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**THE INFORMATION ENVIRONMENT OF THE AUTOMATED TRAINING
WITH THE PROPERTIES OF ADAPTATION BASED ON THE COGNITIVE MODELS**

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In the light of the globalization of the information environment of a post-industrial society, there is an exponential increase in the diverse flows of information as an antiderivative of the aggregate of knowledge in a wide spectrum of subject areas, therefore the cognitive load on the subjects of educational process is significantly increasing.

At the modern stage of the development of science and technics there is an evolution of priorities from the side of the state and international bodies, regulating the politics in the sphere of education and the informatization of information-educational environments (IEE): the requirements to the quality of (re)training of specialists are expanding and the interest to the capabilities of individual-oriented training is increased.

The informatization of IEE of educational establishments accents the attention on the consideration of a wide spectrum of scientific aspects: regional, social-economic, organizational, pedagogical, ergonomic, introduction, technical, program, physiological, psychological and linguistic [1].

In the light of the personal-oriented and adaptive training the interest is presented [2, 3, 4]: psychophysiology of perception (V.F. Sazonov, Ch.A. Izmaylov, V.M. Crol', A.F. Korniyenko, L.I. Leushin, A.V. Baru, G.V. Gershuni, A.L. Krylova, D.I. Feldstein, V.M. Smirnov and others), psychology of perception (V.I. Arshinov, A.I. Rakitov, V.A. Labunskaya, V.M. Krol, R.K. Potapova, V.N. Druzhinin, M.A. Kholodnaya and others), cognitive linguistics (M.L. Geek, N.A. Kobrina, V.V. Petrov, R.K. Potapova, R.G. Bukharaev, P.P. Zinchenko, A.A. Koverin, L.L. Nelyubin and others).

The individual orientation of information interaction between the subjects and means of training in IEE is achieved by the using of a row of technologies: the individual, individualized and adaptive training [5, 6].

The realization of personal-oriented training is based on the taking into account of the personal characteristics (features) of the subjects of training (PChT): physiological, psychological and linguistic.

The proposed approach is oriented on the improving of quality of the functioning of IEE of the automated (remote) training system (ART) by means of the using of the individually-oriented principle of knowledge formation with the elements of adaptation based on the parametrical cognitive models (CM) block, containing CM of the subject (the parameters, characterizing PChT) and CM of the means of training (the parameters, characterizing the potential possible types and kinds of generated information-educational influences). The contour of adaptation based on CM is technologically realized at the possibility of generation of the training influences on the basis of CM of the means of training in coordination with PChT, contained in CM of the subject of training.

For the complex solution of the problem of creation and subsequent analysis of IEE with the elements of adaptation based on CM block the cognitive modeling technology (CMT), the technique of using of CMT and the algorithm of formation of CM.

CMT is acting as the universal in relation to the object of research and is the iterative cycle, including a sequence of stages: the identification, the conceptualization, the structuring, the formalization, the structural analysis, the parametrical analysis, the realization, the modeling, the analysis, the subject interpretation and the synthesis. For the difficult objects of research of CMT allows the inviting of consultants: an expert in the subject area, a knowledge engineer, a system analyst and a programmer.

The technique of using the technology and the algorithm of formation of CM are designed for the formalization of a sequence of using of CMT with the purpose of formation of CM.

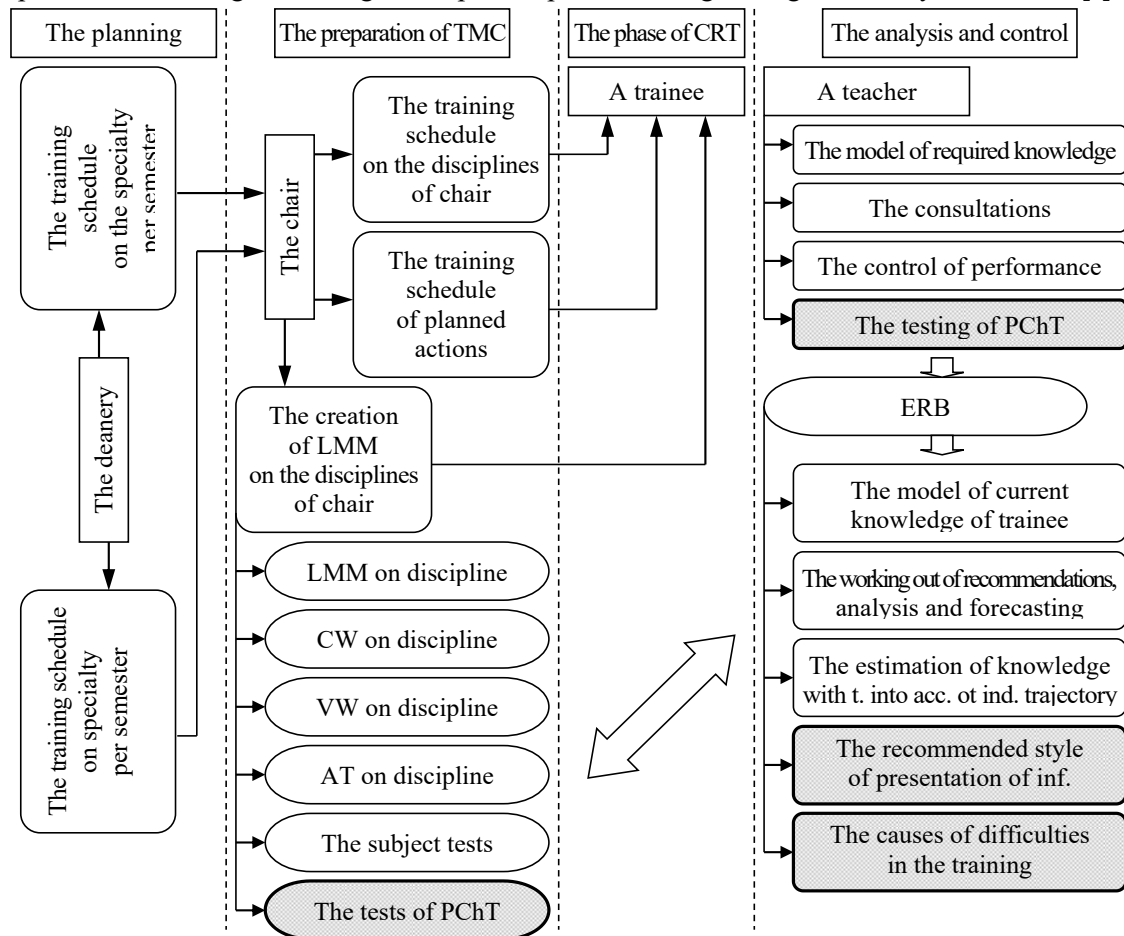
The structure of CM is present inside the construct, echeloned on a set of portraits, each from which is stratified on a set of the kind of properties, properties, the vectors of parameters and elementary parameters, related to the object of research.

CM can be presented by: the formal (theory of sets and the theory of graphs) and nonformal methods (the structural scheme, conceptual scheme and the ontology of the object of research in the subject area).

CM of the subject of training is presented inside the parameterized repertoire, echeloned on a set of portraits: physiological (the features of sensory perception of information by the visual and auditory analyzers), psychological (the convergent, divergent intellectual abilities, learning - ability and cognitive styles of subject) and linguistic (the natural-language aspects of virtual communication).

CM of the means of training includes a row of portraits: physiological (the features of sound and visual representation: volume, timbre, type of stream, sound scheme, parameters of background, font, color schemes of displaying and reproduction of information fragments), psychological (the way of representation of information-educational influences: the kind of displayed information, the style and speed of presentation of information fragments) and linguistic (language aspects: the level of statement, a set of keywords and a set of interface elements).

The training as a technological process (pic. 1) includes a row of phases: the planning, preparation of the training-methodological complex, the phase of training, the stage of the analysis and control [7].

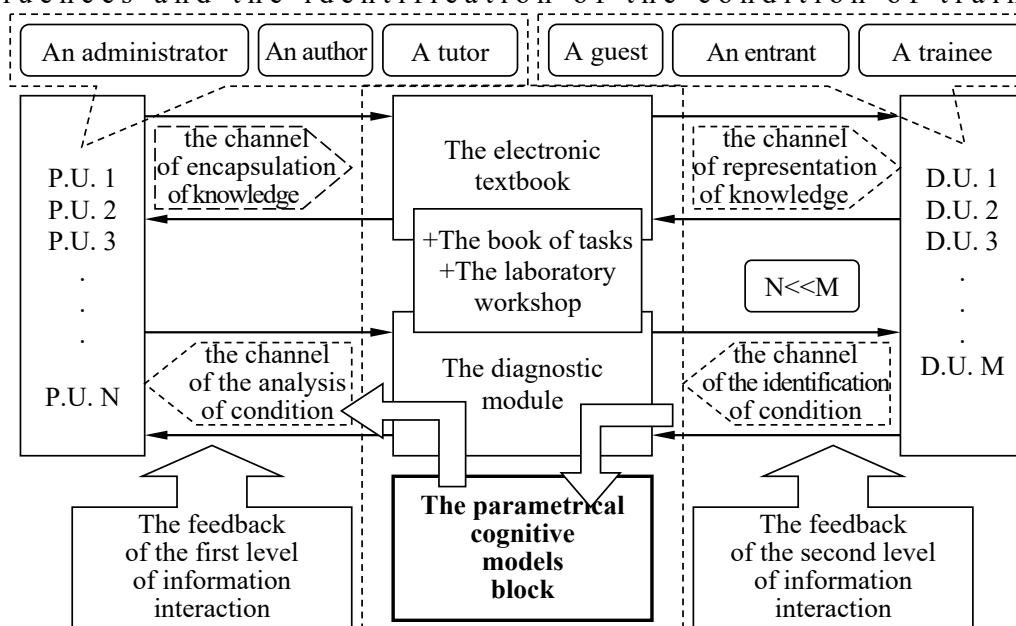


Pic. 1. The technological features at the organization of automated (remote) training based on the parametrical cognitive models

The creation of the contour of adaptation based on the parametrical cognitive models in IEE of ART entails the several organizational and technological modifications.

The regular units of the information center of educational establishment should ensure the preparation of the tests of PChT (the deanery or chair on the stage of preparation of LMC), and also to conduct the initial and quasi-dynamic testing of PChT (a teacher at the stage of the analysis and control). To the trainee accordingly requires to perform the tests of PChT and the tasks, developing PChT (at necessary).

The modern systems of ART are realized in the basis of a technologically expanded educational portal, that allows to introduce quickly the innovative modifications. At the same time the structure of ART system with the elements of adaptation based on the cognitive models block is a closed contour (pic. 2), comprising the two levels of information interaction: the first – is represented by the channels of filling by the subject content and the analysis of condition; the second – contains the channels of representation of educational influences and the identification of the condition of trainee.



P.U. – the proficient unit; D.U. – the deficit unit

Pic. 2. The structure of the automated (remote) training system with the elements of adaptation based on the parametrical cognitive models block

The subjects of IEE of ART system are differentiated by the level of access, acting in the various roles: administrator, author and tutor; guest, entrant and trainee. The information interaction (dialogue) of subjects is carried out indirectly by means of the means of training (diagnostic module and electronic textbook).

The training acts as the controlled process of transferring of the structured knowledge in a certain way in the subject of studying into the consciousness of trainee, including a sequence of the phases (stages) of information processing: the visual representation, perception, understanding, the formation of skills, the aggregation of obtained information into the knowledge. At this the level of residual knowledge of the trainee depends from the quality of perception and processing of information fragments [8].

The realization of the process of training with the elements of adaptation based on the parametrical CM block is reflected on the principle of functioning of the diagnostic module and electronic textbook (not presented in the article).

The linguistic processor of the electronic textbook provides the control by the displaying of information fragments in various ways based on the parametrical cognitive models block. The testing of the level of residual knowledge of trainee and PChT performs the diagnostic module [9].

For the carrying out of testing and processing of a posteriori data the technique, allowing to form the interval scale and the function of estimation, to carry out the procedure of testing on their basis (realized programmatically), and then to carry out the analysis of the condition of examinee and to estimate the quality of test itself [10].

The estimation of the efficiency of introduction of the results of research was carried out with the usage of commonly-accepted indicators of efficiency:

$$K = \{k_1; k_2; k_3\} = \left\{ Y_2 - Y_1; \frac{Y_2}{Y_1}; \frac{Y_2 - Y_1}{Y_1} 100\% \right\}$$

The coefficients respectively denote the absolute, comparative and relative indicators of efficiency, and the results of the statistical processing of a posteriori data of a series of experiments are summarized in the table 1.

Table 1.

The results of statistical processing of the data of experiment

The name of indicators	The number of the experimental group of examinees							
	1	2	3	4	5	6	7	8
The experiment №1 (without the using of technology)								
Average point Y_1	3,850	3,414	3,224	3,678	4,036	3,643	3,790	3,645
AQD of av. point	0,867	0,178	1,958	0,879	0,577	0,783	1,679	1,047
The experiment №2 (with the using of technology, personal adaptation)								
Average point Y_2	4,041	3,674	3,357	3,786	4,157	3,853	3,821	3,743
AQD of av. point	0,723	0,127	1,743	0,743	0,446	0,654	1,538	0,986
The summary results of research								
k_1	0,191	0,26	0,133	0,108	0,121	0,21	0,031	0,098
k_2	1,049	1,076	1,041	1,029	1,029	1,057	1,008	1,026
k_3	0,049	0,076	0,041	0,029	0,029	0,057	0,008	0,027
Change of AQD	-0,144	-0,051	-0,215	-0,136	-0,131	-0,129	-0,141	-0,061

The proposed approach allows to realize the additional contour of adaptation based on the parametrical CM block, and also to conduct the analysis of the efficiency of functioning of IEE of ART.

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