

## THE USE OF INFORMATION TECHNOLOGY IN THE ORGANIZATION OF INDEPENDENT ACTIVITIES OF STUDENTS

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**Annotation:** *The main task of a higher educational institution is the training of highly qualified specialists in the areas of study. Along with the conduct of training, an important place is given to independent education, which gives the educational process a problematic research character. To achieve a maximum effect of independent work, it is necessary to analyze the main problems of organizing the relevant conditions. The main options for organizing independent work are proposed.*

**Key words:** *independent work, uniformity, objective function, algorithm, database, optimal plan, documentary basis, self-study, professional competencies.*

### INTRODUCTION

One of the leading requirements for the conditions for the implementation of basic educational programs is the organization of independent work of students as an important component of the modern educational system. Reforms in the higher educational system are aimed at the formation of a personality-oriented model of education. For more effective implementation of the educational training program, it is necessary to develop a legislative framework, i.e. standards, curricula, job descriptions. The main task of higher education is to form the creative personality of a future specialist capable of self-education based on a competency-based approach to mastering professional activities, the process of forming such professionally significant qualities of future specialists as creativity, a culture of thinking, responsibility, and communication. Independent work is understood as the planned educational, teaching and research, research work of students. Classroom and extracurricular time is planned for the performance of independent work on assignment and with the methodological guidance of the teacher, but without his direct participation.

As a special type of educational activity, independent work is organized by the teacher and carried out under his methodological guidance, it is also a modeling of future professional activity, in which there will be no teachers, but there will be leaders who, as a rule, evaluate independence as one of the most sought-after professional qualities.

One of the most important strategic tasks of modern education is the formation of professional competence of future specialists. At workplaces, high demands are placed on the level of specialist training, on professional skills, the ability to make independent decisions, the ability to select a significant amount of information necessary for the task at hand and process it. The formation of professional competencies is in close connection

with the experience of organizing independent work, accumulated in the student years. A future specialist may find himself in a difficult position if, during the years of study at an educational institution, he does not learn the skills of self-acquisition of knowledge, the skills of everyday self-education. In this regard, the independent work of students is becoming increasingly important, which creates conditions for the formation of their readiness and ability to use various media to search for the necessary knowledge. The latter is especially relevant in connection with the development of such a new form of the educational process as the design of an individual self-learning trajectory. This is a kind of universal competence that is applicable to any professional activity.

The documentary basis for the organization of independent work of students is: the state educational standard of vocational education, the main professional educational program (working curriculum, calendar schedule of the educational process, work programs of academic disciplines and professional modules); regulation on the organization of independent work of students; program of independent work of students. In universities, independent work of students is considered as an educational and research activity of students aimed at developing general and professional competencies. The effectiveness of independent work is achieved if it is one of the main, organic elements of the educational process, if it is carried out systematically and systematically. Undoubtedly, teachers are faced with the task of organizing independent work of students, which will ensure, firstly, the formation of independence in the educational process and, secondly, the creation of conditions for acquiring sustainable information culture skills in various types of activities, including by increasing the efficiency classroom activities in various forms. The student should become an active figure in the learning process, and not a passive object of learning. Therefore, it is necessary to include him in active learning activities, to assist him in acquiring knowledge. Education should permeate the entire conscious life of a future graduate, i.e. education is not for life, but throughout life. The student and the teacher should be a single system of education, in which the parties are connected by a common goal: the achievement of positive qualitative results as a result of the student's independent work.

To organize independent work, information pedagogical technologies can be used as components of the electronic environment, as well as automated controls for recording information, technical means for ensuring its individualization. Attention is paid to the possibility of developing an automated decision support system for developing an independent work plan formulated as a decision-making task.

In connection with the need to automate the process of performing independent work, the task arose of implementing an application that can generate an independent work plan in an optimization setting, namely, to obtain the optimal vector of forms for preparing independent work.

The creation of a self-study plan is based on various criteria. This provides for the compliance of the plan for the implementation of independent work with the selected

topics aimed at the comprehensive education of a person capable of performing socially-oriented activities in practice.

In order to increase the efficiency of the generated plan, functionality should be provided that implements the choice of functions in individual areas. From the point of view of various state standards, there are clear limits on the time allotted for independent work. There are norms that regulate the amount of physical and mental activity for students per week, norms for the amount of time for the use of technical teaching aids. However, the standards cannot regulate restrictions on all forms and all activities.

Models for automating the development of a plan for the implementation of independent work.

The following were chosen as criteria for the analysis of existing software solutions for organizing independent work:

- uniformity - the presented software should refer to professional software intended for teachers and people involved in educational activities;
- generated - the main function of similar software tools for generating plans for independent work should be selected in accordance with the curriculum;
- Flexibility - the degree of compliance with educational standards and the number of levels of education captured.

Based on the analysis of the subject area - the process of organizing independent work in educational institutions - it can be concluded that automation of the process of organizing VR will significantly reduce the laboriousness of drawing up its plan, as well as generate an individual plan taking into account the individual preferences of students.

The developed system must meet the following functional requirements:

- the function of choosing a topic in accordance with the direction of the subject;
- the function of choosing the fund of time allotted for the performance of work;
- input function;
- the ability to prioritize according to the degree of importance;
- automatic generation of the plan in the optimization setting, taking into account the restrictions - in accordance with the methods of mathematical programming to find the optimal value of the objective function on the set of allowable values;
- automatic adjustment of the plan for uniform distribution of activities.

When creating a self-study plan, the following inputs are possible:

- the name of the topic and the plan for the implementation of independent work;
- the date of commencement and completion of work on the implementation of independent work;
- activities included in the work on the implementation of independent work;
- the priority of each event;
- time limits for events.

#### **System output:**

- information about the user account: first and last name of the user, e-mail;

- brief information on the chosen direction: the title of the topic, the date of commencement and completion of work on the implementation of independent work;
- a list of created plans, reflecting the implemented activities for each individual part of the plan, the duration of each implemented activity.

The generation of independent work execution plans in the optimization setting involves solving the integer programming problem. The objective function that can be maximized within the framework of this problem has the form

$$F = \sum_{i=1}^m \sum_{j=1}^n a_{ij} x_{ij} \rightarrow \max, \quad (1)$$

where  $a_{ij} = a_1, a_2, \dots, a_n$  is the priority of activities in the independent work plan;

$x_{ij} = x_{11}, x_{12}, \dots, x_{mn}$  – the required components of the optimal distribution of the time resource, corresponding to the set of activities selected when creating the plan for the implementation of independent work.

The presented objective function belongs to a certain set of valid values:

$$D = \{x \in R^{nm} \mid x_{ij} \in \{0;1\} \forall i, j; \sum_{j=1}^n x_{ij} \geq 1 \text{ для } \forall i \in [1, m]; \quad (2)$$

$$\sum_{i=1}^m \sum_{j=1}^n t_{ij} x_{ij} \leq T,$$

**where  $t_{ij}$  - duration of a particular event;**

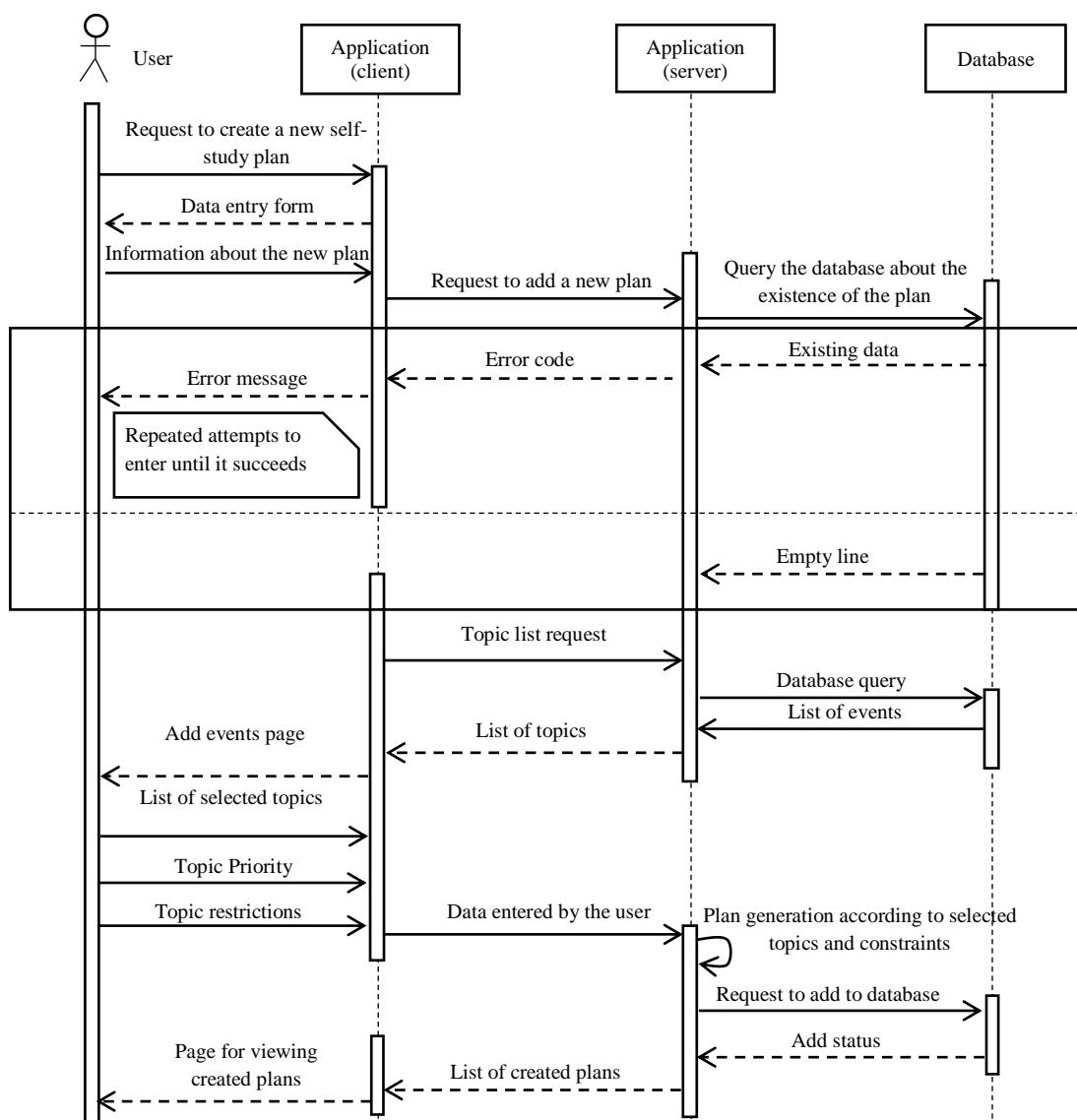
$T$  is the total resource of time allotted for the execution of independent work;  $D$  is the set of admissible values;  $R$  is the space of real numbers;  $n$  is the total number of events;  $m$  is the total number of event types;  $i, j$  are variables characterizing the numbers of rows and columns.

If the number of restrictions imposed on the objective function is insufficient, it is necessary to provide for the possibility of their automatic correction.

The implementation of activities for the implementation of independent work takes place in many areas of education. When searching for the optimal vector for solving the objective function, there should be a check that determines the availability of an action plan for all the presented areas of education.

The solution of the presented problem of mathematical programming should take place in an integer formulation. When solving, the simplex method can be used, followed by the search for an integer answer using the Gomori algorithm.

Fig.1 shows a model of the software architecture of the designed system for generating a plan for independent work using a sequence diagram of the object-oriented language UML.



**Fig.1. Software architecture of the system**

When choosing one of the list items, the user opens the generated optimal plan.

Thus, the use of optimization models allows you to automatically generate a plan for the implementation of independent work, taking into account the formal constraints of the subject area, as well as automatically adjust it if necessary to take into account new requirements.

### Conclusion

The presented software solution allows for methodological, mathematical and software support for the process of developing an independent work plan, significantly reducing the laboriousness of the process of its generation, as well as taking into account the specifics of its implementation at different levels of education in an automated format.

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