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# Block-Modular Curriculum as a Tool of Prompt Reaction of HPE at Changes in an Employer's Requirements

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**High quality training of specialists required for different branches of economy and social sphere can be performed only in terms of the curriculum that not only meets the requirements for competencies mentioned in FSES, but also exceeds sufficiently in terms of their goal-oriented development and steady updating on the part of employer. The major tool for realization of curriculum is syllabus. Due to its «integrity», the current structure and mode of syllabus do not permit for academic trajectories and, hence, for prompt reaction to changes in employer's demands in graduates' new competence development. These drawbacks are absent in block-modular structure curriculum allowing for students' educational trajectories development according to «LEGO» construction kit, without interfering with Federal Standard requirements for «obligation» of some general disciplines.**

***Key words:*** *educational program, employer, competence model, effective response mechanism, block-modular curriculum, study pathway, educational trajectory.*

It is obvious that the basis for curriculum design is to be the development of a graduate's competence model designed in accordance with not only FSES requirements but also on the basis of professional standard. The development of graduates' competence model based only on FSES requirements and without taking into account professional standards means to create an intentionally out-of-date curriculum. The necessity to apply professional standards in profile curriculum development is to contribute to more intensive interaction of university and employers that, hereafter, is certain to affect the general conditions of economic development positively. The most sufficient result of such an interaction would be discussion and revealing the most relevant, concrete and perspective requirements for learning outcomes.

Obtaining one or another learning outcomes, the quality of which influences directly the competence development of a «professional engineer», is defined by the structure [1] and content of curriculum of corresponding profile. Therefore, the key task for academic process development in university is to design such a curriculum the disciplines (module, course) of which would intentionally develop the graduates' preset competence model, and, simultaneously, this plan would provide the possibility to react promptly to the employer's definite demands. In this case, the changes introduced into curriculum in terms of employer's requirements should not af-

fect the basis of curriculum, i.e. introduction of changes should be in such a way that the whole curriculum should not be reconsidered every time in order to meet the changing requirements of private character.

The solution to the problem of intended formation of the required competencies and development of educational trajectories for students on employer's demands is in one plane with creation of block-modular structure. Such an approach is widely used in development and production of complex electronic and electrical devices and equipment. Let us take a modern computer as an example. The basis for it remains a base unit consisting of a case, power unit and «mother card», but for meeting the preset definite requirements different modules can be added and attached, for instance, CD or DVD disc-drive mechanism, monitor, sound or videocard, printer, loudspeakers. It is very convenient from the point of view of one or another function performed by a device and cost-effective for a customer of this device.

The same principle can be used in curriculum design, keeping FSES requirements as a basis (not to have a great disagreement in basic levels of training in all Russian universities) in each definite profile. Having developed «basic academic blocks» and taken them as a basis for curriculum for all engineering profiles (a kind of curricula unification), then the curriculum in the form of block-modular structure is formed, where every academic block is clearly aimed at development of a competence set in the graduate's model [2]. Here the target function of every academic block is set by a number of courses or modules of disciplines, each of which contributes to formation of the given competence. In this case one can form the blocks of both pre-existing disciplines of the current curriculum and entirely new, not previously studied ones, but indispensable for competence model realization. Besides, having arranged «the resource pack of academic blocks», one could form the students' training trajectories out of them in one or another direction. Moreover, this «resource pack of academic blocks» could be permanently added with other blocks according to an employer's order, without disturbing an established academic process. Only after new academic blocks having been prepared and provided with staff and supporting materials, it could be inserted in academic process. A new block will replace an old one or some unnecessary for the required learning outcome in the curriculum.

The existing form of curricula with discipline distribution in time and cycles (Humanitarian-Social-Economic, Natural Sciences, and General Professional cycles) does not permit for efficient and prompt respond to changes of market conditions in the graduates' required business competencies. Replacing one discipline for another does not virtually allow for development of the required competencies. But if to replace some disciplines in the curriculum, their inconsistence in time of teaching brings to naught the synergetic effect in formation of the given competencies [3]. To demonstrate the suggested mechanism of efficient university's respond to employer's demand visually, let us make an example of block-modular project for Bachelor's training in «Mechanical Engineering» speciality, «Engineering technique» profile (Fig. 1). It is assumed to be composed on the basis of the graduate's competence model correlated with an employer by means of distribution in time of the relevant disciplines blocks from the earlier composed resources of academic blocks (Table 3). The academic blocks themselves are provided with necessary resources and run by corresponding supervisors as well as the time for each block is defined in the experimental way in credits and hours. The content of curriculum in every academic block is responsible for development of definite competence set.

Not to describe the whole content of every academic block in the article let us give the example of only two of them – one is from the part for professional competences development (Table 1), the other – for special competencies development required by an employer (Table 2).

**Table 1. Academic Blocks for Development of Professional Competencies**

| № | Competencies | Academic block | Courses, internships, tutorials, modules, course and diploma work and papers, projects | Block supervisor |
|---|---|---|---|---|
| 3.1. | Awareness of professional engineering methods of force field, strength, electrical, hydraulic and thermophysical calculations in the sphere of mechanical engineering. | Academic block № 3.1 Block «Professional methods» block | Cutting theory – the whole course, hydraulic gear – the whole course, thermal physics of engineering cutting processes - the whole course, mechanical engineering – Module № 1.2 Structural resistence – Module № 5,6 B. Mathematics – Module № 5.6. | Associate Professor Industrial and Environmental Safety Department Reznikov L.A. |

**Table 2. Academic Blocks for Development of Special Competencies**

| № | Competencies | Academic block | Courses, internships, tutorials, modules, course and diploma work and papers, projects | Block supervisor |
|---|---|---|---|---|
| 4.2. | Ability to form the directions of team development, design programs, and training methods for acquiring higher qualification. Ability to manage resources, developments, trends in activity of a department or team | Academic block №4.2 «Management» block | Methods of engineering activity – Module №6 «Organization and management» Quality management system – the whole course, Personnel management – the whole course. | Associate professor of Management and organization department Shevlyakova Ye.M. |

**Fig. 1. Scheme of the Block-Modular Curriculum**

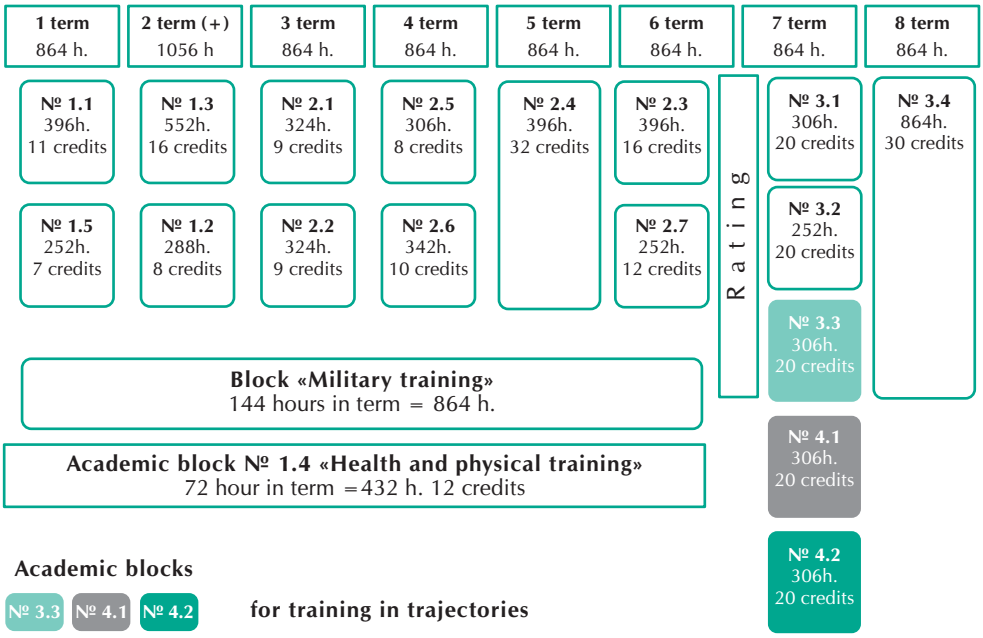

**Table 3. Resource of Academic Blocks for Curriculum Design**

| № | Name of block | вес в кредитах | Hours | Distribution in time |
|---|---|---|---|---|
| 1 | Academic block №1.1. block «Social communication and culture» | 11 | 396 | 1 term |
| 2 | Academic block №1.2 block «Adaptation to academic and labour activity» | 8 | 288 | 2 term + (summer, internship) |
| 3 | Academic block №1.3 block «Professional communication and technical culture» | 16 | 552 | 2 term |
| 4 | Academic block № 1.4. block «Health and physical training» | 12 | 432 | From 1 to 8 term |
| 5 | Academic block №1.5 block «Law and social-economic responsibility» | 7 | 252 | 1 term |
| 6 | Academic block №2.1 block «Engineering graphics and computer modelling» | 9 | 324 | 3 term |
| 7 | Academic block №2.2 block «Programming» | 9 | 324 | 3 term |
| 8 | Academic block №2.3 block «Bases of engineering research» | 16 | 396 | 6 term |
| 9 | Academic block №2.4 block «Mechanics, mechanisms, methods» | 32 | 648 | 5 term |
| 10 | Academic block №2.5 block «Computer-aided engineering system» | 8 | 306 | 4 term |
| 11 | Academic block №2.6 block «Construction materials» | 10 | 342 | 4 term |
| 12 | Academic block №2.7 block «Safety and economics of production» | 12 | 252 | 6 term |
| 13 | Academic block №3.1 block «Professional methods» | 20 | 306 | 7 term |
| 14 | Academic block №3.2 block «Automation and mechnization» | 20 | 252 | 7 term |
| 15 | Academic block №3.3 block «Modeling and evaluation» | 20 | 306 | 7 term (traject.) |
| 16 | Academic block №3.4. block «Engineering solutions» | 30 | 864 | 8 term |
| 17 | Academic block №4.1 block «Production operation and commercialization» | 20 | 306 | 7 term (traject.) |
| 18 | Academic block №4.2 block «Management» | 20 | 306 | 7 term (traject.) |

The mechanism of efficient reaction to employers' demands operates in the following way. Having received an order from an employer to train Bachelors with management competencies instead of block № 3.3 block № 4,2. is introduced in the curriculum and academic process goes on in the former conditions. If managers or functionaries are in demand - blocks № 4.1 and № 4.2 are simultaneously introduced.

If an employer asks some additional characteristics of learning outcomes, one can react promptly by designing new academic block. It is possible to meet any requirements in this way.

Having prepared academic blocks, one can form practically any trajectory for students' training in required competencies. For this purpose it is necessary to remove all irrelevant blocks from block structure and introduce the required ones, as hours taken for elective blocks are the same and time for their realization is also the same. Even if it is necessary to perform global transformations, for example, to replace two or three academic blocks, it would not result in sufficient loss of resources and time and would not disturb the steady mode of academic process.

**Conclusions**

1. The existing form of students' training curricula in the sphere of higher professional education does not permit for efficient and prompt respond to changes of market conditions in the graduates' required business competencies.

2. Design of block-modular curriculum of students' training contributes to the development of mechanism of university prompt response to employers' demands in the sphere of graduates' training with the competence set.

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