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Strategy to Reinforce Employer Engagement in Engineering Education

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The article discusses the basic issues facing higher education, unveils the forms employer engagement can take, examines the stages of competence development within Basic Engineering Program. It proposes the algorithm of Basic Education Program design on the basis of the developed strategy to reinforce employer engagement into the engineering training process.

Key words: professional competencies, competence, information system.

Introduction

Considering the current reform of Higher Education, it is worth noting that the employer needs analysis is not carried out by the representatives of the Federal Government but by the universities themselves. In the Soviet Union, education programs were compiled in accordance with the uniform education standards. At the best of times, the specialists were ready to resolve all possible tasks. The job placement was also regulated by the Government. Today, universities train graduates who are relevant to the labor market of the same or neighboring regions. Most potential employers are the representatives of small business focused on extremely specific tasks.

The Minister of Education and Science of the Russian Federation advances the idea of closer cooperation with the employment sector in terms of employer

engagement into the educational process as an educator, internship supervisor, member of the State Examination Board, i.e. so-called standard roles. In accordance with most of Federal State Educational Standards (FSES), the share of employers involved in education activities should not account for less than 10 %. Due to the above-mentioned standard forms of employer engagement, there is not always possible to consider employer's requirements to the graduates.

The development of professional and integrated professional competencies for various qualifications could hardly be effective without matching them with employers' needs and expectations, i.e. existing professional standards (PS). However, the final generation of FSES provides educators only with generalized definitions of both professional and integrated professional competencies. To achieve clear understanding of such competencies, it is required to carry out much closer cooperation with numerous employers. This work does not only involve employer survey, but also should facilitate the recognition of the existing competencies. It should be done within the limited time frame, precisely, prior to program enrollment.

The education process itself is a slow-response system. As a rule, the Higher Education Programs last 2 to 5 years. It means that during education period economic climate and especially engineering environment may change the emphasis employers are likely to give to graduates' requirements, i.e. competencies.

On the one hand, the generalized competencies stated in FSES provide educators with freedom in their understanding of professional competencies, precisely, in their choice of this or that skill or knowledge a student should gain. On the other hand, due to these generalized competencies, it is not always possible to reveal the skills and competencies that will be highly valued by employers.

Stages of competence development within Basic Engineering Program (BEP)

Basic Engineering Program (BEP) involves the following stages:

1) BEP design;

2) BEP delivery.

In order to reinforce employer engagement into the training process, it is required to introduce such sub-stage as program revision or correction. Within the BEP design stage, revision mostly concerns the curricula of professional cycle and integrated professional cycle courses. At the second stage, revision may involve the changes of the rest courses delivered within the same cycles. At both stages, competences should be matched with ever-changing employers' needs.

In order to specify the generalized competencies given in FSES in terms of the skills and knowledge related to the definite lecture and practical class content, it is necessary to design the so-called "passport" of competency (Fig.1).

The Strategy to employer engagement that is based on the engineering training stages involves the following stages:

The first stage implies design of BEP, i.e.:

1) insight into the competencies (performed by educator);

2) insight into job responsibilities (performed by educator);

3) design of competency passport (performed by educator);

4) design of BEP, i.e. in case of new qualification or degree (performed by program coordinator);

5) awareness of an employer with competency passports, FSES competencies, job responsibilities in accordance with professional standard (performed by educator or program coordinator);

6) development of employer's requirements (performed by employer);

7) BEP revision (performed by program coordinator).

The second stage involves the program delivery:

8) training delivery based on the program content (performed by educator);

9) development of employer's requirements for the current training (stage

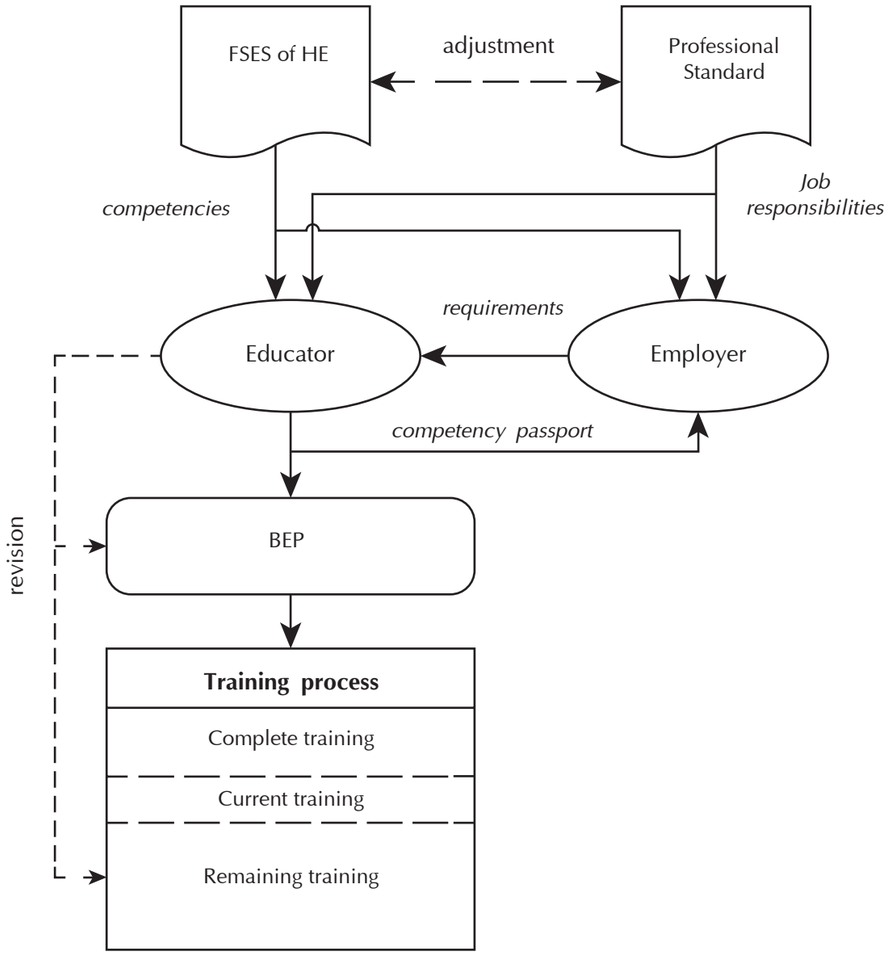
6) in accordance with the updated FSES competencies, job requirements stated in the professional standard, competency passports (stage 5) (performed by educator or program coordinator);

10) revision of BEP in terms of the remaining courses (performed by program coordinator).

BEP design algorithm

The first stage or start of this algorithm is conditional. Employer's and educator's data input is done simultaneously (block 1, 2). The program coordinator should choose the training trajectory among the existing qualifications. As an example, the diagram presents the codes of the integrated qualifications or education programs: 09.00.00 – Information and Computer Science, 15.00.00 – Machine Engineering, «other» other education programs offered by the university. In accordance with the selected training trajectory, the full description of FSES competencies, i.e. stages 1 and 5 of the Strategy, is provided. The Professional standards are matched in the same way (stage 2 and 6 of the Strategy). It is worth noting that stages 5 and 6 will be implemented simultaneously. Then, the coordinator should adjust and coordinate all the examined materials and data (block 7). The educator, in our case, course instructor, may himself/herself develop the competency passports in accordance with the course learning outcomes (block 10, stages 3 and 9 of the Strategy). Thus, BEP is designed (stage 10 of the Strategy). The competency passport is approved by employer (stage 5 of the Strategy). In addition, he or she should design the graduates' requirements (stage 6 of the

Fig. 1. Diagram of competence development within BEP

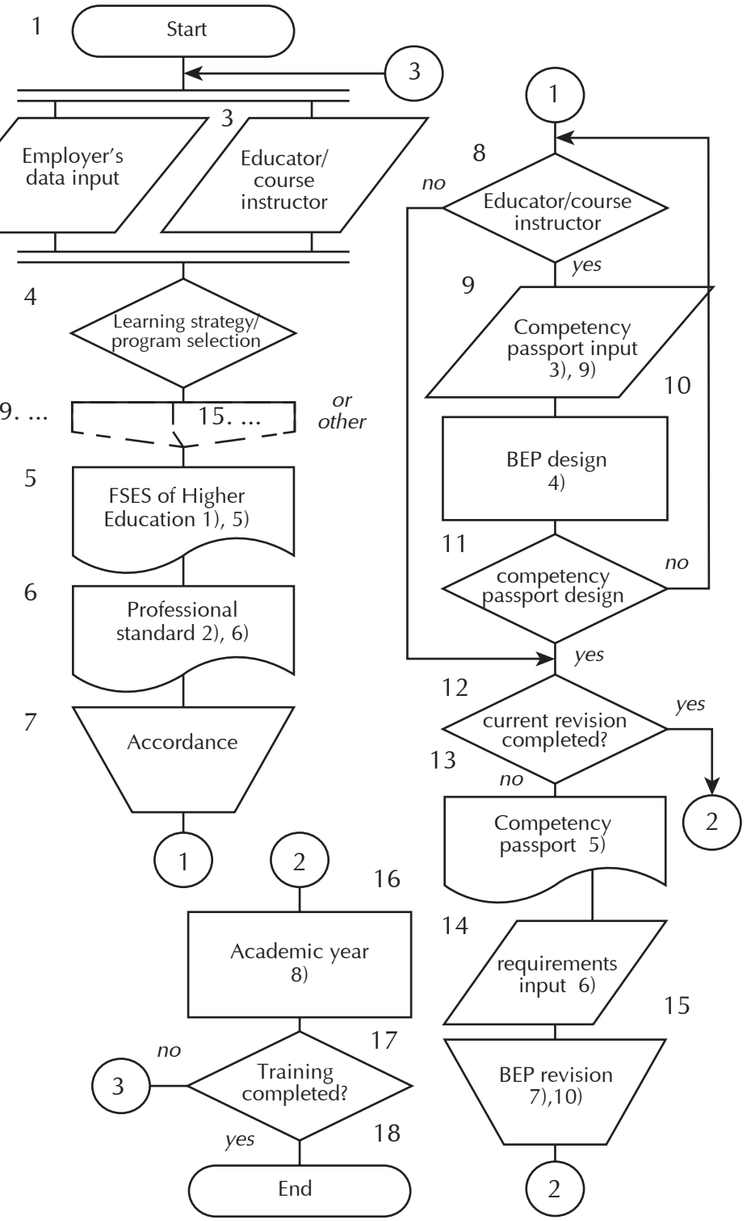


Strategy). It is followed by BEP revision, i.e. stages 7 and 10 of the Strategy). The education program should be annually revised (stage 8 of the Strategy). The stages of the algorithm should be repeated till program competition.

Due to competency passport design and determination of each competency importance, the graduate's competence within the definite BEP is developed [1, p. 31-33].

The need of an employer to influence the training process in terms of well-timed update of graduates' skills and competencies stipulates the use of information system. The information system has been developed on the basis of competence models designed at the university-employment sector level

Fig. 2. BEP design algorithm



[2, p. 52, 53].

The proposed strategy makes the foundation for designing one of the information system modules, which is directly related to BEP development [3].

Conclusion

In the context of rapidly changing work environment, there is the need to introduce new technologies in all spheres of human activities. The proposed Strategy aimed at reinforcing employer engagement in the training process would allow universities to respond effectively to ever-changing workplace requirements and labor market needs.

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Collaboration Between Coal Mining Company and Higher Education Institute for Production Process Improvement

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The paper presents the experience of collaboration in engineer training between three organizations: the surface mine office "Novoshakhtinskoye", Primorskugol, Research Institute of Mining Safety and Efficiency (NIIOGR), and Far Eastern Federal University (FEFU). Students are involved in searching for ways of production improvement through scientific and practical seminars which are held at FEFU with the participation of NIIOGR, and through work experience internship, where students are supposed to overcome particular production challenges. Engineering education, science, and production overlap at the annual scientific and practical forum "Mining School" held by Siberian Coal Energy Company (SUEK).

Key words: personnel policy, collaboration, personnel training, production improvement, work experience internship, seminar, scientific and industrial forum, Siberian Coal Energy Company.

Currently, the critical factor for national production improvement is graduates training since the average age of employees in the surface mine office "Novoshakhtinskoye", Primorskugol, is considerable. If measures are not taken today, the average age will rise from year to year. Having participated in a number of vacancy fairs, the company failed to receive any positive feedback, which means there should be another way to attract graduates to the company.

The students' interest in work in coal mining company arises from participation in the production safety and efficiency improvement project. This activity is carried out on the basis of the programs developed by the company's managers and professionals. This collaboration between the company and university creates a kind of network when the potential employee is involved in production improvement since his studying at the university (Fig. 1). For this purpose, since 2011, the highly qualified personnel of Primorskugol, NIIOGR, and professors and administration personnel of FEFU hold seminars for students of several specialties: mining machinery and equipment, open-pit mining, underground mining, geology and natural resources management (Fig. 2). This work with students includes the following steps: firstly, they are split into teams according to the attributed specialty or given position, then, within a team and on the basis of actual production data, they discuss various alternatives of production safety and efficiency improvement for the surface mine office "Novoshakhtinskoye".

Being involved in these activities, students identify the improvements which can be made to increase the machine and staff capacity. This allows present-day students not only to become professionals,

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