FROM DEVELOPMENT OF PEDAGOGICAL PROGRAM PRODUCTS TO CREATION OF SCIENTIFIC EDUCATIONAL COMPLEX

R. Dzhuraev, M. Tsoy
Uzbek Research Institute of Pedagogical Sciences
Uzbekistan Avenue, 98, Tashkent 100003 Uzbekistan
uzpfiti2005@mail.ru

Abstract. The main goal of the pedagogical designing of systems on the support of educational process is the creation of conditions for the development of the human personality in the process of interaction with the components of the training system. The article is about the principles and approaches of development of pedagogical program products. In this paper, the mechanism of the development of program products that focus on the intellectual development of students and the formation of their creative thinking is explained. Development of pedagogical program products for each discipline will lead to the creation of a scientific educational complex.

Keywords: intellectual development of learners, educational resources, pedagogical program product, principles for projecting, creative thinking.

The main trend in the development of education is a priority use of modern technology along with traditional and widespread introduction of scientific achievements in practice. Creation of pedagogical program products for organizing educational process is the actual problem of modern education and is determined by the following factors:

– The need to address the educational needs of students and to create conditions for their independent work;
– The need of students in the forms of interactive learning different areas of the educational system;
– The lack of necessary conditions for the self-selection of principle, content, method and modern methods of education by students;
– Inadequate use of gained best practices in the practice on information technology penetration in educational process;
– The lack of information and e-learning environment, as well as integrated educational and scientific resources;
– Insufficiency of electronic teaching materials that allow students to independently acquire knowledge in today's environment of information technology;
– Insufficient number of educational-methodological literature, recommendations, developments, manuals, visual aids on the organization, implementation and monitoring of student self-study.

The solution of these problems is the design of pedagogical program products. A pedagogical program product is certain logic for teaching and learning process based on the use of computer and other media. They assume the achievement of specified learning goals, the active involvement of students in the conscious development of educational content, provide motivation, creative mastery of competencies, promote personal formation of students. Designing pedagogical program products must obey the rules of creation of a complex training and methodological support of the didactic process. In the construction of educational complex it is necessary: to take into account differences in the initial training of students; varying visibility, completeness and specificity for material handling; provide systematic and variety of information; provide an opportunity to study the training material based on the characteristic of each student. This ensures the adaptability of complex training and methodological support to the knowledge acquiring process. Designing personally tailored pedagogical program products should be organized in accordance with the following principles:

– The principle of integrity (provides real functioning and development of specific didactic system based on the integration of objectives, methods, tools, forms, terms of training);
– The principle of reproducibility (which serves to achieve specified learning objectives based on the reproduction of pedagogical program products educational resources, taking into account the characteristics of the specific pedagogical environment);
– The principle of non-linearity of pedagogical structures (sets the priority of the factors that have a direct impact on the mechanisms of self-organization and self-regulation education system);
– The principle of adapting the learning process (implies separation of the educational process into sub-processes, each of which has specific, unique features that meet the cognitive needs of a particular student);
– The principle of potential information redundancy (requires the development of technology of information transfer process, which creates optimal conditions for generalized acquisition of knowledge by students).

These principles define the design features of pedagogical program products and the organization of independent work of students:
– The development of goals and objectives based on specific subject curriculum;
– Logical-content analysis of information on materials studied, conducted from a position of priority in its main ideas and methods of action in the context of achieving the learning objectives;
– Oriented learning processes to maximally achieve educational goals, a complete solution of didactic problems;
– Design tasks aimed at implementing the algorithms of knowledge that take place in the measurement and evaluation activities of students;
– Prompt feedback, assessment and self-assessment of current and final results of learning and personal development of the student;
– Formation of educational resources as from the standpoint of the objective content of training (knowledge, skills, abilities), and from the standpoint of changes in personal experience, values and qualities of the student in accordance with state educational standards.

Thus, the basis for designing pedagogical program products is setting and implementation in the educational process of teaching tasks formulated taking into account the organization of students’ independent work. For its definition the implementation of the following stages are required:
– Formulation of the learning objectives of specific subjects;
– Selection and structuring of learning content, adequate to given objectives;
– Level establishment of the assimilation of the training topics of taught subjects;
– The development of tests, case studies and practical exercises to control the assimilation of the content of subjects;
– Planning and organization of students’ independent work;
– The definition of complex methods and techniques of organization of cognitive activities of students, the construction scheme of its management.

When considering the sequence of pedagogical designing of pedagogical program products, it should be noted that the design is a complex, multi-level process consisting of a series of interrelated stages, each of which is subject to the educational process.

With an ever-increasing amount of knowledge, the main task of the educational process with the use of pedagogical program products is an acquisition, establishment, construction of knowledge in line with emerging needs. Our study showed that for the implementation of such action it is necessary to perform two conditions:
1) the possibility of obtaining necessary educational information on time;
2) conversion of the acquired educational information to high-quality knowledge.

The use of pedagogical program products in the educational process cannot replace traditional forms of teaching, but can significantly complement and enrich them. Proper application of pedagogical program products will help to intensify the educational process, describe in detail the studied phenomenon or object. It is also important to prepare the student for a qualified use of computers in learning activities to make learning more attractive and interesting (Gerasimov, Zaytseva and Gubochkina, 2014).

Based on the psychological analysis of personality structure and activities, we have identified the following components of the formation of computer literacy. Computer literacy includes elements of creative activity: motivational, intellectual, substantive-practical.
Motivational component characterizes the attitude to the means of information activities, in particular computers as a tool to address emerging educational objectives: interest, motivation to learn new competencies; the desire to take advantage of computer training and self-activity.

Intellectual component is a system of knowledge and skills in relevant subjects as a means of solving information problems in school and extracurricular information activities. Formation of this component is based on the qualitative and quantitative characteristics of the acquired knowledge.

Substantive-practical component involves the development of ways to solve problems in the educational and independent information activities; it refers to the process and the result of the formation of the most important information skills.

Based on the analysis of formation of skills in the system of intellectual training that includes elements of creative activity at the present stage, and focusing on a three-level trajectory of the learning process, we came to the conclusion that the feasibility of the design in the teaching process more complex educational resources – a system of creative tasks. A fundamental prerequisite for the development of creative tasks is the learning objectives related to the creative inclination.

A pedagogical program products must meet the following requirements to the complex of creative tasks: psychological comfort – based on the types of thinking and memory that predetermine the individual trajectory of educational activities; target orientation – a definite place and role of each task in the resource block, consistent with the objectives of the subject; the adequacy and completeness of the target – a sufficient number of creative assignments for independent work; presence of key tasks – allocation of tasks that is crucial for the assimilation of the subject in a teaching unit; level-triggered differentiation – an increase in the complexity of tasks; use creative tasks implemented by the method of projects.

Our study showed that the formation of pedagogical program products resources should include the following components: scientific support of the educational process on the basis of modern information technologies; substantiation of principles of organization of independent work; development, design and implementation of information technologies based on interactive, audio, video, computer, telecommunications means.

When using pedagogical program products in the organization of independent work, it is possible to handover educational materials depending on the level of training, background information related to cross-references, and can at any time obtain the fullest possible response to questions that arise in the process of exploring new topics.

In the procedure for creating pedagogical program products, certain steps and invariant components stand out (Danovich L.M. & Shaposhnikova T.L., 2008). Sequence of their pedagogical design comes from the fact that e-learning resources are adapted to personality, multilevel and media-resource.

Personal adaptation of the system involves the orientation of the developer on the motivation of the personal activity of the student in the study of educational material at maximum consideration of personal interests, preferences, features of perception and thinking.

Multilevel feature involves varying degrees of complexity of the educational system resource that focuses on a different level of preparedness of the learner and a different level of motivation for learning.

Media-resource feature involves the use of all forms of media presentation of educational information: text, image, animation, and video, audio (in the near future, possibly, flavor, heat, wind blowing, and more).

Form of a logical representation of the content of electronic educational resources is hyper-media-text. Educational resources of pedagogical program products are considered as a combination of didactic units – modules. A pedagogical program product is an open, evolving, educational system, actively interacting with other information resources. Hyperlinks are points of such interaction.

The first element of the pedagogical design is a pedagogical idea which stipulates pedagogical objective. In accordance with the idea and objective, the model of intellectual training system is created. The key point is the design of the module.

Originally, the lowest level of complexity of teaching material module is designed. It is a series of pages which in strict logical form sets out the minimum required volume of educational information on a specific part of the subjects. At the end of studying the module material, the student at the appropriate level is tested by control tasks on the taught materials. Positive feedback allows him to move to a higher level of module.

The second level is formed on the basis of the first level with the addition of an additional learning. Activation of all or most of hyperlinks of the second level transfers the student to higher level of didactic...
module material. And at the end of the study allows him to test his knowledge with the help of control tasks of the second level, allowing him, in case of a positive outcome, to move to the third level.

The third level is generated based on the second level. In this, the scope of studied information expands and its quality presentation in accordance with elaborated pedagogical criteria. At the end of the study at this level, the student is given a test and practical tasks of the third level complexity.

The module can contain from one to a many pages. At the design level of the page, a projection of a direct presentation of educational material on the computer screen is carried out.

Further development of pedagogical program products for each subject will lead to the creation of a scientific complex containing all sections of the curriculum in subject disciplines that may in the future become a significant computer support in teaching.

References

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