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THE SOFTWARE OF THE AUTOMATED
EDUCATIONAL ENVIRONMENT WITH THE PROPERTIES OF ADAPTATION
BASED ON THE COGNITIVE MODELS

The modern stage of development of the information technologies in the sphere of education is characterized by the existence of a row of significant contradictions: one of the main requirements to the automated information-educational environments (IEE) is the maximal individualization of the process of training, but the existing approaches, methods and technologies of realization of the automated means of training and the learning-methodical complexes practically do not take into account the individual features of perception, processing and understanding of the content of information fragments by the trainee.

The training in the automated IEE acts as the technological process of controlled formation of knowledge of the trainee by means of the various means of training and includes a row of stages of information processing: visual representation, perception, understanding, formation of skills, aggregation of the received information into the knowledge, therefore the level of residual knowledge of the trainee depends from the features of sensory perception (the physiological aspect), understanding (the linguistic aspect) and processing of information fragments by the psychological construct of the brain (the psychological aspect).

Obviously, the development and introduction of the technologies of personally-oriented training causes the necessity of taking into account and researching of the individual features of the trainees, in particular: physiological, psychological, linguistic and others.

The proposed structure of the automated (remote) training (ART) system with the properties of adaptation based on the parametrical cognitive models (CM) block realizes the individually-oriented model of training, and the developed cognitive modeling technology, techniques and algorithms allow to provide the analysis and increasing of efficiency of the process of training.

The process of individually-oriented training in the automated IEE with the properties of adaptation based on CM includes a row of stages, involving the usage of various means.

At the first stage by means of the applied diagnostic module – the automated research of individual features of the contingent of trainees is carried out, which are introduced into CM.

For IEE of ART system CM reflects the most important parameters of information interaction between the subjects (CM of the subject of training) and educational means (CM of the means of training), which allows: to provide the adaptive generation of educational influences, to reveal the causes of difficulties of the trainees at the studying of material and the factors, affecting on the efficiency of training.

The diagnostics of parameters of CM of the subject of training involves the use of the method of interviewing and a row of applied methods (see the scientific basis of each portrait of CM), realized in the basis the applied diagnostic module and enabling to reveal the presence / absence (the degree of manifestation) of various anomalies.

The physiological portrait of CM of the subject of training is formed on the scientific basis of the physiology of sensory systems (analyzers): the abnormalities of refraction (astigmatism, myopia and hypermetropia), the perception of space (acuity of vision, field of vision), the color vision (achromasia, protanopia, deuteranopia and tritanopia) and the anomalies of sound perception.

The psychological portrait of CM of the subject of training is formed on the scientific basis of cognitive psychology and includes: the convergent (the level of development of verbal intelligence, the abilities to reasoning and analytical thinking, combinatorial abilities, the deductive and inductive thinking, mnemonics and memory, the planar and volumetric thinking) and the divergent intellectual abilities (the level of development of the verbal creativity: the index of associativity, the index of originality, the index of uniqueness, the index of selectivity; the level of development of figurative creativity: the index of associativity, the index of originality, the index of uniqueness, the index of selectivity), the bipolar cognitive styles (the level of indicators: field-dependence and field-independence, impulsivity and reflexivity, rigidity and flexibility, concretization and abstraction, cognitive simplicity and difficulty, categorical narrowness and categorical width), and also the predisposition to the implicit / explicit learning-ability.

The linguistic portrait of CM of the subject of training is formed on the scientific basis of cognitive linguistics and characterizes: the level of proficiency in the language of statement of the material, the level of proficiency in the dictionary of terms (tests for each discipline), the level of proficiency in the elements of interface of the program (tests for each of means of IEE).

CM of the means of training is formed on the basis of the technical possibilities of educational means and is modified during the life cycle of the relevant program product.

CM of the means of training characterizes: the features of visual and sound representation of information fragments – the parameters of background, font, color schemes of display of the information, volume, timbre, the type of audio stream and sound scheme (the physiological portrait); the way of representation of the educational influences – the kind of displayed information, style and speed of presentation of the information fragments (the psychological portrait); the level of statement of the material, the set of used keywords and definitions and the set of interface elements (the linguistic portrait).

In case of modification of the structure of the parametrical CM the applied diagnostic module allows to modify a set of procedures, realizing the techniques of research of the certain parameters.

At the second stage the adaptive means of training (the electronic textbook), operating on the basis of the parametrical CM block, provides the individually-oriented representation of a set of information fragments (the training influences) in the studied discipline to each trainee.

The principle of functioning of the adaptive electronic textbook with the support of the individually-oriented generation of training influences based on the parametrical CM block includes the semantic model for the storing of the structured information in a certain way in the studied disciplines and the adaptive representation processor of information fragments contained in it.

The semantic model provides the storage and retrieval of a set of information fragments (the pieces of information), reflecting the content of the chapter, section, subsection of the studied discipline, and also containing the blocks of questions for the realization of the intermediate and final testing with the usage of the diagnostic module.

In the third stage the automated testing of the level of residual knowledge of the contingent of trainees is realized by means of the basic diagnostic module according to the formed sample of questions for each discipline.

The statistical processing of a posteriori data allows to reveal the factors, affecting on the increase in the efficiency (resultativity) of training and the reasons of difficulties of some trainees (from the contingent).