19 Information Technology of the Educational Planning and Curriculum Development

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Abstract

Optimal design of teaching process in higher school is realized to a considerable extent intuitively or on the basis of expert evaluations. Such an approach allows to achieve an approximate solution of the problem only. The experimental study of the teaching process and learners' characteristics, computer-aided technologies of statistical processing of experimental data, computer simulation of the educational process, computer analysis of simulation results are proposed as methodology of this problem solution. This curriculum design is prominent for the logical project development of education, the content areas of each course, and for the professional qualification. Other opportunities of using this procedure are linked with the development of a new and modifying existing curriculum.

Keywords: education, computer simulations.

Paper

The major problem of the educational planning and curriculum development is the lack of its flexibility and multifunctioning. The impact of this problems is becoming especially acute nowadays due to the increased complexity of the tasks and need of new curriculum design.

Today the effectiveness of project curriculum in education is based on subjective estimates by education experts. This complicates the process of taking decisions and judgements.

The computer-based procedure for educational project in higher educational institutions is being worked out at the Computering & Mathematical Modeling Department of the Tambov State University. Arzamastsev A. & Kitaevskaya T. (2001) described a similar procedure

The procedure is based on the computer simulations, the computer-assisted testing the students and on the statistical processing of the educational outcomes.

The object of investigation, projecting and having an optimum effect is the educational process. It is represented in fig.1 by a graph. It's made up of the student's steps of mastering the content of the curriculum. The starting level corresponds to Situation 1 describing the knowledge, creativity and other aptitudes of a future student. The aim of the education is to move a student from Situation 1 to Situation 2. Situation 2 is described by the level of professional qualification.

Figure 1: Graph of educational process.

The optimum effect is achieved through:

- the duration of a disciplines;
- components of disciplines;
- the distribution of time for course models according to the student's level of knowledge;
- contents of the disciplines.

In full, the steps of the procedure are represented below.

Step 1: Diagnosis of a student's background knowledge, motivation and aptitude, adaptation of the curriculum to the student's individual differences.

Step 2: The curriculum design is based on the student's individual differences and needs. Contents of the discipline are the standard for professional training and decision-making in the local context.

Step 3: Out all the possible variants the one is selected that meets the optimal criteria. The curriculum of the educational process is shown on fig. 1.

Step 4: The graph being a large system splits into subsystems, each of which corresponds, to a single subject. The requirement is that every subject is naturally integral.

Step 5: Individual duration of studying the contents of subjects is determined by interviewing students. All these data are the basis for the distribution of time of studying the contents.

Step 6: The simulation of the distribution of time of studying the contents (step 5) is performed by the computer.

Step 7: The distributions of the discipline duration are summed up. The outcome is the general time of professional training in a higher educational institution - the basis for the distribution for the discipline duration.

Step 8: As a result, the two alternative aims of the optimum effect of the educational process are being solved:

The general time of teaching is defined by the level of educational process (minimizing of resources).

The level of educational process is defined by the general time of teaching (maximizing of the quality of education).

The technology of the educational planning and curriculum development is shown in fig. 2.

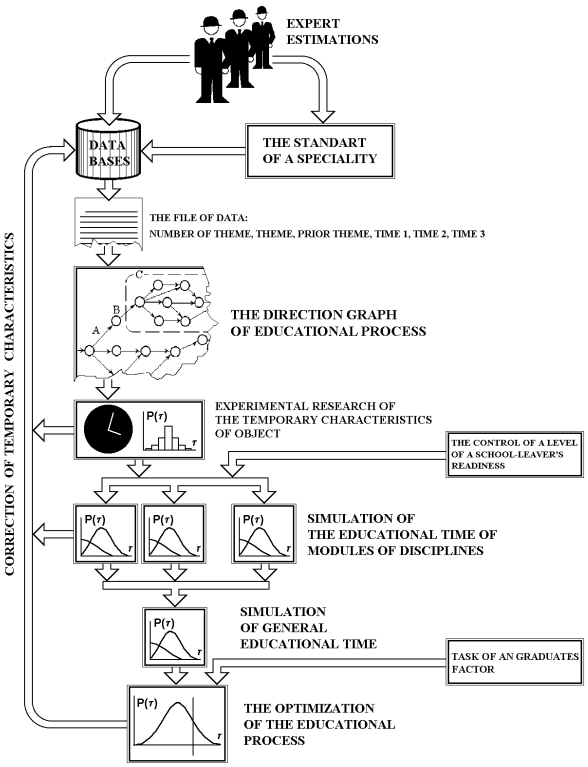

Figure 2: Technology of the educational planning and curriculum development

Out of the content areas a file is formed that meets the national standard and experts' estimates. It's made up of the notes about previous topics, duration of a modules of disciplines and the level of students' knowledge. The graph of a curriculum design is based on this information.

The next stage is the experimental research of the temporary characteristics of disciplines. They are intended to perform computer simulation to get the information about the distribution of time for modules of disciplines.

A specially worked out program – the universal generator of the accidental numerals - performs the simulation modeling. It makes getting the set numerical streams possible. The algorithm and the generator program are described in the article of Arzamstsev A. & Kitaevskaya T. & Ivanov M. (2002). One can contact us in the Internet: www.chat.ru/~emsd.

The final stage is the optimizing of the educational process.

Temporary characteristics is corrected according to the educational results, computer simulation and optimizing the process of education.

This curriculum design is prominent for the logical educational planning and curriculum development, the contents of each disciplines, and for the professional qualification.

This technology of the educational planning and curriculum development in education affords to overcome difficulties of curriculum design.

1. The graph of education process sometimes can have important shortcomings:

- the contents areas of disciplines describing the knowledge and aptitude of the students are not always systemized;
- the subjective discipline modeling can result either in repeating or excluding some of the content areas.

2. A student who passes the entering exams is believed to show the background knowledge. But in reality this background knowledge is an accidental characteristic.

3. The duration of time for the discipline models is considered to be fixed and its significance is mirrored in the curriculum. The duration of each discipline is an accidental characteristic.

4. When the discipline duration of an “average student” is designed there can appear paradoxical situations:

- outgoing students cope with the material very quickly and are bored the rest of the time;
- students that are legging behind do not pass credits and exams (that results in higher percent of selection and this is totally unprofitable both to the higher educational institutions and the state);
- a student’s unfounded mark in this case leads to the non-professional qualification;
- as a rule, the general time of teaching is equal to 5 years. However there is no a well-grounded reason to design curriculum within this period of time.

This technology of the educational planning and curriculum development in education has been designed in the form of programs and approved by the departments of Physics & Mathematics and of Art & Culture of the Tambov State University. The procedure distributed time between the subject models for the following disciplines: ”Computing

Science & Programming", "Mathematics & Computing Science". It also helped to get spare time for teaching other modules of discipline.

Other opportunities of using this procedure are linked with the development of a new and modifying existing curriculum.

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