THE ADAPTIVE CONTROL OF HIGHER EDUCATION PROCESS QUALITY OF A UNIVERSITY ON A "TEACHER - STUDENT" LEVEL

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Summary: An adaptive control model of the educational process of higher education based on the optimization of choice of education, forms of organization and holding classes is proposed. This model will enable to implement the adaptation of holding classes' forms to the students' needs and opportunities.

Key words: adaptive control, higher education, education process' quality, holding classes' forms.

INTRODUCTION

Current realities in higher education shows a high need to examine educational problems, and difficult socio-economic status of the state - the need for adaptation of higher education as one of the key links in the system of state, as evidenced by the high attention to the issue of state power [Ministry of Education and Science of Ukraine Order #612, 2007].

Scientific and technological progress, the market developing in Ukraine, places new demands on higher education system, put forward higher requirements for quality training that leads to finding new methods and means to enhance the educational process [Dolzhenko O., Shatunovskiy V. 1990]. The educational process is complicated, new specialties, each year increasing the amount of information that the student must learn, in some areas of the information is updated within a short time. At the same time the teaching load of teacher time spent on preparation work and process information is increasing. All this leads to the need to develop and implement effective systems to optimize the learning process.

Lack of feedback in education at all levels, from the participants of the labor market to their needs in specialists of certain categories and requirements for their competence and ending with one of the main recipients of educational services - students, makes the adaptation of higher education to the changing external environment influence and internal needs more difficult. Therefore, it can be argued that the adaptive quality management education is one of the most important tasks of universities adapt to the needs of the educational process and opportunities for university students is a key task in the development of the system of adaptive quality

management of education institutions. So the model of adaptive learning process is a matter of urgent that needs attention.

OBJECTS AND PROBLEMS

The purpose of the article is to build a model of learning process quality adaptive control of higher education at the level of teacher-group based on optimizing choice of the holding classes' forms (HCF).

Higher education institution has significant features in the structure of quality management, because, as mentioned above, the customers of the services that it provides are the companies (i.e., labor market) and students themselves, both.

The quality of educational services should be managed at all levels. One of the levels of quality education management is the level of teacher. In [Tkach V., Ramazanov S., 2008], which directly come upon the model of communication process of the student and teacher in the transmission of material was introduced several variables that describe exactly the level of perception. It describes the reasons for this level can be increased or decreased. These reasons include also an HCF. Today the practice is widely used in the following forms: lectures, seminars, laboratory exercises, tests, course work, counseling, self-employment, etc. Testing knowledge is by writing tests and exams.

If you consider the individual features and characteristics of each student and each teacher, it becomes clear that in the process of communication can happen when a student takes a good type of one of an HCF and does not accept another. Because the conduct classes for one or two students who perceive it does not make sense, so there is a need to choose such a form of exercise, when the total number of perceived maximum information.

This choice is purely empirical. In this paper, the authors propose a model of learning process quality adaptive control of higher education that includes the mechanism of choice.

So, let the student group consisting of N students. Let us also that there are some success group (SG) formed on the basis of the model described in [Tkach V., Ramazanov S., 2008].

Describe these groups as:

1 - "excellent" - the level of compliance of the student is in the interval (0.8 ... 1.0], a student honors pupil is learning at a high level of perceived and uses material studies;

2 - "good" - the level of compliance of the student is in the interval (0.6 ... 0.8];

3 - "satisfactory" - the level of compliance (0.4 ... 0.6];

4 - "unsatisfactory" - the level of compliance (0.2 ... 0.4];

5 - "not adoptively" - the level of compliance (0.0 ... 0.2].

Then, let we have S forms of holding classes (lectures, practice lessons, review lessons, visual tours, trainings and so on). Obviously, every element of the matrix $R\left\{r_{ij}, i = \overline{1, S}, j = \overline{1, N}\right\}$ reflects the perception level of i-th student of j-th holding classes form (table 1). It should also be noted that the student belongs to a SG in this case does not mean that his perception of forms of employment meet this level, as are possible cases where perception is lower than the overall compliance rate [Tkach V., Ramazanov S., 2008].
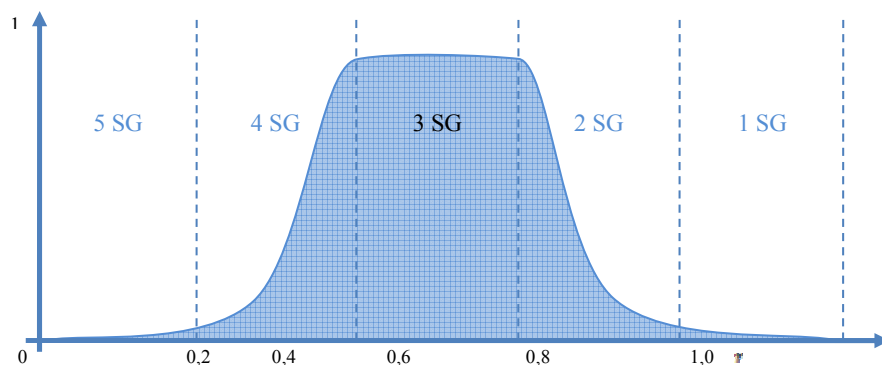
Fig.1. Probability distribution curve important level of perception, depending
on group performance (for 3-rd SG)

The reverse case can occur when, for example, a student who has a low overall
compliance for this form of training can show very good results for the perception of
information is this form of exercise. More appropriate is the distribution of this quantity
and taking into account the probability of changes in student perceptions based on group
performance (Fig.1). To model take as such function a pseudo-normal with centers in
the corresponding SG. A similar approach was used by the authors in the paper
[Shepit'ko G., Akimov Y., Shishkin I., 2003].

Table 1. **The students' perception level in different forms of holding classes**

Student	HCF					
	1	2	3	4	5	SG
1	0,94	0,81	0,98	0,96	0,82	1
2	0,87	0,82	0,98	0,88	0,91	1
3	0,28	0,39	0,28	0,35	0,34	4
4	0,03	0,01	0,10	0,15	0,00	5
5	0,86	0,81	0,86	0,91	0,91	1
6	0,63	0,63	0,75	0,78	0,67	2
7	0,63	0,75	0,69	0,76	0,79	2
8	0,44	0,46	0,41	0,60	0,49	3
9	0,42	0,48	0,43	0,50	0,47	3
10	0,02	0,12	0,12	0,17	0,00	5
11	0,75	0,63	0,76	0,66	0,65	2
12	0,56	0,48	0,59	0,42	0,56	3
13	0,34	0,21	0,26	0,26	0,29	4
14	0,22	0,33	0,23	0,30	0,29	4
15	0,93	0,81	0,99	0,94	0,92	1
y	7,94	7,75	8,45	8,62	8,12	
P	**1380**	**1520**	**1350**	**1440**	**1234**	

Given that each course has its own form of information that is submitted to class, then the effectiveness of training offered calculate as the product of the total (aggregate) level of perception of the group and the amount of information P_j, brought to class (a value that reflects the quantitative importance of the amount of information, such as this magnitude can be used for credits or other marks that may be the measure of information):

$$E_j = P_j \sum_{i=1}^{N} r_{ij} ,$$ (1)

Such a balanced assessment of performance will allow for a general analysis of the effectiveness of each form of exercise, and therefore, to adapt the educational process for students abilities to maximize the level of perception of the group, respectively - overall quality of higher education institutions. For example, the attached table for the most effective form of lessons at number 4, because its efficiency calculated by (1) has the highest value.

To build a model of adaptive management build a management structure also. The object is the quality of the educational process at the level of "teacher-student". In the context of this work as a manager will choose the HCF, i.e. the form of lessons. Overall, the control structure schema represented as Fig.2.
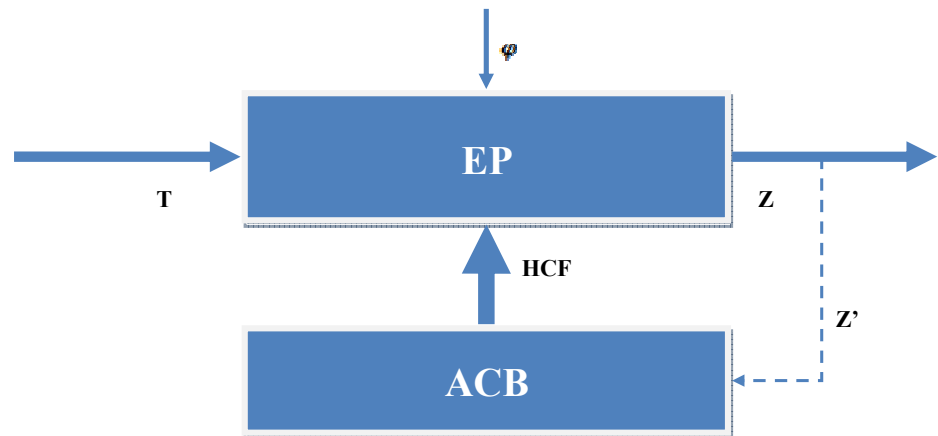

Fig.2. Structured schema of educational process adaptive control

On this figure are shown: Z – knowledge level, that student takes in an educational process, EP – educational process, which is under influence of knowledge level, that teacher gives (T), holding classes form (HCF), and uncontrolled random influence of environment φ; ACB – adaptive control block. The process further disclosed in the authors' work [Tkach V., Ramazanov S., 2008].

Adaptive control is based on a feedback from that knowledge level, that students group took, through the choice of such HCF, to maximize given knowledge level.

Feedback is realizing by obtaining estimation Z' of that knowledge level Z, that group took in educational process.

For that schema is rightly:

$$Z = Z(B, u, \varphi), \tag{2}$$

$$u = u(Z'), \tag{3}$$

$$Z' = g(Z), \tag{4}$$

where: u – is control, which is realizing through the choice of such HCF and is a function of a perception level ($u \in \{1, S\}$, that is an index of a HCF), Z' - estimation of a knowledge level Z, estimated by the rule g; φ – uncontrolled environmental influence.

So, the final view of model, including restrictions and (2)-(3), is:

$$\sum_{i=1}^{N} z_i^k(\tau) = p_u^k(\tau) \sum_{i=1}^{N} r_{iu} \longrightarrow \max_{u} \tag{5}$$

$$\begin{cases} r_{iu} \in (0,1], \\ p_u(t) > 0. \end{cases} \tag{6}$$

CONCLUSION

Estimation of HCF remains to the teacher's choice, as it depends on a discipline specific. Realization of such permanent monitoring is a difficult task, but is very important also. Scientific works of some national and foreign scientists are concerned to necessity of an education process quality, in a way of using a more effective HCF [Tsvetkova I., 2008, Radvanskaya L., Sokolova N., Grigorova A., Bugayov A., 2003].

There is a model of a higher education process quality adaptive control on a "teacher - student" level, based on a optimization of choice of HCF, is given in this article. The principle of HCF definition is still one of the problems, which need to be solved.

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МОДЕЛЬ АДАПТИВНОГО УПРАВЛЕНИЯ КАЧЕСТВОМ УЧЕБНОГО ПРОЦЕССА ВЫСШЕГО УЧЕБНОГО ЗАВЕДЕНИЯ НА УРОВНЕ «ПРЕПОДАВАТЕЛЬ – ГРУППА»

Ткач В.М.

Аннотация. В данной статье предложена модель адаптивного управления учебным процессом высшего учебного заведения на основе оптимизации выбора типов обучения, форм организации и проведения учебных занятий. Дана модель позволяющая реализовать адаптацию формы проведения занятий к потребностям и возможностям студентов.

Ключевые слова: адаптивное управление, учебный процесс, процесс коммуникации, уровень восприятия, форма проведения занятия, уровень соответствия, группа успеваемости.