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EDUCATION INTELLIGENCE SOFTWARE AS A TOOL OF INCREASING THE EFFECTIVENESS OF CREATIVE LEARNING

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Abstract: *A mathematical model of learning in the way of self information-educational activity of a student is developed in his article. A method for constructing and optimizing of individual educational trajectories is proposed. The impact of the use of specialized information and analytical systems on quality scores of the learning process is analyzed. This paper introduces the concept of Education Intelligence systems and shows that their use in an education process is a powerful tool of the intensification of the training activities.*

Keywords: *infological and cognitive models of selftraining, individual educational trajectory, optimization of educational process, cognitive space, cognitive resource, Education Intelligence system.*

1. INTRODUCTION

In the information society education focuses on the organization of learning process aimed to formation of readiness of a future expert to "lifelong learning", to continuous personal and professional self-perfection, to the development of creativities and the search activities. Primarily this is provided by means of constructing of efficient and self-training student work, as dominant among other learning activities [1-4]. Self-learning student activity occurs in the process of solving of educational and creative tasks which require separate search and analysis of required knowledge, admit alternative innovative solutions, initiate display of ingenuity, flexibility of thinking, the ability to take responsibility for adopted decision [5]. Fig. 1 shows the Infological model of independent learning work in the context of the modern competence-oriented paradigm of education [6]. The purpose of this paper is to study possibilities to improve the efficiency of the modern educational process through the use of specialized information and analytical computer tools oriented on using in the educational sector and aimed at information support of self student activity.

2. SPACE COGNITIVE MODEL OF INDIVIDUALIZED SELF-LEARNING STUDENT ACTIVITY

For demonstration of the process of forming the subject competencies of a student during self activity the original model of self-learning process (Fig. 2) based on the space approach [7, 8] is proposed.

Learning in the model is represented by means of the accumulation of three basic components of the subject competencies: knowledge, skills and abilities (KSA). These three components form a cognitive space (*K*-space) which may correspond to a particular discipline, section, topic, etc. In this paper we consider the case when the *K*-space corresponds to a section of a discipline.

The points in *K*-space have coordinates whose values match a certain level of KSA studied in this section.

Each division on the coordinate axes in Fig. 2 cuts a corresponding element of knowledge, skills or abilities.

Suppose, for a student it is a point p_0 (Fig. 2), which has the coordinates $p_0(p_{01}, p_{02}, p_{03})$, where p_{01} – the level of knowledge of the material relevant

section of a discipline, p_{02} – level of skills of using the section materials, p_{03} – level of abilities of using the section materials.

If a point $x(x_1,x_2,x_3)$ corresponds to a particular segment of the section, and $\forall i: 1 \le i \le 3$ $x_i \le p_i$, then it is considered that the material is learnt by the student. In this case we say that $x \in R$.

Study of a section of a discipline we associate with the decision of the relevant class of learning tasks, resulting in a change in the personal *K*-student resource, i.e., the increase of the level of knowledge, skills, abilities and, accordingly, the increase in the area R. The process of solving a task is illustrated in Fig. 3.

3. OPTIMIZATION OF STUDYING ON THE BASIS OF ITS SPATIAL COGNITIVE MODEL

Consider the example of the construction of an individual educational trajectory in the cognitive space (Fig. 7).

It is obvious that with a sufficient volume of tasks bank, the formation of a large number of sequence variants of learning can be selected according to different criteria: didactic, organizational, economic, etc. However, for many groups of criteria, one of the most versatile indicators of learning effectiveness today is its duration. Therefore, this article, illustrating the procedure of optimization of educational trajectories, is concentrated on minimizing the time required to reach the target area of the cognitive space by a student. To solve the problem of optimizing of individual learning paths over a time parameter, we analyze the factors determining the rate of student learning in his or her self creative work.

Resorting to some generalizations, the speed of learning through self-study solutions of the learning tasks (in the cognitive model, it is a speed of a *K*-point in *K*-space, which we call *K*-rate) can be represented [6, 7] (4). Here N – a so-called student Intelligence-power (*K*-power), which characterizes the intensity of his or her intellectual activity to implement the learning tasks; F – a so-called student intelligence-force is the power (F – force), which measures the ability of the student to intensification of the relevant intellectual activity and is determined by its abilities.

We use the cognitive model to determine the time required to solve a particular task (denoted as t). Based on the spatial representation of the learning process and (4) can be written (5), where S is the distance in the cognitive space (*K*-distance) on which the student *K*-point is moved as a result of execution by him the relevant job.

Thus the transition time from point p_{j-1} to point p_j of *K*-space including (5) will be (7). Then the total time to perform all tasks in the sequence $Ш($ can be defined as (8).

The algorithm determining possible sequences of courses is represented by Fig. 8.

4. IMPROVING OF THE EFFICIENCY OF INDIVIDUALIZED SELF-LEARNING ACTIVITIES OF STUDENTS WITH EDUCATION INTELLIGENCE SYSTEMS

The introduction of information-analytical systems essentially modifies the technology of self – learning activity (Fig. 9).

The effect of intensified training is achieved through automation the most important component of the implementation process of any task of creative character, i.e. acquisition of the necessary information [9, 10]. IIAS functionality can accelerate the receipt of information through the implementation of the operations to find data [11], classification [12-16], clustering [12, 17, 18], annotation / summarization [12, 19], structural analysis of text documents [20-22], etc. [1].

(9) shows that the use of the information and analytical system aimed at automatization of the search and analytical processing of educational information, lead to an overall acceleration of learning.

Clear functional direction of specified computer tools to support of educational interaction with the text segments of global electronic information resources can allocate them in the separate subclass of information-analytical systems, which can be called Education Intelligence systems (EI-systems).

The scheme of organization the educational process with the support of EI-Systems acquires qualitatively new character (Fig. 10)

5. CONCLUSIONS

The article offers the original mathematical model of the learning process during the self information and training activities. The increasing of a student competence in training is given as the movement of its reflection in the cognitive space from a starting point toward the target area, which is the desired level of knowledge skills and abilities.

The spatio-graphical interpretation of the category “educational trajectory” is given. The concept of velocity of movement is introduced by the educational trajectory during the training. A method of constructing and optimizing (by the criterion of length of study), individual educational trajectories is proposed.

The effect of the use of specialized information and analytical systems on the intensity of training is

analyzed. The concept of a class of Education Intelligence systems is introduced. It is shown that their introduction in the educational process represents a powerful tool for intensification of educational activity in its modern interpretation.

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