

*Materials of Conferences***CONCEPTUAL MODEL OF TEACHING STUDENTS A COMPUTER PROGRAMMING UNDER CREDIT-BASED TECHNOLOGY**

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The paper provides differences between traditional and credit-based education systems. Post-classical education assumes an individual approach to a student to provide him with a broader education and teach him to replenish and renew his knowledge as and when needed. Introduction of new information technologies into practice in the context of the credit-based education system should help to change most academic disciplines and major methodological approaches. A conceptual model of teaching students to a computer programming has been developed and a scientific substantiation of the proposed methodology has been given that provides integrity of an educational process.

The traditional programming technology developed under conditions when major consumers of computer programs were represented by scientific institutions only, while computing resources were limited and maintenance problems were virtually unknown. Program efficiency and compactness, which are narrow-minded concepts, were the main criteria to assess the quality of a computer program. In the course of time, the complexity of the programs has increased so much that their development took years of hard work by a large team.

Modern criteria to assess the quality of a program include, above all, reliability and ability to accurately plan a program development process and its maintenance.

Computer programming disciplines aim to improve attainment level of highly-skilled professionals for business areas related to data compilation, reservation, management and processing, including the use of IT equipment. Development of a conception, a coherent system of general rules and their execution, ensures an educational process at a high level [1].

Transition to the credit-based education system changes the situation in higher education environment compared to classical education. One of the main objectives of the higher education modernization process is to prepare students for lifelong education, focus them on self-education, develop a motivation to supplement their knowledge and make them ready for retraining based on the needs of the labor market. Classical education was massive,

stable, traditional and usually completed. Classical education results in the knowledge and a specific profession obtained. However, in the modern rapidly changing world the knowledge becomes obsolete very quickly. Therefore, post-classical education assumes an individual approach to a student to provide him with a broader education and teach him to replenish and renew his knowledge as and when needed. Such an education results in a number of general cultural and professional competences provided by a general education standard among high school graduates.

A special role in the credit-based education system is given to students' independent work, which requires time twice as much as lectures and seminars, which is distinctive feature of this system [2].

Thus, requirements to the quality of education have changed significantly, therefore, to meet the requirements it is necessary to use new methods and training schemes that will help to achieve the main goal – to bring up a competent professional, a creative personality, who possesses necessary professional, cognitive and communicative competences.

The need to use new methods is due to the introduction of the credit-based education technology:

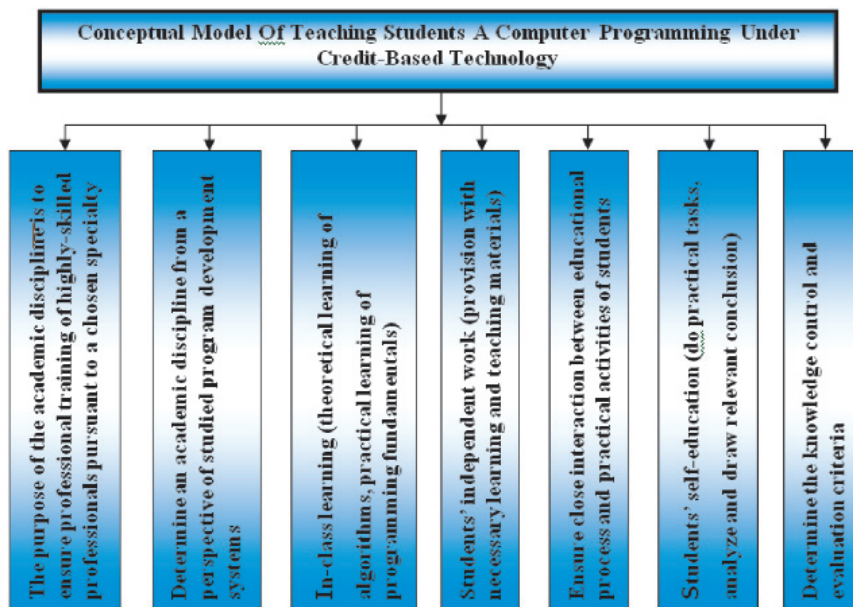
- reduction in the number of class hours;
- increase in students' independent work and supervision by a lecturer;
- increase in the complexity and scope of information learned;
- quality preparation of class rooms;
- need to visualize inter-discipline relations.

The number of class hours, including core disciplines, is reduced that requires to change an educational material presentation plan and to enhance a self-learning process.

Increase in the complexity and scope of information learned requires a conceptual presentation and teaching materials [3].

For example, after completing the discipline "Algorithms, Data Structures and Programming", students should be able to develop structural diagrams of various algorithms, organize tasks depending on the requirements, organize necessary data structures, select a programming language, develop programs using the selected programming language with the use of language tools and develop programs in a proper style as well as adjust and test programs, prepare high-quality software documentation.

When preparing a conception one should be guided by a system and use the most developed conceptual principles: *goal-setting, comprehensiveness, unity, consistency, integrity, decomposition, compliance, and analysis*, which often give an opportunity to form private conceptual principles, which are specific to a given subject area.



Conceptual Model Of Teaching Students A Computer Programming

As for the goal-setting principle, we should note that the main purpose of the discipline “Algorithms, Data Structures and Programming” for students of information systems is to teach them the fundamentals of task algorithmization, classification of programming languages, data types, classification of Turbo Pascal language operators, program development using subprograms, debugging techniques and program tests, and basics of object-oriented programming. We should outline main objectives to achieve this goal. The primary requirement to a task system is to ensure comprehensiveness that is requirement to examine tasks in close connection with each other that covers the relevant subject area, and to learn the fundamentals of task algorithmization, data types, operators, subprograms, debugging techniques and program tests [4].

A conceptual basis for a variety of data processing methods is an algorithm. The ability to automate processes is provided by appropriate algorithms. Formal definitions of algorithm are associated with special mathematical structures (Post machine, Turing machine, Church’s recursively computable functions) [5].

Comprehensiveness in teaching a discipline assumes use of all teaching aspects: from motivation, teaching and learning methodologies, organizational issues and forms of discipline teaching and learning and their compliance with the practical needs, to forms and methods of knowledge and skill control.

The principle of unity assumes common approaches and close relations when using various aspects of teaching and learning at semantic and structural levels. Given that for the development

of complex systems some specialists widely use a decomposition method – from general to specific – that means a common project is divided into slightly coupled parts until these parts become easy to develop, then the principle of unity is used for all parts of the decomposed project.

When implementing the project it is important to take into consideration that when developing different parts of the project one should remember about subsequent integration of these parts into a single system. This is the principle of consistency.

Finally, when considering a set of selected conceptual principals one should remember principles of integrity and compliance. The principle of integrity assumes an internally consistent system covering necessary knowledge to study. The principle of compliance assumes an externally consistent and coherent system of interaction between a discipline support system and a system of disciplines covered by the curriculum [6].

The above approaches are fit to any systems regardless of their nature, content and structure and, therefore, applicable to educational systems.

Using these conceptual principles, we can create a conceptual model of the academic discipline “Algorithms, Data Structures and Programming” for the study by students of the Information Systems Department (Figure).

Analyzing the conceptual model we should draw conclusion that use of conceptual modeling greatly facilitates the development of teaching documentation and the organization of an educational process and makes these processes more manageable.

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FROM THE EXPERIENCE OF REFLEXIVE SKILLS FORMATION OF THE TEACHERS IN LEVEL COURSE OF PROFESSIONAL DEVELOPMENT

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The processes of education reforms, upgrading education and consequently the change of system of teachers' professional development are the purpose and means of socio-economic and moral progress of society. Only those specialists who have the potential to create in new environment, who are characterized by unconventional style of pedagogical thinking and can competently solve professional problems, are capable to change the reality of teaching and to achieve effective results [1, p. 5].

Kazakhstan initiated a radical transformation of teachers' training. The process of reforming education is being purposefully conducted, the problem of improving the quality of teaching is being solved and interactive teaching methods are actively being introduced. In this regard, an important role is played by the training of teachers, organized on the basis of the Program developed jointly by the Centre of Pedagogical Excellence of the Autonomous educational organization “Nazarbayev Intellectual Schools” in conjunction with the Faculty of Education, University of Cambridge. This project provides organization of teacher training for teachers from secondary schools on a special training program which corresponds with the best international practices. The program is aimed at developing creative personality feature of a teacher and personal re-

sponsibility for the content and results of his work; it enables teachers to introduce interactive teaching methods in the educational process. Also one of the most important teacher's professional qualities which are being formed and developed in these level courses is reflection, which is considered the most powerful tool of teacher's self- development.

A reflecting teacher is a cogitative, analyzing and examining his experience educator. Reflection- is turning inward of the activities with the aim of their further improving, which involves awareness of the teacher of his inner world and his actions [1, p. 8].

The attitude of a teacher to his mistakes is truly a tentative step for his professional reflection. As J. Korczak wrote, a good educator differs from a bad one only in the number of errors made and harm caused to children. There are mistakes that a good educator does only once and after critical assessment does not repeats them, remembering his mistake for long. A bad educator lays the blame for his errors on the children (Korczak, 1966, p. 107) [2, p. 47].

Unfortunately, insufficient level of manifestation of reflection hampers the successful implementation of education reforms. So the problem of development of reflective skills has not only professional, but also a wide social meaning.

On the level courses the formation and development of reflective skills of teachers are being paid sufficiently large attention. This is because it is reflection that allows teachers to critically evaluate their activities, gives them the opportunity to experience problems in teaching and learning and find ways to tackle them. The second “face to face” stage stipulates writing reflective reports by the participants on their implementation of activities in the period of practical training in school. At this stage we are trying to develop their skills in understanding their activities through self-analysis, i.e. reflection on professional difficulties, mistakes, problems and increased accountability for their performance.

But unfortunately not all teachers possess reflexive skills, and the coaches often encounter this problem during the course. The problem is that the course participants do not usually find the causes for their results or problems; it is difficult for them to say and write what really happens in the course of their activities.

As a support for reflective activity the teachers are given the following guiding questions (for self-study or discussion with the coach):

- What are your main results, what have you understood, what have you learned?
- What tasks have been most interesting and why?
- How did you carry out the tasks, in what ways? What did you feel in the process?
- What difficulties have you encountered and how did you overcome them?
- What are your comments and suggestions for the future (yourself, the coach)?

In the training sessions reflexive questions offered to the teachers, are close to the studied material