

# Road Map for Designing the Means of Self-Training for Students

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**Abstract**— The article presents a technological map of pedagogical design of self-study tools for students. The essence of this process is revealed through the following key characteristics: implementation in a professionally significant educational process based on a pedagogical invention; the need to resolve a topical problem and the predominance of creativity; representation of the result in the form of a model of the object of pedagogical activity. The process of designing autodidactic means is determined by: the preparatory stage; the stage of creating a single pilot sample project and an experimental verification of its quality; the final design stage. The road map is implemented in the form of functional diagrams in the IDEF0 notation and the function tree created with the modern Case package. A detailed description of each stage of the work provides a complete picture of the technology of pedagogical design of self-learning tools. A ready-made pre-production model – a pedagogical project – of self-education means is reflected in a modular program which includes the target program, the diagnostic, content-operational and methodological components. The effectiveness of the project was tested by the introduction of the designed autodidactic means in the process of preparing students for interpersonal cognition. The results of experimental work on the use of self-learning tools created according to this map give grounds for expanding the experimental base and introducing a new sufficient condition – the development and introduction of self-study tools, including tools for human cognition, in the process of an IT specialist training.

**Keywords**— *pedagogical design; self-study; student vocational/professional training; structural analysis and design; Case-package.*

## I. INTRODUCTION

Autodidacticism, or self-learning, is regarded as a purposeful, systematic, independent and autonomous activity of the individual in the acquisition, assimilation and creative processing of knowledge. An essential sign of this activity is „autonomy“, which is understood as the ability of students to

determine the purpose, objectives and content of their training, to choose the methods and means of its organization without compulsion or motivation from without.

„Autonomy“ in autodidacticism, in its turn, is defined as the ability to realize the goals, principles, content, methods and means of instruction determined by the educational system without direct involvement of the teacher [4, 8].

Autodidactic means are specially designed training assignments that provide students with the opportunity to independently and autonomously increase their level of training in a certain field of knowledge by gradual transition from one task to another. According to one of the classifications (a classification feature is a student’s work stage), these tools are represented by diagnostic, training, cognitive-search and creative tasks.

Our research shows that in the process of self-study, the order of work with the selected means, determined by the individual program in accordance with the results of self-diagnostics in the field of knowledge in question, is of particular importance for students. We took this factor into account when organizing the processes of designing and applying these tools. [1, 2, 10]

## II. THEORY AND PRACTICE OF RESEARCH

Having analyzed a number of works (V.S. Bezrukova, E.S. Zair-Bek, G.L. Il'in, E.A. Kryukova, V.M. Monakhov, N.A. Norenkova, V.I. Slobodchikov, N.O. Yakovleva, etc.) on the problem of pedagogical design, we came to the conclusion that the key to understanding this process is in treating it as an activity that has the following features:

- 1) it is carried out in conditions of professionally significant educational process and is aimed at ensuring its effective functioning and development;
- 2) it is caused by the need to resolve a topical problem and is creative;
- 3) it is based

on a pedagogical invention; 4) as a result, it provides a model of a pedagogical reality object, which has systemic properties and is adapted to mass production (replication). [3, 4, 7, 9, 17, 18]

The process of designing autodidactic means is characterized by a number of stages, whose names and content are presented below.

As part of the preparatory phase, the goal, object, methods and means of further work on the project were identified. The goal of the design was to ensure the process of preparing students for interpersonal knowledge by means of autodidacticism. The object of the designing activity was autodidactic means. The main method was the method of structural analysis and design. [5, 6, 16]

Through the method of structural analysis and design, the content-procedural side – the road map – of each of the indicated stages was identified and presented in detail (Figure 1).

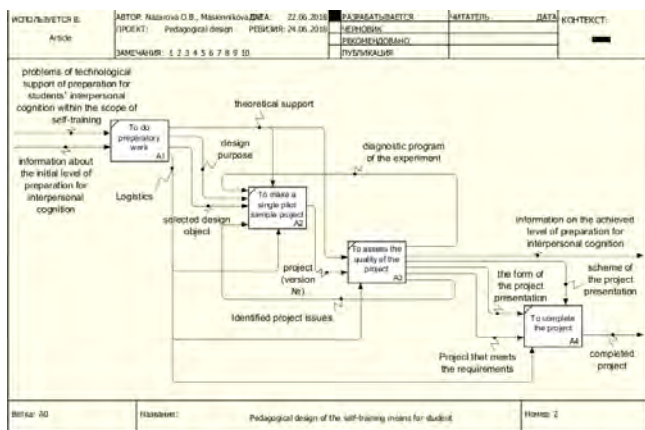


Fig. 1. The road map of designing autodidactic means

In the process of pedagogical design of the selected objects, certain groups of means are used, including computer-aided design systems. In this research, the Case-package of Computer Associated All Fusion Modeling Suite was used. The second group of means – spiritual ones – can include: a system of knowledge about the modeling, designing and reconstructing methods for ideal and social objects; a system of knowledge about pedagogical technologies, etc.

The result of the design is a pedagogical project. Within our study, these are autodidactic means, which are presented in a modular program including the target program, diagnostic, content-operational and methodological components. The effectiveness of the project was tested by introducing the designed autodidactic means into the process of preparing students (future IT specialists) for interpersonal cognition. [13-15]

**III. PEDAGOGICAL EXPERIMENT**

The created prototype of the project of autodidactic means passed a quality check in the form of a pedagogical experiment. As is noted above, the developed tools were

introduced into the process of preparing university students (future IT specialists) for interpersonal cognition (Figure 1, block A3).

The set of pedagogical conditions included the following provisions: 1) the design of autodidactic means based on the modular approach providing students with independent knowledge acquisition and advance to a higher level of human cognition; 2) application of the autodidactic means in the lessons of the specially developed course "Student as a subject of interpersonal cognition" to accelerate the initial diagnosis and development of students' motivation in the area under consideration; 3) presentation of the content and subject matter of students' self-study process within the framework of the modular program through three levels of complexity of diagnostic, learning, cognitive-search and creative tasks. [14]

TABLE I. DYNAMICS OF THE DEVELOPMENT LEVEL OF STUDENTS' PREPARATION FOR INTERPERSONAL KNOWLEDGE

Group	Total increase data (G)				
	G on levels (%)			G in terms of AI	G in terms of EF
	Low	Middle	High		
EG-1 (conditions 1 & 2 are checked)	-17,65	7,84	9,80	0,27	0,15
EG-2 (conditions 2 & 3 are checked)	-18,37	8,16	10,20	0,29	0,15
EG-3 (all conditions are checked)	-28,00	8,00	20,00	0,48	0,27
$\bar{X}$ in EG-1, EG-2, EG-3	-21,34	8,00	13,34	0,35	0,19
CG (Control Group)	-3,85	3,85	0,00	0,04	—

In accordance with the goal and the objectives, the experimental work was carried out in three stages, in the natural conditions of the educational process. The effectiveness of the study was assessed by the change in the average indicator (AI) and the efficiency factor (EF). Their dynamics in the experimental work is shown in Table. 1.

These changes in the level of students' preparation for interpersonal cognition in groups could occur either as a result of random factors or under the influence of purposeful pedagogical influence. The reliability of the obtained experimental data was verified with the help of the statistical criterion Pearson's chi-squared test.

When calculating its value, a 5% significance level was used. The try-out showed that any two of the proposed pedagogical conditions were insufficient for effective preparation of university students for interpersonal cognition, since  $T_{observed} < T_{critical}$  (3,380 and 4,416 < 5,991). The use of a set of pedagogical conditions is statistically significant for the successful preparation of university students for interpersonal cognition, since  $T_{observed} > T_{critical}$  (8,445 > 5,991). This enables us to conclude that the changes in Experimental Group (EG)-3 are the result of a purposeful pedagogical influence.

#### IV. DISCUSSIONS

Thus, the obtained experimental results give grounds to draw a generalized conclusion about the effectiveness of the designed project. The application of the structural approach and modern Case-tools as the main method of construction made it possible to facilitate the development process and create a flexible and easily replicable project.

In the future, it is planned to develop and introduce into higher education practice the autodidactic means of training students in the following training programs: „Applied Informatics in Economics“, „Pedagogical Education (Computer Science and Economics Profile)“ in the disciplines / subjects „Software Engineering“, „Implementation, maintenance and adaptation of IS“, „Information systems“. The project will be implemented in the form of electronic manuals which meet the modern requirements for software products of this kind.

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