the meaning composing components and reflects cyclicity of educational process and its basic objective: the society which invests in training and education is interested in the continuous reproduction of qualified professionals who are at the same time are socially active citizens.

It is necessary to pay attention to what meaning in the scheme (1) is put into a component <the teacher>. This subject of process of training by definition itself is the student and according to thesis G, himself continuously enriches his baggage of knowledge.

In conditions of Uzbekistan this component of the scheme (1) can be interpreted through the following meta-linguistic construction:

<the teacher>:: = <parent> │ < the educator of preschool establishment > │ < the teacher of high school > │ < the teacher of college > │ < the teacher of the academic lyceum > │< the teacher of a higher educational institution >.

Similar concretizing interpretations can be providing also to other components of the scheme (1).

Now we shall enter a number of new definitions which will allow us to write down the formalized model, alternative to the scheme (1), in which alongside with the purpose and cyclicity of education process, multi-variant approach also will be reflected.

Let $[0, T_1]$ – the period of activity of *the teacher*, $[0, T_2]$ – the period of life of *the student*. Through K1 and K2 we shall notate concrete subjects or objects. For K1 and K2 elements of set

$\Sigma = \{\exists, \neg, \lor, \land \}$, named structural logic operations, we shall define in the following sense:

(1) $\exists K1 = K1 \Rightarrow$ K1 − a component of process

(2) $\neg K1 = \varnothing \Rightarrow$ K1 − is not component of process

(3) $K1 \vee K2 \quad \Rightarrow$ K1 or K2, or both are components of process

(4) $K1 \wedge K2 \quad \Rightarrow$ K1 and K2 simultaneously are components of process.

i. We shall define some function $L_{ij}^{m}(t_1, t_2)$, for which Σ there is a set of values, namely $L_{ij}^{m}(t_1, t_2) = \sigma \in \Sigma$, where

$m = \overline{1,5}$; $t_1 \otimes t_2 \in \Omega = [t_i, t_{i+1}] \otimes [t_j, t_{j+1}]$, $\bigcup\limits_{i=0}^{k-1}[t_i, t_{i+1}] = [0, T_1]$,

$t_k = T_1$, $\bigcup\limits_{j=0}^{n-1}[t_j, t_{j+1}] = [0, T_2]$, $t_n = T_2$, $i = \overline{1, k-1}$, $j = \overline{1, n-1}$.

Using function $L_{ij}^{m}(t_1, t_2)$, which in distant, we shall write for short as L_{ij}^{m}, we shall define above Ω *set of pentanoms*

$$\{ L_{ij}^{1}, L_{ij}^{2}, L_{ij}^{3}, L_{ij}^{4}, L_{ij}^{5} \}, \tag{2}$$

and to each admissible value, that is not breaking the meaning of the scheme (1) pentanom lets confront structure of a kind

$$L_{ij}^{1}\text{<the teacher>} \rightarrow L_{ij}^{2}\text{<IDPC>} \rightarrow L_{ij}^{3}\text{<the student>} \rightarrow <L_{ij}^{4}QP \vee L_{ij}^{5} \text{ SAC>}. \tag{3}$$
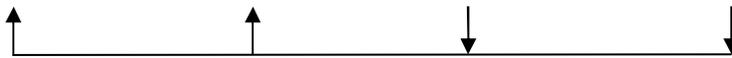
At fixed i, j and the corresponding choice of variant of cyclicity, the structure (3) reflects the certain form of educational process, and also can reflect concrete objects and subjects of this process if the last ones are stipulated initially.

Examples:

(1) Lets chose in (2) pentanom $\{ \exists, \neg, \exists, \neg, \neg \}$. Then, at the corresponding choice of variant of cyclicity, the structure (3) generates educational process of a kind

$$< \text{the teacher} > \quad \rightarrow \quad <\text{the student} > . \tag{4}$$

The specific variants of this model are rather diverse: from education in a family to individual training. In the literature such model called as a *classical.*

(2) Pentanom $\{ \exists, \wedge, \exists, \exists, \wedge \}$ allows through (3) to write down educational process of a kind

$$<\text{the teacher}> \wedge < \text{IDPC}> \quad \rightarrow \quad <\text{the student}> \rightarrow <QP \wedge SAC>, \quad (5)$$
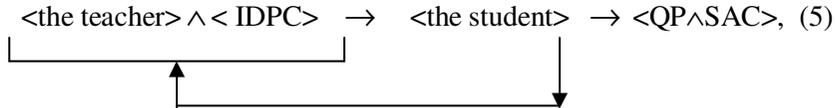
which reflects variant of innovational educational process bachelor+master in the system of higher education of Uzbekistan.

In brief lets limit ourselves to these two examples. The further formalization is possible on the basis of application of function $L_{ij}^m(t_1, t_2)$, introduction of criterion functions with use of the appropriate device of the theory of optimization. In the present work we illustrated only structural model (3), and in a number of publications (see Ashurova (2006); Yuldashev and Ashurova (2006)), on an example of specific university lecture course *«Algebra and the theory of numbers»* the description of components IDPC and their functional filling is presented.

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