INNOVATIVE METHODS OF TEACHING AND HARMONIZATION OF EDUCATIONAL STANDARDS IN THE SPHERE OF COMPUTING

Alekseyev M.A., Chernyshenko V. S., Loza T.J.

State Higher Educational Institution "National Mining University",
Ukraine, 49600, Dnipropetrovsk, Karl Marx Ave. 19,
e-mail: VS_Chernyshenko@live.ru

Competence-based approach to education (unlike traditional qualification) reflects requirements not only to the content of education, but also to a behavioral component. Recommendations about drawing up curricula for training of specialists in the computing sphere are considered. New pedagogical methods, proposing creative combination of the theory and practice which is reached in the course of direct professional activity are analyzed. The analysis of the problems arising at creation of educational standards is also given. It has shown that professional standards are primary link in high-quality training of various areas of economy specialists (including for computing area), and also ensuring their competitiveness have to be a basis for their development. Thus, problems when developing professional standards complicate prospect of harmonization of professional and educational standards which demands necessary methodological, methodical and expert completion at the first design stage.

Keywords: computing, curricula, educational standards, competence-based approach, cases.

1. Introduction

In transitional the period from industrial to information society by which development of world economy is characterized, creation and dissemination of knowledge become key processes. Basic course of development of new economy is the mobile and highly skilled human capital. Creation of curricula and programs on the basis of competence-based approach which synthesizes informative, business, information and social components, allows to intensify educational process and considerably to approach it to real inquiries of consumers of education [13].

In the international educational practice the direction of preparation of information technologies (IT-professionals) professionals since 1989, received the name computing which at first united three knowledge units: Computer Science, Computer Engineering and Information Systems. Now in the document Computing Curricula 2005 (CC2005) [1] the term "computing" combines already five knowledge units and is defined thus: “any goal-oriented activity requiring, benefiting from, or creating computers. Thus, computing includes designing and building hardware and software systems for a wide range of purposes; processing, structuring, and managing various kinds of information; doing scientific studies using computers; making computer systems behave intelligently; creating and using communications and entertainment media; finding and gathering information relevant to any particular purpose, and so on.”

Competence-based approach to education (unlike traditional qualification) reflects requirements not only to the content of education (that has to know, be able and what habits to own the graduate of higher education institution in professional area), but also to a behavioral component (ability to apply knowledge and skills concerning the solution of professional activity problems). So, now the wide circulation was gained by treatment of competence as ability to apply knowledge, skills and personal qualities to successful activity in a certain area [8].

All aforesaid led to new understanding of a role IT as scientific and educational discipline, caused need of consolidation of the world community efforts for formation of the complete harmonized approach to preparation of professional human resources for this sphere.

2. Analysis of the last researches

The leading world organizations – Committee on Education of professional society ACM (Association for Computing Machinery) – the oldest and largest international organization in the field of information technologies together with IEEE Computer Society (Institute of Electrical and Electronics Engineers Computer Society), directly engaged in a computing, carried out studying of the current requirements to experts in the sphere of information and computer technologies. During researches both organizations came to conclusion that the computing area at present corresponds to five main knowledge units. For each of these units, in process of development of the corresponding subject domain, and ACM and IEEE Computer Society constantly update recommendations concerning the academic teaching.

3. Computing structure

The computing structure combines now five knowledge units, judging by prompt rates of development, emergence of new knowledge units is inevitable.

So, the knowledge unit Computer Science covers many aspects – from theoretical and algorithmic bases of the computing to modern questions of a robotics, computer visualization, intellectual systems, bioinformatics and other CS areas which develop.

New recommendations about drawing up curricula for training of specialists of this knowledge unit left in 2008 that is connected with growth of problems of software safety, development of overlapping technologies for multinuclear processors and Web Science [3].

The knowledge unit Computer Engineering covers design and development of technical means and the computer focused systems [2]. The preparation program on CE includes studying of hardware, software, communications and interrelations which exist between these areas. The curriculum contains the theory, the principles and practical bases of the primogenitor of CE – Electrical Engineering and mathematics, applying them to problems of design of computers and the computer equipment.

The knowledge unit Information Systems is focused on integration of information technologies and businesses processes solutions for satisfaction of information requirements of economy and other areas of human activity. This specialty is aimed at use of information resources and sees technologies as the tool, allowing generating, processing and extending necessary information. New recommendations about drawing up curricula for training of specialists of this knowledge unit left in 2010 [4]. Similar plans concentrate on systems of difficult and globally distributed information, systems allowing organizing business, effectively to work with colleagues and participants of team worldwide; management of globally distributed resources; modern modeling; management and development of platforms for the Web environment.

The term Information Technology as usual is used in two values: in a broad sense – for designation of all computing, in the academic sense – for designation of the students preparation direction which is connected with computer technologies in business, public institutions, health care, schools and other types of the organizations. Often these preparation programs are called "information and computer technologies".

The knowledge unit Information Technology considers more technological, than information context IT and represents new quickly developing area which arose as response to changing requirements of daily needs of the state, society and business. New recommendations about drawing up curricula for training of specialists of this knowledge unit left in 2008 [5] that is connected with development of such areas: World Wide Web and its applications; the network technologies first of all based on the TCP/IP protocol; administration and service of computing systems; graphics and multimedia; Web systems and technologies; service-oriented architecture; technologies of electronic commerce; relational databases; technologies client-server;

interoperability; technologies of integration and expansion; object-oriented and event-driven programming; human machine interaction; safety.

The knowledge unit Software Engineering [19] – includes development and support of reliable and effective systems of the software which meet requirements of clients. The Software Engineering differs in character from other engineering disciplines thanks to the nature of the software and intermittence of the nature of the software development operations. The principles of mathematics and computer sciences unite in it with the methods developed for engineering of material, physical bodies and so on.

4. Competence-based approach and innovative methods of teaching

Now when teaching disciplines in higher educational institutions division into parts of uniform process of vocational training is used with the emphasis on splitting into theoretical and practical aspects. But modern pedagogics ("the pedagogics of competences"), without denying need of analytical division while training, supports a further synthesis, i.e. creative combination of the theory and practice which is reached in the course of direct professional activity or its game imitation.

It is possible to distinguish from modern methods of teaching, first, Case method [12] – technique of training which uses the description real economic, social and business situations. At its use trainees have to analyze a situation, understand an essence of problems, propose possible solutions and choose best of them. Cases are based on a real actual material or are approached to a real situation.

Classification of cases can be carried out as follows:

- The highly structured case – a short and exact statement of a situation with concrete figures and data. For cases of this kind there is a certain quantity of the correct answers. They intended for an assessment of knowledge and/or abilities to use one formula, skill or a technique in a certain field of knowledge.
- Unstructured cases. Represent a material with a large number of data and are intended for an assessment of style and speed of thinking, ability to separate the main thing from minor and skills of work in a certain area. There are some correct versions of answers for them and usually possibility of finding of the non-standard decision isn't excluded.
- Ground breaking cases can be both very short, and long. Supervision over the solution of such case gives the chance to see, whether the examinee unconventionally is capable to think, how many creative ideas it can give out for allowed time. In case of the group decision ability to pick up foreign thought, to develop it and to use in practice is checked.

In a form of representation there are paper cases and video cases. By the size can be:

- The full cases (on the average 20-25 pages) are intended for team work for several days and usually intended for team performance for presentation of the decision;
- The squeezed cases (3-5 pages) are intended for analysis directly on occupation and mean the general discussion;
- The mini-cases (1-2 pages), as well as the squeezed cases, are intended for analysis in audience and are most often used as an illustration to the theory stated on occupation.

On level of complexity can be:

- Cases for bachelors;

– Cases for masters;
– Cases for the MBA programs and advanced training courses.

Besides, in pedagogics of the higher school the technology of developing cooperation [11] now gains strength. The main receptions of this technology of training are:

– Individual, then pair, group, collective promotion of aims;
– Collective planning of study;
– Collective implementation of the plan;
– Designing of the training material models;
– Designing of own activity;
– Independent selection of information, training material;
– Game forms of training process organization;
– Mutually control in cooperation (microoffsets, the public admission to test and so on).

For realization of these receptions the teacher repeats three technological steps. First step: relying on knowledge available in students, the teacher puts an educational problem and enters into it group of pupils. Obligatory element of practical occupation is introduction in a problem when each participant realizes need of its decision. It reaches initial informative activity of students and primary updating of their internal purposes.

The second step is directed on support of necessary level of trainees' activity. They are given opportunity for independent activity. United in creative groups (on 6-8 people), students again, but this time already independent, in the course of communication staticize (specify, clear up) the internal purpose, comprehend an objective, define a search subject, develop a way of the general activity, fulfill and defend the positions, problems come to the decision. Creative groups are created by the functional principle – taking into account pedagogical need. The group is formed so that in it were: "leader", "idea man", "functionary", "opponent" and "researcher". Change of the leader happens through each two-three practical training that stimulates development of organizing abilities in students. Creative groups can be constant and temporary. Their structure varies, i.e. students are allowed to pass from one group to another, and also to communicate with members of other groups.

The third step allows the general discussion in the course of which the teacher aims students at the proof of the decisions validity. Each group actively defends the solution of a problem, its position. As a result there is a discussion during which from students are required justification, the logical argument, leading to the solution of a task. Having convinced that process of knowledge stopped because of a lack of trainees' knowledge, the teacher reports necessary information in the form of lecture, conference, and conversation. Thus, advantage of developing cooperation technology is that students get experience of the general actions at the organization and planning of informative activity, a formulation and the solution of educational problems, modeling of means of acquisition and information processing. The constant exchange of opinions leads to changing of work style of the teacher, who becomes more democratic, based on the principles of cooperation with students.

5. Conclusion

Harmonization of the standard is a reduction of its contents in compliance with other standard for ensuring interchangeability of production (services), mutual understanding of results of tests and information which contain in standards [6].

For the computing area which distribution of activity has global character, implementation of the unified requirements to competences of IT specialists, to processes and programs of basic professional education is many years an actual task of world educational community.

Growth of activity of Ukraine in the international economic markets causes need of harmonization of higher education system with international and, first of all, the European education system within Bologna Process [10]. Need of the international recognition of the Ukrainian diploma in the field of a computing assumes specification of educational programs according to uniform criteria of the quality of education, stated in the central, international document Computing Curricula 2005 [1] and specifying programs [2, 3, 4, 5, 9]. Clear split of the directions of specialists training in the field of a computing possible only on the basis of application of competent approach which will allow determining requirements to training of specialists by activity implementation in the corresponding subject domains.

But on the present in the state educational standards of Ukraine in field of knowledge of the INFORMATION SCIENTIST AND COMPUTER FACILITIES there are three directions: "Computer sciences", "Computer engineering" and "Program engineering". And, the Computer Sciences direction includes the specialty "Information Managing Directors of System and Technology". It doesn't answer fully to ideas of the document Computing Curricula 2005 as these directions don't cover completely that area which in world university education is called by "Computing".

The analysis of the problems arising at creation of educational standards shows that professional standards are primary link in high-quality training of various areas of economy specialists (including for computing area), and also ensuring their competitiveness have to be a basis for their development. Thus, problems when developing professional standards complicate prospect of harmonization of professional and educational standards which demands necessary methodological, methodical and expert completion at the first design stage.

Concerning prospects of application of innovative education forms and an assessment of graduates' competences now it is possible to come out also only with careful assumptions. It is necessary to consider that the first two of the described methods came from the West. Attempts of their literal transfer on the domestic ground can be unsuccessful because of a divergence in mentality, systems of values, etc. Therefore not all recommendations of the western teachers it is possible to execute in Ukraine. However it is possible to tell with confidence that at their accurate and creative adaptation it is difficult to overestimate the potential of these innovative technologies.

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