

Higher Education Institutions Educational Process Digitalization in the Context of the Necessity to Provide a Model for Students' Choice of Training Areas and Academic Specialties

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Abstract: The digital revolution in the Russian economy is leading to a radical change in the labour market, the emergence of new competencies, improved cooperation, increased responsibility of citizens, their ability to make independent decisions. This, in turn, is the reason for the reorganisation of the educational process, largely based on the use of IT technologies. The purpose of the paper is to solve the problem of unification of educational programmes within the framework of digitalisation of the educational process in universities. The unification of educational programmes is proposed, which ensures the conducting of the educational process without losing its quality, taking into account individual educational trajectories, as well as implementing a model for students' choice of a direction or training specialty, starting from the third year of study, and, as a result, making it possible to transfer students between educational levels up to 5 semesters, and within a level – up to 6 semesters. The unification of educational programmes is considered on the example of the Moscow Aviation Institute (National Research University). The proposed unification covers the extended groups of specialties taking into account different levels and forms of training, as well as various territorial sites (branches).

Keywords: Educational programme, unification of disciplines, individual educational trajectories, information technology.

INTRODUCTION

Today, the main trend in Russian education is digitalisation. The digital revolution in the Russian economy is leading to radical changes in the labour market, the emergence of new competencies, improved cooperation, increased responsibility of citizens, their ability to make independent decisions (Safuanov, Lekhmu and Kolganov 2019). This, in turn, is the reason for the reorganisation of the educational process, largely based on the use of IT-technologies (Dvoretzkaya 2019). Digitalisation of the educational process has the following advantages:

- improvement of the quality of training and educational resources;
- organisation of a single information space;
- prompt collection of relevant data characterising the state of all areas of the university;

- providing access to educational resources from anywhere in the 24/7 mode.

The task of digitalisation affects both teaching methods and the system for assessing the quality of knowledge. To do this, it is necessary to develop for each student his own, unique set of tasks, the answers to which will require creative approach, professional ability to compare, consider, analyse, and weed out the unnecessary. On the other hand, it is necessary to develop in the student not only professional knowledge, abilities and skills, but also such qualities as mobility, adaptivity, communication skills, independence, the ability to take the initiative, make a choice and be responsible for it. Teaching creativity and development of a creative style of professional activity is implemented through individual educational trajectories (hereinafter IET) of a student (Shaposhnikova 2015) which allow them to independently choose courses and areas of study. Student's decision on which trajectory to take depends on the demands of the industry. Employers from an enterprise send a request to educational organisation, on the basis of which a set of competencies is formed and an IET is developed (Anamova, Bykov and Kozorez 2020). On the other

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hand, there is a dependence of the study of disciplines that must be observed when a student chooses an IET. Therefore, a tutor who has the information necessary for this can assist in the development of an IET (Gorchakov 2019). Traditional higher education does not keep pace with the rapidly changing economy, the high rate of change of information technology, the growth of computer capacities, the rapidly changing requirements of the employers: for example, upon admission, students must choose a direction, to which they will have to devote four years, and during this time the profession may lose relevance or undergo a dramatic changes.

The President of the Russian Federation in his message dated January 15, 2020 set the task to the Federal Assembly of the Russian Federation to provide for students mastering educational programmes of higher education, the possibility of choosing a trajectory of training, starting from the third year of study (Message of the... 2020). One of the ways to solve this problem is to ensure the first two years of study, where they receive basic knowledge in all object-oriented programming (OOP), implemented by the university, is as close as possible in content for all students. And only by the third year of study, the student must decide on the direction/specialty of training and specialisation. This approach will also allow students to transfer to another direction or specialty, if necessary. In this case, students already have basic knowledge, the number of retaken subjects will be significantly reduced. It is possible to implement this approach through the unification of educational programmes in the first two years of study in all areas of university training programme.

The basis for this is laid in the Federal State Educational Standards of Higher Education (hereinafter FSES of HE), where the composition of universal competencies is formed (Federal state educational... 2018a; Federal state educational... 2018b, Federal state educational... 2018c; Federal state educational... 2018d; Federal state educational... 2018e; Federal state educational... 2018f; Federal state educational... 2018g; Federal state educational... 2018h; Federal state educational... 2018i; Federal state educational... 2018j; Federal state educational... 2018k; Federal state educational... 2018l). The educational organisation has developed indicators of achievement of these competencies, developed procedures and tools for assessing the development of required universal competencies in students.

CHARACTERISTICS OF THE EDUCATIONAL PROGRAMME UNIFICATION

The unification of educational programmes while maintaining the proper quality of education, on the one hand, makes it possible to provide the model of IET, and on the other hand, it is impossible without digitalisation of the education, in particular, without complete digitalisation of the methodological support of educational programmes. Full digitalisation of methodological support of educational programmes ensures the achievement of the following results:

1. Providing of a single information space.
2. Ability to analyse all the components of the methodological support of the educational process.
3. Reducing efforts for the development of new educational programmes.
4. Ensuring the proper quality of the educational process.
5. Elimination of duplication of the content of the educational process.
6. Possibility of unification of parts of the educational process.

Implementation of the educational process taking into account digitalisation provides:

1. Control over the development of competencies.
2. Analysis of the effectiveness of modules, disciplines.
3. Determination of the teaching staff efficiency.
4. The possibility of optimising the educational process for the benefit of training high quality personnel for the digital economy of the Russian Federation (Anamova, Bykov and Kozorez 2019).

The unification of educational programmes is based on the following principles:

- the principle of unity of requirements of FSES educational blocks for the competencies of a number of areas of the university;
- the principle of unity of requirements for teaching general scientific disciplines at the university;

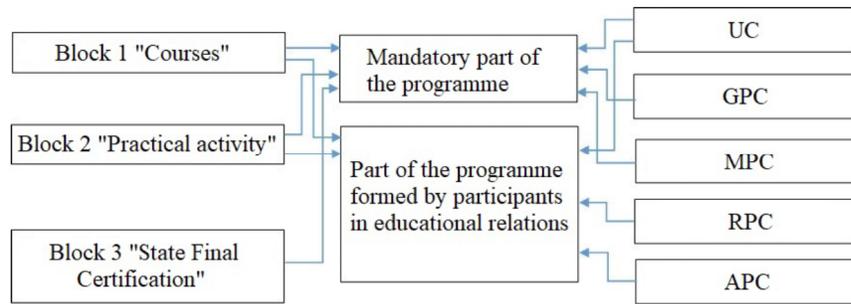


Figure 1: The structure of the educational programme at the FSES of HE based on professional standards.

- the principle of unity of requirements for the assessment of competencies in general scientific disciplines at the university.

When solving the problem of educational programmes unification, we will consider the structure of the educational programme in the Federal State Educational Standard of Higher Education based on professional standards, presented in Figure 1.

The entire educational programme is divided into a mandatory part and a part formed by participants in educational relations. The mandatory part contains disciplines, practices and a block of State Final Certification, which ensure the development of universal competencies (UC), general professional competencies (GPC) and mandatory professional competencies (MPC). The part formed by the participants in educational relations contains disciplines and practices that also provide the development of universal competencies, recommended professional competencies (RPC) and additional professional competencies (APC), which determine the focus and profile/specialisation of the educational programme. It is the RPC and APC that are determined by professional standards comparable to the Federal State Educational Standard of Higher Education in a certain area of training.

State Final Certification is a mandatory part of the programme and provides the entire set of competencies. For each competency, indicators have been identified, procedures and tools have been developed to assess the degree of development of the required competencies in students based on learning outcomes (knowledge, skills, expertise), which in turn are correlated with indicators (Kozorez and Sidorov 2018). Learning outcomes, in turn, are related to specific disciplines and practices. Thus, we have a graph of disciplines presented in Figure 2, and a table of correspondence between competencies and disciplines, presented in the Table 1.

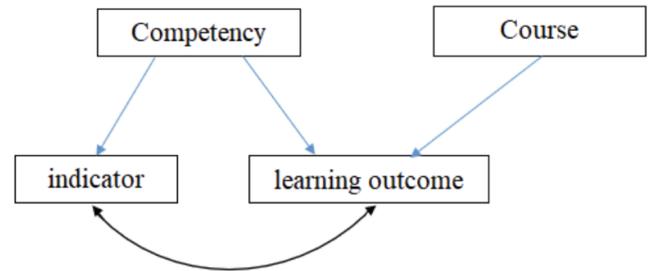


Figure 2: Graph of disciplines.

Unification of educational programmes is possible at several levels of the organisation:

1. At the level of competencies (universal and general professional), which determine the mandatory part of the educational programme.
2. At the level of disciplines that ensure the development of these competencies.

Thus, unification affects the mandatory part of the educational programme, which provides basic knowledge, and does not in any way affect the development of professional competencies that determine high-quality training in the specialisation in accordance with professional standards.

ANALYSIS OF THE UNIFICATION OF EDUCATIONAL PROGRAMMES ON THE EXAMPLE OF THE FSBEI OF HIGHER EDUCATION "MOSCOW AVIATION INSTITUTE (NATIONAL RESEARCH UNIVERSITY)"

Let us consider the unification of educational programmes using the example of the Moscow Aviation Institute (National Research University). The proposed unification covers the enlarged groups of directions/specialties of engineering (09.00.00, 10.00.00, 11.00.00, 12.00.00, 13.00.00, 15.00.00, 20.00.00, 22.00.00, 24.00.00, 27.00.00, 28.00.00), information technology and applied mathematics (01.00.00, 02.00.00, 03.00.00, 05.00.00) and humanities and economics (38.00.00, 39.00.00,

Table 1: Correspondence Table of Competencies and Disciplines

Competency	Indicator 1	Learning outcome 1.1	Discipline 1
			Discipline 2
			...
		Learning outcome 1.n	Discipline 1
			Discipline 2
			...
	Indicator 2	Learning outcome 2.1	Discipline 3
			Discipline 4
			...
		Learning outcome 2.n	Discipline 3
			Discipline 4
			Discipline m

42.00.00, 43.00. 00, 45.00.00), taking into account different levels and forms of education, as well as various territorial sites (branches).

It is possible to single out the general disciplines of the bachelor degree course and specialist programme in the mathematical and scientific course, the humanities and economics course, which are subject to uniform unification at the level of universal competencies and general professional competencies throughout the university. For different levels of study,

a different volume is possible, but always the same supporting semesters and load distribution by discipline. Variation in supporting departments and semesters is possible for branches.

It is also possible to single out the general disciplines of the bachelor's and specialist's programmes of the engineering course, which are subject to unification according to their qualifications, for example: structural designers, systems engineers, programmers, technologists, economists and

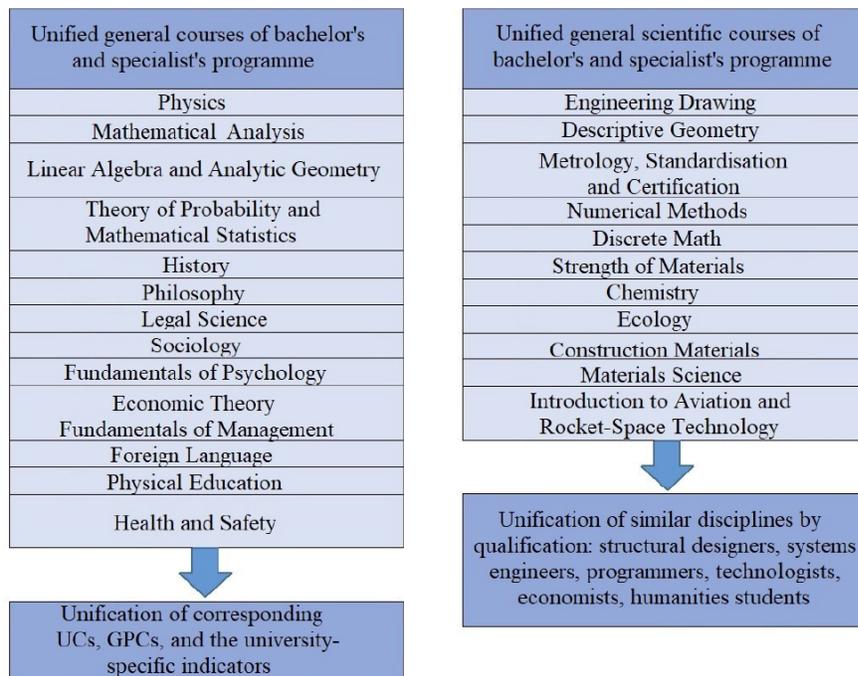


Figure 3: Unification by disciplines.

Table 2: Unification by Competencies, Indicators, Learning Outcomes and Disciplines on the Example of UC-3

UC code	UC wording	Indicator code	Indicator wording	Disciplines	Learning outcomes
UC-3	Able to carry out social interaction and fulfil his role in the team	UC-3.1	Self-evaluates readiness to work in a team	Sociology	To know the structure and motivation of social action, the basics of status-role theory
				Fundamentals of Psychology	To know psychological theories of personality, types of temperament and character
					To be able to use methods of psychological diagnostics of readiness for teamwork
		UC-3.2	Determines and fulfils his role in the team, independently analyses the results	Sociology	To know the types of social communities and groups, the specifics of the work collective as a team.
					To be able to analyse role expectations in a team
				Fundamentals of Psychology	To know the psychological principles and concepts of team building
					To be able to analyse the socio-psychological structure of the team
		UC-3.3	Effectively uses interpersonal and group communication techniques in social interaction with other team members	Sociology	To know the types and conditions of social interactions, types of social inequality and stratification
					To be able to choose communication strategies in social interaction
					Fundamentals of Psychology
				To be able to choose the optimal tactics of behaviour in conflict situations	

humanities students, regardless of the direction being implemented, since the same qualification feature may

be present in various enlarged groups of directions. Thus, unification is provided for enlarged groups of

specialties. For different levels of study, a different volume is possible, arranged semesters and a different distribution of the load by discipline. A variant of unification by disciplines is shown in Figure 3.

In accordance with the graph of disciplines presented in Figure 2, we have unification in terms of competencies, indicators, learning outcomes and disciplines. Thus, all the general unified disciplines of the humanities and economics course, as well as the disciplines "Health and Safety" and "Physical Education", ensure the development of all universal competencies of both bachelor's programme and specialist's programme. Table 2 shows the unification of disciplines that develop the universal competency in the bachelor's programme on the example of UC-3 "Able to carry out social interaction and fulfil his role in a team."

CONCLUSIONS

The proposed unification of educational programmes provides:

1. Unification between the education levels, which allows to implement the educational process with no loss in quality of education, taking into account the possibility of choosing an IET, starting from the 3rd year of study, and, as a result, transferring students between the levels of education up to the 5th semester. At the same time, the disciplines of the mathematical and scientific course, the humanities and economics course can have a different volume, but the same load distribution. Disciplines "Physical Education" and "Health and Safety" are the same for bachelor's and specialist's programmes.
2. Unification by the level of education, which allows to implement the educational process with no loss in quality of education, taking into account the possibility of choosing an IET, starting from the 3rd year of study, and, as a result, transferring students within the level of education up to the 6th semester. At the same time, the disciplines of the mathematical and scientific course, the humanities and economics course have the same volume and the same load distribution.
3. Unification by extended groups of specialties (EGS), which allows to implement the

educational process with no loss in quality of education, taking into account the choice of IET, starting from the 3rd year of study, and, as a result, to transfer students between educational levels up to the 5th semester. Such unification covers EGS subgroups: engineering (09.00.00, 10.00.00, 11.00.00, 12.00.00, 13.00.00, 15.00.00, 20.00.00, 22.00.00, 24.00.00, 27.00.00, 28.00.00), information technology and applied mathematics (01.00.00, 02.00.00, 03.00.00, 05.00.00) and humanities and economics (38.00.00, 39.00.00, 42.00.00, 43.00.00, 45.00.00).

4. Unification in the direction, allowing to implement the educational process with no loss in the quality of education, taking into account the possibility of choosing an IET, starting from the 3rd year of study, and, as a consequence, transferring students within the level of education up to the 6th semester. The mandatory part is determined by a template that is uniform for the entire university, taking into account the branches, for which variation in supporting departments and semesters is possible.

Thus, the complete digitalisation of the methodological support of educational programmes provides an opportunity for their unification. The presented unification of educational programmes makes it possible to implement the educational process without losing the quality of education, taking into account the possibility of choosing individual educational trajectories, and also implements a model for students' choice of a direction or specialty of training, starting from the third year of study, and, as a result, makes it possible to transfer students between educational levels up to 5 semesters, and within a level – up to 6 semesters.

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