

Article

Multitrack Educational Programs as a Method of Educational Process Personalization at Universities

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Abstract: This study analyzes the approach towards educational process organization at a university. We study existing practices of educational program personalization (and the relevant existing limitations) in the Russian system of university-level education. This study reviewed the general trends in university program personalization and performed an in-depth analysis of actual cases of personalized study plan implementation at Russian universities (we compared the declared objectives of such programs with their real-life implementation results). In this article, the authors also highlight the limitations affecting the maximum attainable level of personalization of study programs (such as the minimum number of students enrolled in a course in a given semester, problems of resource reallocation between different chairs at the university and administration costs of digitalization of a personalized study process). Based on our research, a model of study process organization (based on multitrack educational programs) has been developed and implemented. The article describes an algorithm for implementation of multitrack educational programs, highlights the limitations that this model of educational process complies with and formulates the advantages of this approach towards organization of the university-level study process compared to models employing individual educational trajectories.

Keywords: higher education; personalization of education; individual learning plans; digitalization



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1. Introduction

Personalization is one of the recognized global trends in higher education. It allows a student to choose not just their expected educational results, but also the way to achieve those through a choice of disciplines and study formats made by the student [1–3]. The current Russian educational policy is set in the Priority 2030 program implemented by the Ministry of Education and Science. Creation of individual educational trajectories is one of the tools used to achieve the targets for global competitiveness of universities [4–6]. Leading Russian universities have been making steps to personalize the educational process in one way or another over the past 3–5 years. However, a unified approach has not yet been formed at this stage. It remains unclear what is meant by individual educational trajectories in Russian universities, to what extent a student has the right to choose the subjects of their curriculum and whether such programs can be called truly personalized or if they are a tribute to the educational policy being pursued by the state.

The maximum degree of personalization today can be provided by an independent choice of disciplines from a wide range of massive open online courses (MOOC) [7–9]. In our research, we analyze the formation of individual educational trajectories at universities.

Our analysis does not consider the question of whether the student's free choice in forming their own learning trajectory could replace studying a prescribed curriculum of subjects at a university (defined in a state standard). Today, the significant role of universities in the educational process is recognized all over the world [10–13]; therefore, it remains important to adapt the educational process used at universities to new challenges and requirements. In addition, the system of students choosing educational trajectories remains relevant at many universities. For example, back in 2015, a study performed by the European Students' Union revealed that every second student had less than 20% of subjects in the curricula chosen freely (Figure 1).

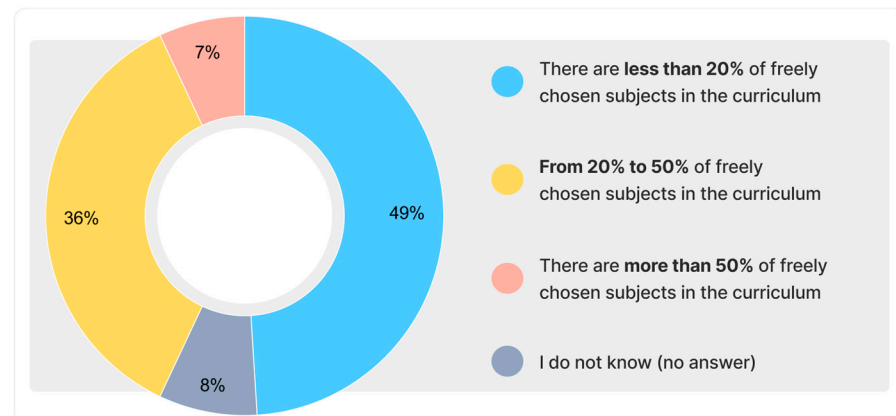


Figure 1. Number of students' responses to the question about subjects from the curriculum chosen freely by students, %. Source: European Students' Union [14].

Personalization of the educational process is necessary for a number of reasons. First, personalization motivates students to take responsibility for their educational results and for the methods chosen to achieve those results. The second reason is the development of soft skills, which the students must have to become specialists in any field [15–17]. The third one is the possibility of forming interdisciplinary research groups, where undergraduate students can choose subjects from related fields which they require for their research and which could not be acquired otherwise [18–20]. The fourth is the unsatisfied employer demand—when a specific combination of competencies is needed in the workplace but is not currently taught in existing educational programs [21–24].

It is clear that the personalization of the educational process at universities faces a number of limitations. First, these are state educational standards that impose certain requirements both on educational results and on the stages and methods of their achievement [25]. The second obvious limitation is the resources available to a particular university: funding, the number of auditoriums available and the faculty members' time constraints. The third limitation is the willingness to manage the transition to personalized education, readiness to transform the university administration system and the degree of digitalization of all kinds of processes at the university [26–28].

The purpose of this study is to develop an approach to the educational process organization at a university, based on the analysis of the existing practices of implementation of personalized educational programs, taking into account the limitations imposed by the system of higher education in Russia.

2. Literature Review

Personalization of education implies giving students the freedom to choose the subjects they will study from the list of disciplines comprising the variable part of a curriculum and elective subjects, as well as among the core disciplines of their program curriculum [29]. Among Russian universities, there is no unified approach on how to change the current model of a university with permanent student groups, pre-determined study programs including only a small variable part (if provided by the national educational standard),

which are directed by a particular department. Therefore, each institution willing to increase the personalization of their education process should create its own methods of giving its students a broader choice of learning opportunities [30–32]. This process results in noticeable differences in terminology.

For our research, it is crucial to explain the most common terms used in scientific papers, delineate them and comment on the specifics of their usage. This is required to avoid confusion and to find out what degree of personalization of education Russian universities currently can offer. Special attention sometimes will be paid to translation of terms from Russian into English as the study is largely based on the experience of Russian universities.

This article mainly deals with individual learning plans—a curriculum largely composed by the student, following the minimum (and usually the maximum) number of credit hours (credits) and the burden of study of the subjects set by the university; this includes a number of core subjects according to the program. Individual learning plans (ILPs) are not unique to higher education; they are a widespread practice in school and preschool education as well, and so this helpful tool can be used at all levels of the education process to deepen the learner-centered approach [33]. Scientific research dedicated to ILPs seems to be especially abundant in the United States. This could be explained by the fact that 23 out of 50 US states have legally adopted an “individual learning or education plan” as a part of their school system, which has to be provided by all high schools [34].

The term individual educational trajectory (hereinafter IET) is almost exceptionally used by Russian-speaking researchers to specifically address the same phenomenon. It is a word-by-word translation of the name of the concept, which appeared in the national education program Priority 2030 and is now being implemented (to different extents) at a considerable number of universities in Russia. In our research, the term IET will be used, yet it is necessary to understand that it is a national interpretation of the concept of individual learning plans (ILPs). IET is defined as a concept of higher education where the student becomes the central figure, and thus is given the right to choose subjects (except for the set of compulsory ones for a given major) and to create a “unique development path”, which serves to cultivate the capacity for self-discipline in students [35–37].

One disadvantage of this term is that it closely resembles the “individual (or individualized) educational plan/program”, which addresses a completely different problem in the field of education. Individual educational plans are designed for children with special needs (physical or mental disabilities, etc.) receiving related services [38]. So the term “individual learning plan” remains the most universal term used in the scientific literature, while “individual learning trajectories” is the term used in publications translated from the Russian language.

“Individual study plan” is another common term used all over the world to refer to postgraduate (doctoral) studies programs, where there is often no pre-defined curriculum [39,40].

This terminology list is far from exhaustive: just the most common terms were explained in detail above, yet due to the widespread practice of creating individual plans, many more similar-sounding terms are used—sometimes their use is restricted to just one or several universities. For example, at National Research University “Higher School of Economics” (hereinafter HSE), all students have an individual curriculum, which includes mandatory disciplines (for all bachelor’s degree programs, listed in the Federal State Educational Standards), major disciplines (core and variable parts), minor disciplines and project-research work. At the same time, in a number of special cases described in the university’s internal rules, a special individual curriculum could be designed for a student [41]. Such situations include:

- Intra-university transfer from one degree program (hereinafter—DP) to another or student transfer from a different university;
- Reinstatement of a student previously dismissed from HSE;
- Dual-degree programs;

- A student's transfer to an accelerated degree program;
- A student's participation in an academic exchange program;
- Repeating courses (no more than two) in case of failed examinations.

It is worth noting that if a student requires the design of a special individual curriculum at HSE, it is only possible on a commercial basis.

The analysis of the literature conducted using The Lens digital source showed that most publications mentioning self-directed individual learning plans are related to medicine (Figure 2).

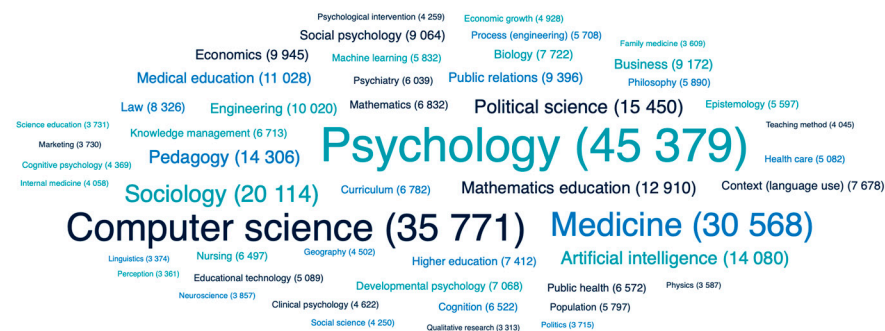


Figure 2. The number of publications related to individual learning plans by professional field. Source: The Lens.

Closer analysis showed that research on the efficiency of personalized curriculum has been mostly carried out among third- and fourth-year medical students (including both “Medicine” and “Psychology” fields) and graduate students who have already taken the basic subjects and are currently studying highly specialized disciplines. Various research papers [42,43] highlight the importance of life-long learning for healthcare professionals and giving students the responsibility for their choices, for completion of study courses and for reaching the goals they have set by themselves. This is supposed to train the students in self-directed learning, which helps the students in their lifelong continuous education. This thesis has now become relevant for all fields of education; therefore, the most dynamically changing field—computer science—has the second highest number of publications mentioning individual learning plans.

The national strategy for the development of higher education in Russia “Priority 2030” lists the implementation of individual learning plans (“individual educational trajectories”) as one of the effective measures for improvement of the quality of higher education. However, the document does not provide the practical definition of these individual learning plans; this gives universities freedom to include elements of personalized education into their programs in a way that they consider appropriate and feasible at this point of time. Taking into account several limiting factors (financial, digital, human resources constraints, national educational standards) and the fact that this model is new for Russian universities, it becomes clear why at this point most of the announced programs including individual educational trajectories do not actually fulfill the initial requirements—for example, the option for students to take courses at online open education platforms, at other universities or at other departments of the same university—and still have these educational results reflected in a university degree (national diploma).

3. Materials and Methods

This study has examined the experience of leading Russian universities in the implementation of individual educational trajectories (IETs). At the first stage, it was supposed to compare the experience of creating IETs in different countries, but as the analysis of the literature showed that country-specific differences in regulation of the educational process make it impossible to apply European practices of organizing higher education to Russian universities.

Due to the above-mentioned limitations, the research described in this paper analyzed the practical aspects of implementation of personification of educational programs at Russian universities—taking into account the existing legislative framework for higher education programs in the Russian Federation. The federal educational standards currently in force are in fact the main limitation for the personification of higher education in the Russian Federation.

Russian Federal State Educational Standards provide for:

- Unity of the educational space of the Russian Federation;
- Continuity of the main educational programs of primary general, lower secondary (basic general), upper secondary, primary vocational, secondary vocational and higher vocational education.

Each standard includes three types of requirements:

- Requirements for the structure of the main educational programs, including requirements for the ratio of parts of the main educational program and their volume, as well as for the ratio of the core part of the main educational program and the part formed by the participants of the educational process (variable part);
- Requirements for the conditions for the implementation of main educational programs, including personnel, financial, logistics and other conditions;
- Requirements for the results of mastering the basic educational programs [25].

Within the framework of the bachelor's degree program, the core part and the part formed by the participants of educational relations are allocated. The core part of the bachelor's degree program includes disciplines (modules) and practical classes that ensure the formation of general professional competencies as defined by the Federal State Educational Standard.

The main part of the bachelor's degree program includes:

1. Mandatory disciplines (modules) specified in paragraph 2.2 of the Federal State Educational Standard (in Philosophy; History, including History of Russia and World history; foreign languages; and first aid and emergency response);
2. Disciplines (modules) covering physical education and sports;
3. Disciplines (modules) and practical classes that ensure the formation of universal competencies determined by the Federal State Educational Standard, as well as professional competencies determined by the university independently, can be included in the core part of the bachelor's degree program and (or) in the variable part, which is set by the students.

For different directions of studies, the Federal State Educational Standard sets different ratios of the core and variable parts of the curriculum (see Table 1).

Table 1. Examples of ratios of the core and variable parts of the curriculum set by the Federal State Educational Standard in different fields.

Direction of Study	Ratio of the Core Parts of the Curriculum to Total Curriculum (Excluding the State Final Exams), Not Less than (%)
38.03.01 ECONOMICS	30
50.03.03 HISTORY OF ARTS	40
05.03.06 ECOLOGY AND NATURAL RESOURCE MANAGEMENT	40
58.03.01 ORIENTAL AND AFRICAN STUDIES	50
01.03.01 MATHEMATICS	60
47.03.01 PHILOSOPHY	60
44.03.01 PEDAGOGICAL EDUCATION	70

It should be noted that even though the variable part has been included in curricula at Russian universities for a long time, students de facto had no real choice of subjects at all, as the variable part was actually designed by the educational organization and even if the chosen disciplines were specified in the curriculum, students could not select one or another subject at their will.

The experience of the authors in the educational and methodological department of the university allows us to see the evolution of this problem through professional communication at the level of the Ministry of Education of the Russian Federation. Based on this experience, we have selected universities that have already implemented a personalized approach to education to a certain extent. The information provided in the public domain (including on university websites intended for applicants and students) was analyzed and students were interviewed via social networks. The latter source of information allowed us to gain a better understanding of how the declared individual educational trajectories are being implemented in practice.

3.1. HSE Learning Plans

HSE educational programs include a cycle of mandatory disciplines (previously mentioned as set by the Federal State Educational Standard), a major cycle, a minor cycle, project assignments and research work, as well as state final exams (certification) (see Table 2). The major cycle includes core disciplines and subjects chosen by the student, which together constitute a set of disciplines that form professional competencies in a specialized subject field, and can be taught as a profile or a specialization; the latter supposes that in the course of the learning process, students choose a more narrow specialization within the framework of one degree program. A variable part is provided at all degree programs; for example, in the “World Economy” degree program, the variable part includes disciplines from three blocks: international business; world development and finance; and regulation of international business. Students can freely combine disciplines from all three blocks.

Table 2. HSE learning plan structure.

Degree Program Structure	Disciplines	Number of Disciplines	Number of Credits
Mandatory disciplines	First aid and emergency response Physical education Philosophy * History * 2 subjects chosen by the DP: Sociology, Law, Psychology, Economics *	6	17
Major cycle	B.2. B Core disciplines B.2. V Chosen disciplines (students' free choice) Can be optionally included B.2.C Profile part Can have: (1) B.2.CB Core part (2) 2.KV Variable part	Approximately 28 subjects	149–152
Minor cycle	Minor disciplines chosen by students	4	20
Project and research work	Project seminar and/or Scientific research seminar and/or Term paper and/or Practical course (Internships) and Preparation of Graduate qualification work (thesis)		At least 48
State final certification			3–6
TOTAL		Approximately 36	240

* Except for degree programs specializing in the respective fields.

A distinctive feature of the HSE educational model is the disciplines of the minor cycle, which all students study for 2 to 3 years. The student can make their choice from a wide list of subjects (proposed by the HSE management) forming part of the bachelor's degree programs (there were 94 programs for students of the 2022 enrollment year to choose from). Minors cannot relate to the degree program the student is enrolled in (the major). This facilitates the acquisition of competencies and skills by students in non-core subjects, and truly expands educational opportunities [39].

An aspect worth mentioning is the procedure for choosing minors. When submitting applications, priority is given to students with higher places in the overall university ranking (based on the student's first-year academic performance). A large number of options and the ability to specify the five most preferable minors increase the student's chances of getting into a program they are interested in. However, ranking students by academic rating for choice of elective subjects contributes to a certain extent to the creation of a "vicious circle" of academic failure, since students with lower first-year results could be enrolled in programs that they have less interest in.

The natural limitations for solving this problem will be the number of faculty members; a higher number of faculty members often allows for opening extra groups in the most popular minors. The technical capacity of online platforms which are used to record the students' choices of subjects is also a factor. If students are allocated to programs on a "first come—first served" basis, then a large number of simultaneously submitted applications could overload the university's online systems.

3.2. ILP in Tyumen State University

Tyumen State University (hereinafter TSU), being one of the leaders in Russia in terms of implementation of IETs, is an interesting object for analyzing the implementation of this system. For this purpose, a number of interviews with students of this university were conducted. During the interview, it became clear that the system of IETs at the TSU elicits various responses and opinions among students; they emphasize both positive and negative aspects of this system, and they also indicate some changes taking place in the program.

Tyumen State University has a "2 + 2" educational model—a strategy in which students have the opportunity to make a final decision about their professional path after completing the second year of studies. This method is based on the idea of a personalized two-level bachelor's degree, where the educational program begins with general educational courses, and then gradually deepens into narrower and more specialized areas. The system at TSU is based on the availability of core disciplines, a variable part with chosen disciplines ("specialization" as shown in Figure 3) and the possibility to choose electives from a wide range of options (Figure 3) [32].

It is noted that the system of individual educational trajectory at TSU can create the illusion of choice by offering students courses with different names but similar content. This was reported by 15% of the interviewees, which indicates a possible shortcoming of the system, which by definition should provide students with real flexibility in their choices of study subjects. At the same time, the interviewees are sure that the situation is changing for the better: the university periodically opens additional groups for disciplines in high demand.

Criticism is expressed regarding the system where a student's available options depend on their place in the academic performance ranking. As mentioned earlier, providing more opportunities for highly ranked students can lead to limited differentiation of education for other students and create inequality in access to resources. This approach could lead to a situation where students are assigned courses that do not correspond to their life interests and career goals, which is inconsistent with current trends in personalization in higher education—so that would obviously require revision. During the interview, a 3rd-year student noted that currently the university has managed to improve the system: "rating is no longer a sole determining factor".

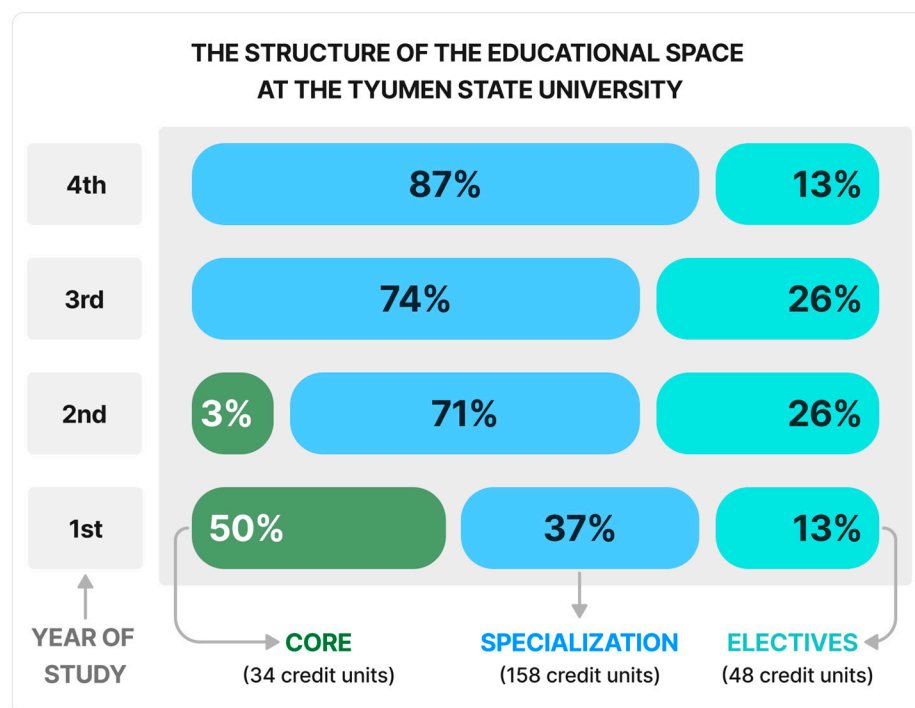


Figure 3. The structure of the educational space at TSU [44].

TSU students' reviews emphasize both negative aspects and positive trends in the implementation of the IET system. Although the system has its shortcomings, it represents an important step forward towards personalizing education and the educational trajectories of students at TSU. Solving the problems and inconsistencies identified during the analysis can contribute to further improvement of the IET system, making it more flexible and guaranteeing fair access for all students.

3.3. Cases of Implementation of Individual Educational Trajectories on the Early Stage

Since 2021, the Advanced Honors Program has been implemented as an individual learning plan at the Landau Moscow Institute of Physics and Technology (MIPT) School of Physics and Research. This program includes mastering, in addition to the main curriculum, one or several additional subjects from the proposed list. Students have to apply to participate in this program; they also have to be approved by the management of the Physics and Technology cluster. The Advanced Honors Program is positioned by MIPT as a way to provide additional non-standard courses to students who were deeply engaged in studying the disciplines of their specialty while studying at high school—this could have caused problems with such students' attendance and motivation during the first and second years of studies at MIPT. This approach to ILP can potentially resolve the problem of a particular university; however, they do not quite correspond to modern ideas about the personalization of education, since these elective disciplines are made available only to a small portion of students, while the rest are trained according to the standard curriculum [45].

Moscow Institute of International Relations (MGIMO) adheres to the traditional educational model; however, students in certain programs also have a significant choice. In the "International Economic Relations" program taught at the Faculty of International Economic Relations, students at the end of their second year can choose one of eight available specializations. Within each of the training areas, eight special disciplines are studied throughout the third and fourth years [46].

Specializations on the program "International Economic Relations" at MGIMO:

1. Business analysis;
2. Accounting, analysis and audit;

3. International transport operations and logistics;
4. International finance;
5. International marketing;
6. International economy and trade policy;
7. Risk management and insurance;
8. Economic analysis in corporate and public sectors.

In 2023, two programs at the Odintsovo branch of MGIMO started implementing a system of IETs with the possibility of choosing minor disciplines and tutoring support (“Financial economics and financial technologies” and “Information technologies in international business”). However, as this program has just been started, it is not possible to assess the degree of personalization of programs and the effectiveness of this approach [47].

4. Results

In 2020, MISIS University formed priorities for the development of the university’s educational policy (see Figure 4). The main reference point was a new model, “Practice-oriented Education Integrating Science and Technology” [48].

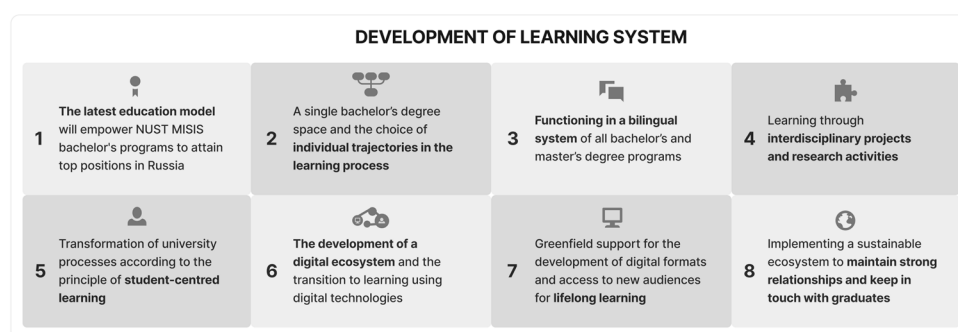


Figure 4. Priorities for the development of the educational policy at MISIS.

In order to achieve the policy objectives, during the last 3 years, MISIS has been developing personalized educational trajectories and implementing them to make the concept of the POINT system possible (“Practice-oriented Education Integrating Science and Technology”), drawing on its own accumulated experience and analysis of the experience of the leading Russian universities. It should be noted that in the 1989 curriculum of the State Institute of Steel and Alloys (the predecessor of MISIS), certain programs offered students a choice of specialization in the third and all subsequent years of studies (the core subjects were taught during the first 2 years and the total university program took 5 years). For example, the specialty “Economics and Management in the Metallurgical Industry” provided specialization in the economics of ferrous or non-ferrous metallurgy, as well as individual electives. Currently, the university has already implemented bachelor’s degree programs based on the “2 + 2” concept. However, the university does not call them IETs, because students have a choice of specialization after the second year of their bachelor’s degree program, which cannot be truly called an individual trajectory. Further development of personalization is planned based on the introduction of multitrack educational programs, taking into account existing restrictions.

The highlighted limitations are as follows:

1. The university’s funding system, receiving a high share of funds from the state budget, cannot organize learning process in small groups: at least 15 students have to take any discipline in the same semester. If there is additional economic justification, a group could contain at least 10 students.
2. The system of organizing the educational process with the assignment of educational tracks to the structural units that implement these tracks. This is necessary for the distribution of financial resources, which are initially associated with a particular

student, between the departments of the university, as well as for the distribution of teaching load between departments.

3. Administration of the personalization of the educational process. This limitation is linked to the level of digitalization of the university's management system as a whole. The availability of electronic document management systems and electronic statements and records systems makes it possible to accompany the student along their chosen trajectory with the lowest probability of errors. It should be noted that this restriction was overcome at MISIS when the implementation of the transition to personalized education began there. The university was the first in Russia to implement a comprehensive university management system based on the 1C system (1C is a Russian accounting and ERP software automating organizational management), and created digital services for students, applicants and employees as part of the digital transformation of the university, and formed a student office, which significantly increased the efficiency of administrative functions.

Based on the analysis of the limitations, potential problems of implementing IETs and the requirements of state educational standards, the authors developed a model of personalization of the educational process based on multitrack educational programs. This model has been implemented at MISIS since 2022. The model is based on a combination of IETs and the traditional structure of linear educational programs aimed at obtaining a pre-determined result.

The multitrack educational program that has been developed consisted of:

The **CORE PART**, containing the established requirements for disciplines, including their number, name, timeframes for study, structure and content;

The **VARIABLE PART**, which includes a set number of **chosen disciplines** and defined timeframe, but the names and content of these disciplines can be decided at any time until the last year of study. These vacant disciplines are designed to create future learning trajectories leading to different educational outcomes.

This system can also include electives, which would be chosen from a comprehensive list of courses by the students from all departments, with the only limitation being the maximum number of electives taken by student in one semester.

The learning outcomes will be determined at any stage of the educational process depending on external or internal factors; the students will receive information on prior year's students' learning outcomes before choosing their own electives prior to the start of the next study year.

The multitrack educational program consists of the following stages:

1. The first year of studies consists entirely of the mandatory disciplines. In the first semester, there is a discipline, "Basics of the Profession", which introduces students to available tracks so that in the second semester the students make an informed decision when selecting their track.
2. The second year consists of core disciplines; it may also contain a block of chosen subjects.
3. The third year consists of the required disciplines for each track and the chosen discipline from the variable part (at least four blocks of elective disciplines), and may contain some disciplines of the core part of the curriculum (which are implemented in all tracks). There are also practical classes at industrial enterprises and research projects.
4. The fourth year contains at least eight blocks of chosen disciplines, and may contain disciplines of the core part. There are also pre-graduate practice (internship) and research projects, as well as the presentation of the graduate qualification work (degree thesis).
5. This curriculum is set for the whole university and approved by the Vice-Rector for Education. Approving persons: Head of the Educational and Methodological Department, Director of the University, Director of the Institute of Basic Education, Heads of departments (departments implementing tracks in specific main professional degree programs).

6. In the structure of the curriculum in the third and fourth years, it is necessary to provide two chosen subjects (for changing the track/for mastering additional disciplines).
7. The track is assigned to the graduating department (defines practical classes, research, state exam procedure).
8. To open a new track, it is necessary to describe the result of educational activity (eight fields), show the difference in at least one discipline from the existing tracks, and approve the decision to open the track at a meeting of the methodological commission of the Institute.
9. The maximum number of lines in the block of choice for disciplines/practice/research/defense of the graduate qualification works = the number of tracks in the main professional degree program. The minimum number of lines in the block of choice for disciplines/practices/research/defense of the graduate qualification works = the number of graduating departments in the main professional degree program (direction).
10. The recommended number of disciplines in the track in one educational program: bachelor's degree—no more than 50, specialty—no more than 60.
11. Each track within the main professional degree program (as well as disciplines in the blocks by choice) implement an identical set of competencies, the scope of credits and forms of control. The specifics of the disciplines in the block of choice are expressed in the indicators to know, to be able, to possess in the working program of a discipline.

The implementation of multitrack programs is schematically presented in Figure 5 for a university as a whole. The possibility of simplified transfer between programs during the first year of study is additionally highlighted, taking into account the partial commonality of core disciplines for all programs implemented by the MISIS.

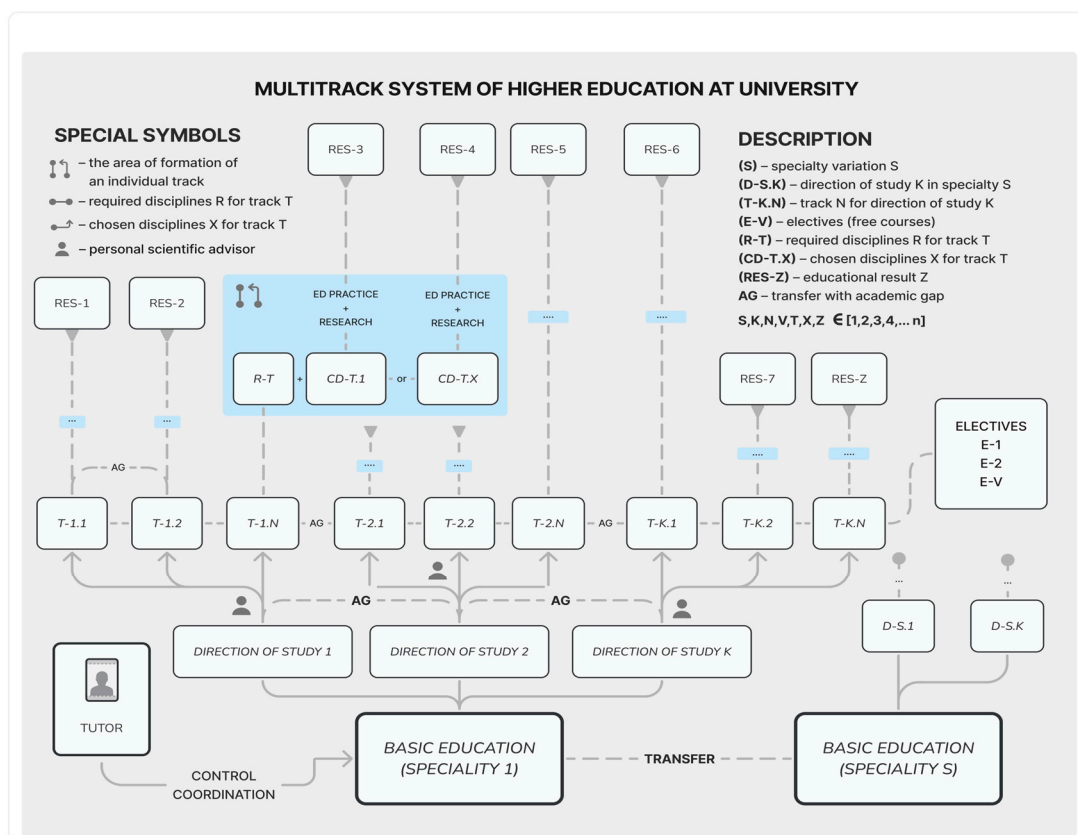


Figure 5. Multitrack system of higher education at university as a whole.

To implement a multitrack educational program, the disciplines of a curriculum are divided into five types: basic disciplines common for the entire field of study (core disciplines or basic education); chosen disciplines selected by students (CD_{i,j}) based on

their tracks of the educational program $T_{i,j}$; practical classes and assignments (research projects) as chosen by the student; electives ($E_{i,j}$); and preparation and passage of state exams on the disciplines from the trajectories ($R_{i,j}$). Research work begins with two–three semesters of study, after the student chooses the result ($ED\ RES_n$) and determines the appropriate training track, and ends with the registration of the graduate qualification work (POINT education). The student can change their educational track by attending the missing disciplines required for other tracks ($R_{i,j}$) in the form of an elective. The number of electives that a student takes cannot be more than two for the whole period of study, which limits the transfer between tracks. Each chosen discipline in the curriculum should be included in a certain track. A track may differ from another even by one discipline. The track will be opened if the average number of students for each subject of the track is not less than 15 students (possibly less, if there is an appropriate economic justification). The distribution of workload across departments will occur in proportion to the number of students who have chosen specific tracks and corresponding disciplines, practices and research in the cross-section of the academic year.

The educational trajectory of a multitrack educational program is characterized primarily by the result of learning, determined by a unique set of knowledge and skills formed in the process of mastering a certain set of disciplines. The multitrack educational program can be adapted in its professional part to the requirements of the corporate entity or organization that will be the future employer of the program graduates. Such adaptation could be performed in the shortest time possible—usually within 1–2 years. The student retains their options to choose the subjects. This approach allows students to make their choices related to learning outcome before the start of their studies, and in the course of the educational program; the students can change their choice (subject to compliance with university requirements). Such a program launches the mechanism of continuous improvement of educational results and motivates faculty members to develop the courses by virtue of constant competition for the students' choice.

In such a paradigm, the student's choice cannot lead to a random educational result, since the student is not offered the option to choose separate disciplines. To increase the level of awareness of choice, as well as to identify the talents, inclinations and abilities of a student, it is planned that the basic component of such educational programs for first-year students will include a discipline aimed at practical work. It will let the students test themselves in different roles corresponding to educational trajectories. Experienced teachers will be able to evaluate their performance and provide appropriate feedback and recommendations on the future choice of trajectories to each student.

The result of this study was the transition in the 2022–2023 academic year of MISIS to the implementation of bachelor's and specialist's educational programs with multitrack curricula. The design of educational programs began with a description of the outcomes of the educational process—eight fields describing the educational trajectory. The leader of the educational program determines the list of the disciplines that will take the students to the described result; the methodological commissions of the institutes review the proposal to include a new track in the curriculum. The number of disciplines in each track is the same within the direction. The volume, form of control and competencies of the disciplines are identical within each block of elective disciplines.

Advantages of the described approach:

- Personalization of education;
- The student chooses the learning outcome, not individual disciplines;
- The possibility to add new tracks in the learning process;
- Unification of the structure of educational programs;
- Reduction of the number of curricula to the number of directions of study;
- Digital service for students/applicants for professional navigation.

In order to carry out the transition to a new approach in education, information support of the educational process was required, namely:

- ⇒ Displaying information on the University's website about implemented main professional degree programs with details on various study tracks;
- ⇒ Implementation of the procedure for choosing an educational track in the student's personal account;
- ⇒ Automatic calculation of faculty workload based on the selection of tracks by students; Automatic generation of streams and lesson schedules.

The system provided:

1. Navigation through the main professional degree programs at MISIS: the number of the main professional degree programs = the number of training areas (list of tracks);
2. Presentation of information (digest) about the tracks included in the main professional degree programs in the form of a text description (eight fields: the name of the track, fields of activity and employers, possible job titles, salary level, job functions, key knowledge, skills, competencies, research topics, career opportunities);
3. Track details—a list of disciplines, the graduating department, advantages, reviews, related tracks;
4. The possibility of switching to the description of the discipline: abstract, the purpose of the discipline, teachers;
5. The possibility of switching to an adjacent track with an academic difference of no more than two disciplines, individual mastering of different disciplines as electives;
6. Visualization of the track tree—displaying the possibilities of transfer between tracks highlighting the difference between adjacent tracks. The student's Personal Account displays a list of tracks that exist within the training area with a certain level of detail;
7. The track selection procedure involves several stages:
 - 7.1. Preliminary track selection;
 - 7.2. Informing about the track selection.
8. Automatic calculation of faculty workload according to the selected tracks;
9. Formation of groups/streams according to the selected tracks;
10. Building a schedule of training sessions.

A personal educational approach implemented through a system of multitrack educational programs creates conditions for active participation of students in learning, development of self-determination and self-realization skills, stimulating the students to control their own learning process, as well as the formation of a responsible, motivated attitude towards education, while reducing the costs of tutoring, since the student chooses primarily the educational result, and the system's algorithm automatically suggests the best way to achieve that.

5. Discussion

The high level of digitalization of the educational process at MISIS has affected all areas of the university's activities, including a digital platform for working with new educational formats started at MISIS in 2019. This platform made the launch of ca. 100 online courses on the national educational platform possible (at the time of this writing). It remains a controversial question whether to include online courses in multitrack educational programs, and if it is possible to consider the results obtained on an online platform in the formation of an educational result confirmed by the university. It should be noted that during the COVID-19 pandemic, MISIS—like most of the world's universities—was able to quickly restart the educational process and transfer the entire educational process online. The experience of the restart of the educational process is described in a number of works [15,49–51]. However, after 2021, the education process at Russian universities has almost completely reverted to a full-time face-to-face (offline) format. Whether this is good or bad remains a debatable issue [52–54].

The analysis of academic performance showed that during the period of online learning, there was a massive decrease in the results of intermediate certification, which indicates

insufficient preparation of students for independent learning and self-control and, therefore, low readiness to take responsibility for their academic performance.

Nevertheless, in exceptional cases, when there are limited opportunities or restricted academic mobility, a truly individual curriculum could be formed for students, taking into account the grades students received for completion of online platform-based courses.

Another controversial question arises here: what we ultimately call the individual educational trajectory (IET) in Russian higher education [55,56]. As the results of the study showed, there are no uniform criteria now. For example, it is not determined at what percentage of freely chosen disciplines the educational trajectory can be considered individual. Is the educational trajectory individual if a student chooses not only the direction of training, but also a specialization that remains unchanged throughout the bachelor's degree program, while the student also has an opportunity to choose individual subjects; for example, one such subject per semester? Can the absence of academic study groups be considered a criterion of a personalized approach in education? In our opinion, a multitrack educational program provides a more personalized approach compared to the number of IETs announced by other universities, at least due to the fact that a student is forced to make a choice annually, thereby satisfying their emerging needs in obtaining certain specific skills.

6. Conclusions

The process of personalization of higher education in the Russian Federation is conditioned by a dynamically changing environment and the need to create a more flexible system to respond to the challenges that a fresh university graduate will face. Transformation processes in universities are inevitable, but these largely depend on the educational policy pursued by the state.

The limitations that exist in the Russian system of higher education do not allow implementation of systems with a wide range of subjects to choose from. Due to this fact, in our opinion, the use of the term “individual educational trajectories” by certain universities in relation to their educational programs is at least in part a desire (and possibly a need) to meet the requirements of educational policy. In the course of the study, we concluded that with current limitations, the developed model of educational process organization, based on multitrack educational programs, best provides for the personalization of the educational process at universities.

As a result of the work carried out at MISIS, the model of multitrack educational program has been developed and implemented at MISIS, thus providing students with the choice of learning outcomes, as well as with the choice of the trajectory to achieve it, taking into consideration the identified limitations. By preserving the academic groups of students, the university will be able to ensure the variability of educational results for each student by selecting and adjusting the trajectory used to achieve these results. In the future, research will be aimed at identifying problems in the implementation of multitrack educational programs based on feedback received in order to improve the developed model of educational process organization at MISIS.

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