

Compliance of Bachelor and Master Competencies with the Professional Standard Requirements

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The paper discusses the issues concerning the development of scientific-methodological basis for the process of Bachelor and Master competencies approval in accordance with the requirements of their possible professional activities.

Key words: *the competence, bachelors, masters, the basic educational program, professional standards.*



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In the context of the transition to the two-level system of higher education much is being done now on developing basic educational programs (BEP) for Bachelor and Master training. Specifically, new curricula are being developed in accordance with the newly approved Federal State Educational Standards of Higher Professional Education (FSES HPE). As a natural result this process faces a number of challenges.

The most critical problems concern the questions of business and higher education system interaction, as well as the correlation of the two-level education pattern with the existing labor system [1]. It can be easily explained by the absence of regulatory support. Because of this, for example, it is not clear what positions the graduates with Bachelor's and Master's Degrees can apply for and how much they should be paid. What are their responsibilities? Today, not only the professors of Higher Educational Institution, but also industrial enterprise representatives express a great concern about the questions they have not received the answers yet.

The implementation of professional standards [2] could be effective in solving these problems. Unfortunately, the development of the professional standards is rather slow if compared to the state educational standards. Therefore, there are some troubles in correlation of graduate competencies, approved by FSES HPE with the future position requirements.

The next challenge concerns the development of the so-called variative component of the basic educational program [3]. One of the peculiarities of the newly approved FSES HPE is the division of the basic educational program into basic and variative components, its proportion depending on the specialty and program type. On the one hand, the presence of the variative component provides Higher Educational Institution with the possibility to vary its educational program in accordance with employer's requirements. However, on the other hand, the methodological basis for variative component implementation has not been completely developed yet. That's why each Higher Educational Institution solves the problem in its own way. Thus, it is required to develop scien-

tifically-grounded technology for effective application of the newly-developed educational programs.

In the circumstances concerned, a group of experts of Bryansk State Technical University has started the project aimed at the development of methods and technologies for matching Bachelor's and Master's competencies, approved by the FSES HPE with the professional standard requirements. The project is realized on the basis of two specialties: 221700 "Standardization and Metrology" and 221400 "Quality Management". Above all, the following objectives are achieved:

- development of methodological basis for variative component integration in Bachelor's and Master's basic educational programs;
- generation of curriculum development technology, paying attention to those subjects which are aimed at competence training and enumerated in the variative component of the Bachelor's and Master's basic educational programs;
- development of Bachelor and Master competence model on the basis of such specialties as "Standardization and Metrology", "Quality Management" where graduates can face various professional requirements set by an employer;
- development of the procedure for the correlation of the Federal State Educational Standards of HPE with professional ones.

To our opinion, professional standards, being an essential part of any professional activity, must be integrated into the educational standards forming the basis for professional educational program development. Due to the implementation of the professional standards, employers, the representatives of industrial enterprises and educational institutions would gain the following advantages:

- enterprise representatives will receive the opportunity to evaluate their professional level, define the needs and possibilities of their professional training;
- employers will be able to control the professional level of their employees in order to reveal the

necessity of advanced training courses;

- there also will be the possibility to renew educational standards (variative component) including curriculum and teaching material development in the system of Higher Professional Education.

The project consists of several stages. The first stage includes the development of methodological basis for the integration of the variative component into Bachelor's and Master's basic educational programs, which is complied with employer's requirements. The flow chart of the first stage realized on the basis of quality function deployment (QFD) [4] is provided in Fig. 1. In this regard, curriculum development technology is being worked out with special attention being paid to those subjects which are aimed at competence training and skill development and enumerated in the variative component of the Bachelor's and Master's basic educational programs. Above all, a corrective semantic-structural model of educational subject is applied. It allows to correct the content of basic educational program variative component in order to broaden or deepen knowledge, develop student skills and competencies [5].

Today, the first stage of the project in question has been realized in Bryansk State Technical University on the basis of the specialty: 221700 "Standardization and Metrology". In order to obtain the data concerning additional competencies of basic educational program variative component within the above-mentioned specialty, the following technologies were applied:

1. Survey of employers and graduates of Higher Educational Institution (10 enterprises of Bryansk region and 22 graduates of Bryansk State Technical University).
2. Expert analysis of academic community data (including research results obtained due to the TUNING project realized in European universities and also due to the research work conducted in Perm State University and Voronezh State University).
3. Expert survey of professors and teachers of Bryansk State Technical Univer-

sity (2 professors, 10 associate professors, 2 senior teachers and 2 assistants)

The obtained data were analyzed based on QFD process including two subsequently applied matrix diagrams [4]. The analysis has revealed:

a) for Bachelor training in the specialty 221700, basic educational program includes:

- 13 additional competencies (with regard to FSES) for variative component of humanitarian, social and economic blocks of basic educational program;
- 12 additional competencies (with regard to FSES) for variative component of mathematics and natural science blocks of basic educational program;
- 22 additional competencies (with regard to FSES) for variative component of basic educational program professional block;

b) for Master training in the specialty 221700, basic educational program includes:

- 10 additional competencies (with regard to FSES) for variative component of general science block of basic educational program;
- 14 additional competencies (with regard to FSES) for variative component of basic educational program professional block.

In order to make the obtained results more vivid, structural-hierarchical model of Bachelor's and Master's competencies within the specialty 221700 has been developed. Eventually, based on the results obtained through the realization of the first project stage, a pilot curriculum was developed in Bryansk State Technical University for the 2011-enrollment, specialty 221700.

The second stage includes the development of Bachelor's and Master's competence models with regard to employers' requirements and professional standards. The flow chart of the second stage is provided in Figure 2. Besides, the second stage includes the analysis of Bachelor's and Master's competencies, i.e. their compliance with the requirements provided in the skills guide for positions of managers, specialists and other non-manual workers;

with regard to the national qualification framework [6] and professional standard projects within the given specialty [2]. Thereupon, it is essential to develop technology for Bachelor and Master certification in order to check whether they meet the professional standard requirements set by organizations – employers.

The second stage realization began with the development of the following formalized competence model M_{BB} relating to a graduate of Higher Educational Institution:

$$MBB = (Sp, PEL, ACC, APA, APT, APC),$$

where Sp – specialty of a graduate; PEL – professional educational level (qualification (degree)) of a graduate (Bachelor, Specialist, Master); ACC_k – abundance of k cultural competencies a graduate must have, $k = (1, 2, \dots, h)$,

$$ACC_k = (ACC_{k1}, ACC_{k2}, \dots, ACC_{kh});$$

APA_q – abundance of q professional activity of a graduate, $q = (1, 2, \dots, t)$,

$$APA_q = (APA_{q1}, APA_{q2}, \dots, APA_{qt});$$

APT_{qi} – abundance of i professional tasks, corresponding to the type q of professional activity, $i = (1, 2, \dots, n)$,

$$APT_{qi} = (APT_{qi1}, APT_{qi2}, \dots, APT_{qin}, APT_{qi1});$$

APC_{qij} – abundance of j professional competencies required for solving different types q of professional activity, $j = (1, 2, \dots, m)$:

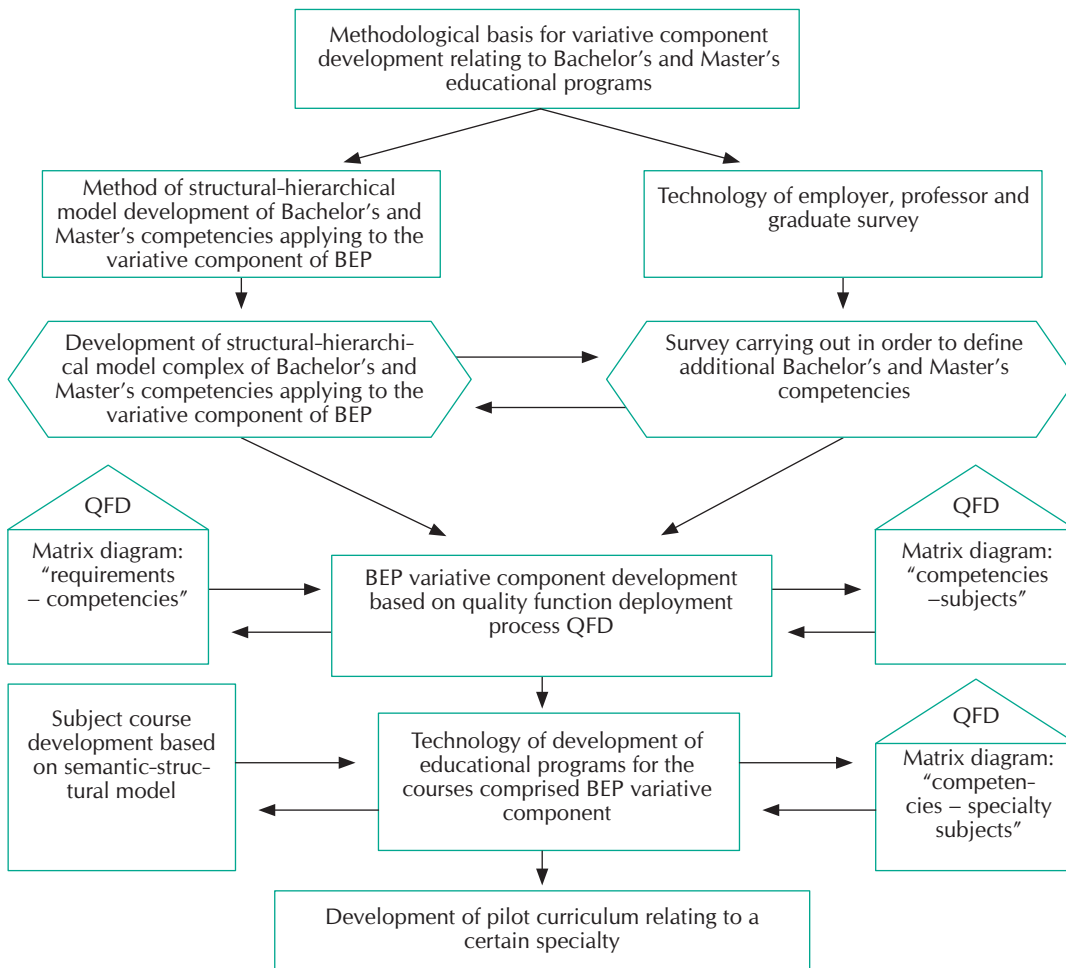
$$APC_{qij} = (APC_{qij1}, APC_{qij2}, \dots, APC_{qijm}).$$

The competencies are presented as a sum of:

$$\begin{aligned} & \text{knowledge } (K_x, x = (1, 2, \dots, X)), \\ & \text{skills } (S_y, y = (1, 2, \dots, Y)), \\ & \text{experience } (E_z, z = (1, 2, \dots, Z)): \\ & APC_{qij} = (K_x, S_y, E_z). \end{aligned}$$

The application of the proposed graduate competence model allows to regulate professional competencies by their differentiation in accordance with the solved professional tasks, i.e. each professional task requires a definite set

Figure 1. Variative Component Development Technology Relating to Bachelor's and Master's Educational Programs in the Given Specialty



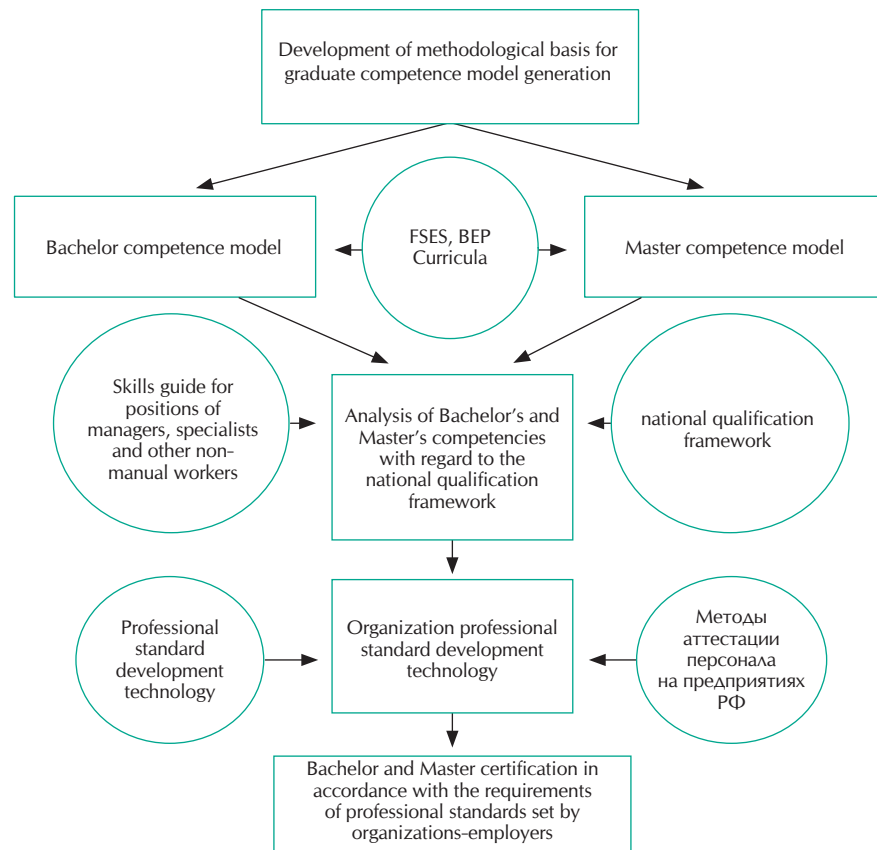
of professional competencies. Besides, this model establishes the correlation between competencies and their constituents: knowledge, skills, and experience. The model is proved to be universal and it can be applied in teaching result assessment relating to any graduate of Higher Educational Institution.

Applying this formalized model, the experts of Bryansk State Technical University developed complete Bachelor's and Master's competence models within the specialty 221700. These models could be used as the basis for professional standard development. To do this, it is necessary to modify the models in the following ways: include

the requirements relating to professional experience; types of professional activities should be replaced by working activities; professional tasks should be changed to working functions (units of professional standard); professional competencies should become working actions [2].

The final stage of the project discussed is the development of the recommendations on specialized Bachelors and Masters professional training within technical specialties. It can be explained by the fact that in the context of the transition to the two-level system of higher education,

Figure 2. Development of Mechanism of Bachelor and Master Competencies and Possible Professional Activities Correlation



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it is Higher Technical (Engineering) Education that has been heavily modified in the Russian Federation. Not only the definite specialties, but also educational programs were united. It was necessary to find a radically new approach towards educational program and curriculum development. A lot of subjects were integrated, their content being significantly changed.

Such critical changes can broaden the sphere of technical training making it closer to the general professional basis which corresponds to the officially approved American and European Bachelor's programs. However, it should be considered that in developed countries the special professional training is usually provided by the companies which are interested in employee

education continuation [7]. As a rule, this kind of education includes the system of short-term or refresher courses in organizations, innovative centers and etc. There is no such an experience in the Russian Federation.

At the same time, Russian enterprises are becoming more and more interested in the engineers who have deep knowledge in a definite professional sphere. However, even large-scale enterprises are not ready to invest into the development of further bachelor education system. As for mid-sized and small businesses, they have no such possibilities at all. Thus, it can be stated that it is essential to develop the system of further bachelor education, so-called "finishing-up" [7], in the Russian Federation. This problem becomes

particularly critical in connection with the orientation of the political leaders to the speed up modernization of Russia's economy.

Based on the proposed approach, we believe that it is possible to develop essential scientific-methodological basis for the structure improvement and content enhancement of Higher

Professional Education that can be achieved by means of correlation of Bachelor's and Master's competencies approved by FSES of HPE and the requirements of industrial professional standards. It would contribute to the creation of favorable conditions for matching the existing labor system and the two-level educational system.

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