Organization of Students' Self-Study to Build Competences in the Workplace

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Abstract—Article are devoted to the descriptions of the student’s self-study organization based on multimedia training complexes which covered subject area of the speciality and help to form competencies needed at the working place.

Index Terms—Competencies on the workplace, multimedia training complex, student’s self-study organization

I. INTRODUCTION

Modern market and employers require from job applicant’s not only theoretical knowledge, but also specific workplace competencies. However, the current paradigm of education in the classic universities does not allow students to manage all necessary practical skills. This situation become even worse because of the fact that the amount of information which is necessary to master increases each year in accordance with Moore's law, but we have critical limitation of the classroom hours. So we need to transfer mastering of practical skills and competences at the workplace to the student’s self-study.

II. MAIN RESULTS

The proposed concept of the professional competencies mastering at the self-study process based on the following main fundamentals:

Fundamental 1. The competencies cannot be fully formed as a result of classroom work, but only trough student’s self-study (SSS) due to the growth of information in modern society and multidirectional learning in engineering degrees.

As a result of the scientific works analysis, it was determined that many scientists have come to a consensus on the types of SSS. So, depending on the location and timing, the nature of the teaching and guiding by the method of controlling the results of the SSS can be divided according with [1] on:
- Independent work in the classes (lectures, seminars, laboratory work);
- Independent work under the supervision of the teacher in the form of scheduled consultations, tests and examinations;
- Extracurricular independent work when the student overworks teaching assignments and complete creative tasks.

In order to determine the formation of professional competence during the student’s self-study we need to analyze the structure of competence.

The American approach to the definition of the professional competence is based on the including in it structure knowledge, skills, abilities, and additional features (abbreviated as KSAO - Knowledge, Skills, Abilities and Other Characteristics) [2]. The complexity of such an approach is the result of competences’ formation, as well as determining by the factors affecting on this process.

During the analysis it was found that the existing campaigns are not binding to the types of training sessions, and especially to the student’s self-study. Therefore, it is necessary to consider the process of the professional competence’s formation based on the data features.

Fundamental 2. We assume that each of the competencies could be presented as a fixed set of components, which determine the method of organization of student’s self-work:

a) Knowledge, "What?", "how", "why" is going on;

b) Knowledge of "What should be?", "How to do";

c) Ability to do so;

d) Motivation, "Why?";

e) Information image of the result: an object, a decision the state of other actors;

f) Knowledge of the application of the result, tools;

g) Ability to discuss issues related to competence;

h) Ability to assess the results of competence.

In the pedagogical design of the SSS it is necessary to solve some problems for managing working place competencies which mastering in the frame of each discipline.

1. To define a competence profile:

To define the purpose - expected result of the competence application.

To define possible ways of its achievement and to choose an optimum way.

To construct activity model on achievement of the given purpose by the given way – to create algorithm of the given activity.

To define what installations, knowledge, skills, qualities, experience is necessary for the expert for realization of the given algorithm – to make a profile of necessary competence.

2. To measure competence components it is necessary:

To pick up or create system of tests

To pick up the most effective methods of development of separate aspects of the competence

3. To select methods of separate aspects of the competence development with using of heuristic procedure of a choice the type of tools for the given competence within the frame of the discipline
Fundamental 3. The process of the professional competencies formation through self-study is presented by the model in the form of multi-dimensional matrix, which includes the levels, stages, components of competencies formation, as well as student’s self-work, in which competence is formed.

The process of professional competencies formation in the frame of SSS organization can be represented as a multidimensional matrix (Tables 1 and 2). It has four scales: the levels of formation of competence, the stages of its formation, the components and types of independent work, in which competence is formed.

Student’s self-work is presented as a multi-component process, and has the following: preparing for class, preparation for laboratory work and tasks for them, preparing for the practical and seminar classes and completing questionnaires, developing complex course projects, implementation of the individual research assignments, internships, training and fulfillment of the training, the preparation for the current and final control.

Fundamental 4. The author’s concept implementation is based on the following types of self-work presented in [1]:
- in the classes (lectures, seminars, laboratory work);
- out of the classes under the supervision of the teacher in the form of consultations, tests and examinations;
- extracurricular work when the student teaching assignments and creative.

Example of the competencies which mastering under the student’s self-work is shown in Fig. 1

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>MATRIX &quot;LEVEL OF THE COMPETENCIES DEVELOPMENT - STAGE OF COMPETENCIES FORMATION&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Cognitive</td>
<td>+</td>
</tr>
<tr>
<td>Reproductive</td>
<td>+</td>
</tr>
<tr>
<td>Creative</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>MATRIX - &quot;TYPE OF STUDENT’S SELF-WORK - COMPONENTS OF COMPETENCE&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing for classes</td>
<td>Execution</td>
</tr>
<tr>
<td>Lectures</td>
<td>Labs</td>
</tr>
<tr>
<td>Knowledge positive</td>
<td>+</td>
</tr>
<tr>
<td>Knowledge normative</td>
<td>+</td>
</tr>
<tr>
<td>Ability to do</td>
<td>+</td>
</tr>
<tr>
<td>Motivation</td>
<td>+</td>
</tr>
<tr>
<td>Information image of the result</td>
<td>+</td>
</tr>
<tr>
<td>Knowledge of the application</td>
<td>+</td>
</tr>
<tr>
<td>Ability to discuss issues</td>
<td>+</td>
</tr>
<tr>
<td>Ability to assess the results</td>
<td>+</td>
</tr>
</tbody>
</table>

Components of competence may be present in every form of self-study in full, in part, or not present at all.
Fundamental 5. Each level of the competences’ development determined by the achievement of educational objectives according to Bloom’s taxonomy: (knowledge, comprehension, application, analysis, synthesis, evaluation).

We propose to use the typology of knowledge presented in the paper [6] under the SSS structure development and based on flexible learning technologies.

At all levels of knowledge mastering we can distinguish four types of skills: the ability to recognize objects, concepts, facts, laws, models; the ability to act according to the patterns, algorithms, the rules; the ability to analyze situations, to isolate the main and build procedures from the mastering operations that helps to obtain the solution of the test task; the skills and ability to find original solutions.

Fundamental 6. The most effective way to transfer professional skills which required at the workplace is using of the multimedia based technology and interactive online training organization. This approach has been implemented in the Kharkiv National University of Economics based on specialty “Technology of multimedia electronic editions” in the form of multimedia teaching complexes for each discipline.

Authors propose in [3] to composed the multimedia training complexes from cognitive, reproductive and creative level to build skills and include all the necessary stages of their formation, implemented through a set of teaching instruments.

Cognitive level contain: presentation section - the training course presentation with time-lapse organization of information, analytical section, including: an article done in encyclopedic style, which carried a description of ideas, approaches, educational, historical facts with links to all materials available in the section, and devoted to the issue theme, materials, revealing in detail the content of the question (presented in the form of text, audio and video); Illustrative section - examples illustrating and explaining the provisions of the theoretical part; CASE; reference section - links to sources of information in printed, electronic libraries and Internet sites, reference numeric and text information (e.g., specifications of equipment, a list of strategies, the list of posts, so on), specifying for example type "what does the example".
“what do the trainee need to see in it”; "what is a result of the example”; examples of the results obtained during work illustrations’ (for example, the business plan of the enterprise).

Reproductive level includes following sections: practical, seminars, testing (the list of tests about the topic) and a portfolio which contains a set of model results on the studied subject.

On the creative level, we have the following sections: "Micro project and creative work" - contains a list of micro-projects and creative assignments, "Year paper (project)" - contains guidelines and examples of coursework (projects) in the frame of one course or set of courses (complex project), "Scientific problems (engineering problems)" contains a list of scientific problems (engineering problems), relevant to the subject area, "ISRT" - contains a list of individual research assignments.

Such multimedia systems (MTC) is based on the set of principles for adult learning giving in [5] and consider the author's approach to student’s self-work. Consider above mentioned concept and principles let’s discuss their application detailed.

1. The principle of the self-study priority. In order to practically usage of this principle it was carried out prior preparation: of flexible learning paths through the development and creation of the multimedia training complexes (MTC). They are giving to students opportunity to get acquainted with the cognitive level of teaching materials, memorize terms, concepts, classifications, overwork standard processes and technology implementation.

2. Principle of communication and learning in a group with the teacher in the preparation and execution of tasks in the process of the self- learning. The main direction of the learning process is to identify the needs of students and the skills which required at the workplace. Interview training, group discussion and the forum would help us identify these needs. It is desirable to compare the four points of view on the necessary competence: majority of the students (or students in learning group), student’s director, and student’s partner at working place. This principle in the MTC’s development is realized through an entrance test (including the application of a technique VARK [4], author of a mechanism which is set out in [6]).

3. The principle of positive life experiences (especially social and professional), practical knowledge and skills using in student learning as a base and a source of new knowledge formalization. This principle is implemented through the use of active learning methods for stimulating the creative work of students. On the other hand, the reproductive level of MTC helps student to perform individual work with some pattern, algorithm, which can then be transformed to the standard workstation, instructions, assignments. Individual work is implemented through the organization and communication students and teachers for the mutual transfer of information and knowledge. In this case, is also appeared the empirical knowledge formalization.

Also, an important step is to customize the work and updating outdated experience, personal attitudes that lead to the development of new knowledge and can be used through the professional and social experience.

4. Individual approach to learning based on personal needs, taking into account the social and psychological characteristics of the individual and the restrictions imposed by his working activities, the availability of free time, financial resources, etc. The individualized student’s assessment consist from the analysis of his career, social status and the nature of interrelations. Preliminary interviews, questionnaires, testing can build social and psychological portrait of the learner. This principle realized at the MTC with a flexible learning paths and based on individual student psychological types and individual information perception (M. Mayer - Briggs typology, G. Gardner’s types of intelligence, etc.) [4,5].

5. Electivity principle of learning realization give to the student the freedom in choosing goals, content, forms, methods, sources of funds, time, place of training, assessment of learning outcomes. We propose to introduce this principle through the organization of flexible learning paths and the ability to log into a training space from various points.

To enter the MTC student use gateways or the entry points based on the structuring of disciplines, topics (within discipline) and competencies (production functions, tasks). Thus, the student has the opportunity to enter the MTC (directed by the teacher or independently) – trough the discipline or the topic within it. Another possible gateway for entry is professional competences, which student will need at the workplace.

6. The principle of reflexivity. This principle is based on a conscious regarding student learning, which, in turn, is the main part of the self-motivated student.

Therefore there is a problem of methodology development for creation of such teaching materials which would allow to organize interactive dialogue of the student with the MTC and would provide the most comfortable maintenance for effective mastering of the professional competencies.

To support interaction between student and teacher we need to implement innovative components in the learning process. First of it - conversational interaction between teacher and student, as well as between students. Second - rapid delivery of the electronic teaching materials to the students and quick access to the knowledge bases posted on the educational institution site. Third - laboratory workshop performance in virtual labs and researches with access to the real laboratory equipment. Fourth - remote testing of student’s knowledge and skills.

7. The principle of relevance of learning to the practical activities of the learner. First of all, the relevance of studying the acquired competencies in the workplace. MTC realized through practical and training components of student’s self-work.

8. Principle of systems in the education. This principle could be realized under the objectives and content of the training, its forms, methods, tools and evaluation. We understood systematic as a permanent training, along with the results of previous studies and new training needs.

9. The principle of mainstreaming learning outcomes (their early use in practice). Application of this principle is provided by previous principles - systematic, practical relevance of learning outcomes, individual approach, the use of the experience gained.
10. The principle of the learner development. Education process could be directed to the improvement of the individual, the self-learning ability creation, comprehension of the new by-doing man.

III. CONCLUSION

The efficiency and quality of the training process improvement can be achieved by developing new approach to the student’s self-work. Proposed technologies are focused at forming professional competencies of the student based on a flexible training based on the set of multimedia training complexes.

Synthesis of the MTC architecture is appropriate to carry out on the base of the adult andragogy’s principles. Authors determined the components of the MTC which used in the process of architectural design, managing flexible, individual interaction between students and teachers.

The presented approach to the organization of the students’ self-work on the basis of the author’s concept and with the principles of the adult education has been realized in the form of multimedia training systems specialty, which allows students to learn occupational competencies needed in the workplace.

Further research in this area requires solving a number of problems - scientific and engineering, among which are: development and justification of models for competencies training and formation of the knowledge bank, copyright protection for the product.

Mentioned methodical approach was tested at the Kharkov National University of Economics. MTC was developed for the disciplines at area of specialities “Multimedia Technology in Publishing”.

REFERENCES


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Manuscript received 14 Murch 2013. This work was supported in part by the U.S. Department of Commerce under Grant BS123456 (sponsor and financial support acknowledgment goes here).

Published as submitted by the author(s).