

Innovations in Pedagogy: Methodology for Organizing the Individual Educational Trajectory of Students for General Education Institutions

Menshikova Irina Petrovna¹ & Shipareva Ksenia Vladimirovna¹

¹ Structural Subdivision of the Educational Autonomous Non-Profit Organization “Funscool Burdenko”, Moscow
Correspondence: Menshikova Irina Petrovna, Structural Subdivision of the Educational Autonomous Non-Profit Organization “Funscool Burdenko”, Moscow.

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Abstract

The review presents a comparative analysis of the concepts of individualization of the educational process, as well as technologies for designing individual educational trajectories. Analysis of the problem field of research shows that the approaches and pedagogical conditions for individual self-realization of students for secondary schools are not sufficiently systematized. The novelty of the work lies in the fact that the studied problem of individual self-realization of students contributes to the development of the concept of pedagogy of individuality. In particular, the issue of methodology for organizing individual educational trajectories of students has been worked out, psychological and pedagogical approaches for various age groups have been identified, and also presents the results of functioning of a multidisciplinary educational center and features of the organization of the educational process in the concept of individual educational trajectories. Theoretical methods include methods of induction and deduction, methods of comparative analysis and synthesis of information, as well as various forms of questionnaires. As empirical research methods, monitoring and diagnostic activities (exams, testing, questionnaires, observation) were carried out at different educational stages, allowing to evaluate the effectiveness of the proposed pedagogical technologies.

Keywords: individualization, curriculum, individual educational technologies, methodology

1. Individualization of Learning as a Pedagogical Concept

The education system must provide a person with continuity of education throughout his or her life. The changes that are taking place in modern society, namely: the processes of globalization, digitalization and automation of production lead to changes in the requirements for specialists in the labor market, as well as for the portraits of graduates of higher educational institutions and schools. And although it is too early to talk about what form education will take in the process of modernization that accompanies changes in society, some trends are already visible (Khutorskoy, 2011; Khutorskoy, 2011; Konanchuk, 2013; Erykova, 2008; Zhukova, 2008; Yurlovskaya, 2016).

1.1 The Growth of Mass Use of Online Education and Digital Educational Technologies

During the pandemic, there has been a large-scale spread of the use of various digital products: programs, applications or virtual (VR) technologies. At the same time, among the purposes of using various digital tools, the focus has shifted from obtaining and transmitting knowledge to developing universal competencies, as well as maintaining the internal sphere of motivation. Further development of educational technologies will be associated with the modernization of educational materials, changing the role of teachers as facilitators and navigators of the educational process.

1.2 New Curricula for a Changing Reality

The pandemic period has caused global changes in the economy, which has become characterized by the use of

unmanned and contactless automated solutions, which has led to an even greater acceleration of the process of automation of traditional industries. Automation of production has shown that the demand for people will be high for those areas that are associated with the creative sphere, the spheres of communications and collaborations, and such universal competencies as interaction in a team and organizing team work will need to be developed from school.

1.3 Hence the Emphasis on the Development of Person-Centered Approaches

Healthy relationships are important for the well-being of teachers and students, as well as the effectiveness of the learning process. Attention should be paid to social-emotional learning as the basis of educational programs, as well as the modernization of services that ensure the harmonious development of students and the appropriate microclimate in an educational institution: psychological services, mentoring services, and tutor support.

1.4 The Growing Role of Multi-Location Partnerships

The crisis has revealed the need to strengthen the development of multi-level partnerships:

- at the local level: coordinated action and cooperation between teachers, administrators, students and their families;
- at the level of cooperation between an educational institution and academic and industrial partners: development of network training programs for full-time or distance, hybrid formats;
- at the level of interaction with the state, as well as other countries: the competitiveness of an educational institution must be confirmed by the effectiveness of participation in regional / federal competitions, as well as in the development of international cooperation in connection with globalization processes.

1.5 Development Based on the Principles of Justice

One of the key issues that has emerged during the pandemic is the grossly inequitable distribution of opportunities to access educational resources, even in systems that state equity of access as one of their priorities.

The emphasis on individualization of the educational process allows us to take into account the individual characteristics of students in order to maximize their potential and develop personal qualities. There are many concepts of individualization of the educational process; the fundamental question remains the question of human nature, human potential, as well as the mission and purpose of man. In the concept of the scientific school of A.V. Khutorskoy, each person has his own system of life coordinates, in relation to which he lives and acts, establishes value foundations, and implements his own path (Khutorskoy, 2011; Khutorskoy, 2011). The ideology of human conformity is a system of views and ideas in which the attitude of people to their education, life in society, and their role in the history of the family, clan, people, and humanity is realized, accepted and evaluated (Khutorskoy, 2011; Khutorskoy, 2011). The individual in each student as a person is a reflection of the universal. The mission of the student in education is the realization of not only the individual, personal principle, but also the social, universal one. In its research, the scientific school is based on the fact that the meaning of a person's education is the realization of his capabilities, and the mission of the Institute of Human Education and the scientific school of human-shaped education is to substantiate the possibilities and conditions for a person's self-realization in the system of his education; to embody the principle of human-conformity of education in the science and practice of education, to bring the meanings, goals, and content of education into line with the internal purpose of a person. There are several principles of human-centered learning (Khutorskoy, 2011; Khutorskoy, 2011; Konanchuk, 2013; Erykova, 2008; Zhukova, 2008; Yurlovskaya, 2016; Uvarova, 2006).

1.6 Principles of Human-Centered Learning

- 1) *The principle of personal goal setting of the student:* the education of each student should be based on personality characteristics and personal educational goals.
- 2) *The principle of choosing an individual educational trajectory:* the student has the right to participate, together with parents, teachers, and tutors, in the selection of the main components of his education: meaning, goals, objectives, pace, forms and methods of teaching, personal content of education, system of monitoring and evaluation of results.
- 3) *The principle of meta-subject foundations of the educational process:* the basis of the content of the educational process is made up of fundamental meta-subject objects.
- 4) *The principle of learning productivity:* the main focus of learning is the student's individual progress, which consists of internal and external educational products of educational activities.
- 5) *The principle of the primacy of the student's educational products and the secondary nature of the study of ready-made known results:* it is necessary to create such pedagogical conditions and space that would motivate students to create educational products, and not just to study generally recognized achievements, including

educational standards in the field of study.

6) *The principle of situational learning*: the educational process is built on situations that involve self-determination of students and the search for their solutions. The teacher accompanies the student in his educational journey.

7) *The principle of educational reflection*: the educational process is accompanied by its reflexive awareness by the subjects of education. The first and main manifestation of the principle of human-conformity in education is student goal setting. After all, it is the student who is the person according to whom it is proposed to build education. Therefore, the student's goals, which are derivatives of his educational potential, should become the main instrument of his education.

If earlier certain groups of academic disciplines had priority for society, now we can say that the priority is the preparation of a person who will be able to live, successfully interact and be a competitive specialist in a complex and changing world. When comparing the scientific paradigms of the school of A.V. Khutorskoy with other concepts, similar trends and principles can be traced, among which the following can be distinguished:

1) *individualization* (the content and organization of the educational process should create conditions for students, together with teachers, to design their individual educational direction, taking into account their interests, inclinations, abilities, as well as ideas about their life path);

2) *adaptability* (the educational process must be structured in such a way that the child does not experience problems with social and educational maladjustment and is prepared for the situation of choice when developing an individual educational program);

3) *flexibility* (student self-determination takes several years, so it is necessary to give the child the opportunity to periodically change and rebuild the directions of individual education);

4) *variability* (due to the fact that in modern society there are many cross-functional professions, the emphasis in training should be placed not only on profiling with in-depth study of individual disciplines, but also on interdisciplinarity).

The problem of individualization of education is currently one of the central issues in the development of the education system. Individualization in education is not a new idea and has gone through certain periods of formation, and a return to this idea is a confirmation of its relevance. So, for example, N.V. Gerdo identifies five stages in the development of ideas of individualization and differentiation of education in Russia and foreign countries (Kasatkina, 2011; Shipareva, 2023; Menshikova, 2023; Baranova, 2012):

(1) *XVII century – end of the XIX century*: individualization was understood as the teacher's ability to take into account the characteristics of children and, taking them into account, plan the educational process. Gerdo N.V. Among other features of the period, he highlights the prevalence of a form of family education with an emphasis on maintaining the motivation and interest of students;

(2) *The beginning of the XX century — the end of the 20s. XX century*: this period is characterized as a period of active application of the ideas of individualization and differentiation of learning due to the accumulation of knowledge in the field of pedagogy and psychology, including about the individual characteristics of students. During this period, when organizing the educational process, the project method was introduced, the individual characteristics of students were taken into account, as well as ways of organizing independent work (Baranova, 2012; Kovaleva, 2010; Unt, 1990; Lebedintsev, 2013; Shadrikov, 2000). In 1919, in the city of Dalton (USA), E. Parkhurst tested a new system of individual work of a teacher with each student, followed by each student's work according to a plan developed jointly with the teacher. Such a system, which was later called the "Dalton Plan," made it possible to individualize the pace of learning the material, as well as lesson formats: the first half of the day was devoted to independent work of students; in the second half - classes in interest groups or work in pairs.

(3) *30 – 50s XX century*: complete rejection of the ideas of individualization and differentiation of education, because during this period, a unified curriculum and programs were formed in Russia; some variability was provided for in the variable part of the curriculum.

(4) *Late 50s XX century – early 90s XX century*: intensification of the accumulation of largely theoretical developments in the field of individualization of education;

(5) *Early 90s XX century – present time*: the main idea of individualization includes the need to ensure professional and personal self-determination of students, which entailed a number of changes:

- transition from unitarity to variability in learning;

- assistance in meeting the educational needs of students against the backdrop of humanization and democratization of education;

- transformation of the main function of the teacher from imparting knowledge to supporting the educational process.

So, Khutorskoy A.V. considers the individual educational trajectory as a way to realize the personal potential of each individual student (Khutorskoy, 2011; Khutorskoy, 2011; Konanchuk, 2013), and Yu.G. Yudin — as “a chain of responsible choices of students” (Baranova, 2012; Kovaleva, 2010; Unt, 1990; Lebedintsev, 2013; Shadrikov, 2000). These choices are characterized by the formation of personally significant meanings.

If we analyze the possibility of individualizing an educational route within an educational institution (for example, a school), then the student's educational trajectory is implemented in real limited conditions. The school provides conditions for the implementation of a set of student trajectories, based on existing restrictions. Individualization is realized by finding a compromise between the capabilities of the school and the totality of individual educational trajectories of students. The points at which choices are made are of decisive importance for the formation of an educational trajectory. At these moments, decisive turns in the trajectory occur, third-party opportunities are cut off, and the sphere of interests is determined. The student moves from a choice made by another, through a choice together with another, to independent choice and the realization of personal meaning. On this path, the subject of choice is formed. It is worth talking about the meaningfulness of the choice, even if the meaning is not reflected. It is important that the subject comes to the point that the meaning of the choice made is closer to his personal meaning. We can say that making a choice requires a certain competence. The child initially does not know how to make many meaningful and interconnected types of choices. The field in which the choice is made is set by another. The ideal goal is to create an educational space that will help the student make an adequate choice, and here the main task becomes the need to develop technology for individualizing learning. So that the meaning of the choice made is closer to its personal meaning. We can say that making a choice requires a certain competence. The child initially does not know how to make many meaningful and interconnected types of choices. The field in which the choice is made is set by another. The ideal goal is to create an educational space that will help the student make an adequate choice, and here the main task becomes the need to develop technology for individualizing learning. So that the meaning of the choice made is closer to its personal meaning. We can say that making a choice requires a certain competence. The child initially does not know how to make many meaningful and interconnected types of choices. The field in which the choice is made is set by another. The ideal goal is to create an educational space that will help the student make an adequate choice, and here the main task becomes the need to develop technology for individualizing learning.

2. Technology of Individualisation of Training

Education in the concept of individual educational trajectories is a form, a model of organizing the educational process, in which pedagogical conditions are chosen in such a way as to maximize the potential of the student. The main advantage of individual learning is that it allows you to completely adapt the content, methods and pace of a child's educational activity to his characteristics, take into account individual progress, and also adjust the trajectory depending on the presence of difficulties (Siberian School of Geosciences [Electronic resource]; Project leader school [Electronic resource]; Aleshkovsky, 2020; G-energy Academy [Electronic resource]; Mobile platform “Atomevent” [Electronic resource]). At the same time, support of the learning process in the concept of individual educational trajectories is multifaceted and should take into account both the point of view of the student himself and the psychologist or teacher.

According to the modern approach to methodology, individualization of learning is:

- Organization of the educational process, in which the choice of methods, techniques, and pace of learning is determined by the individual characteristics of students;
- Various educational and methodological, psychological, pedagogical and organizational and managerial activities that provide an individual approach.

Technologies for individualization of learning represent dynamic systems that cover all parts of the educational process: goals, content, methods and means.

The main goals of individualized training:

- preservation and further development of the child's individuality, his potential capabilities (abilities);
- promoting the implementation of educational programs by each student by means of individualization, preventing student failure;
- the formation of general educational skills based on the zone of proximal development of each student;
- improvement of educational motivation and development of cognitive interests;
- formation of personal qualities: independence, hard work, creativity.

General principles of individualization of training:

- individualization is a strategy for the learning process;
- individualization is a necessary factor in the formation of individuality;
- the use of individualized instruction in all subjects studied;
- integration of individual work with other forms of educational activities;
- learning at an individual pace and style;
- a prerequisite for the individualization of training is the study of the characteristics of students, which should first of all be taken into account when individualizing educational work: learning ability, educational skills, cognitive interests.

The most striking examples of technologies for intraclass individualization of learning are:

- 1) technology of individualized training by Inge Unt (Unt, 1990);
- 2) adaptive learning system A.S. Granitskaya;
- 3) training based on the individually oriented curriculum by V.D. Shadrikova (Unt, 1990; Lebedintsev, 2013; Shadrikov, 2000; Siberian School of Geosciences [Electronic resource]).

(1) Inge Unt's hypothesis (Unt, 1990): According to the point of view of I.E. Unt, Doctor of Pedagogical Sciences, Professor of the Research Institute of Pedagogy of Estonia, the following goals of individualization in learning (educational, educational, developmental) can be distinguished:

- improving the knowledge, skills and abilities of students;
- formation and development of mental processes, creativity, educational skills;
- improvement of educational motivation and development of cognitive interests;
- preservation and development of the child's individuality;

I.E. Unt believes that in practice, we are always talking not about absolute, complete, but about relative individualization. In real school practice, individualization is always relative for the following reasons:

- 1) usually, a group of students is characterized by approximately similar characteristics;
- 2) when forming an individual educational trajectory, only a discrete number of characteristics of students are taken into account (for example, mental abilities), along with this, many characteristics cannot be taken into account fully (for example, various properties of character or temperament);
- 3) designing an individual educational trajectory implies taking into account such characteristics as health status or various types of abilities or gifts;
- 4) individualization is not implemented in the entire volume of educational activity, but episodically, or in some type of educational work and is integrated with non-individualized work.

According to I.E. Unt, in modern educational conditions, the main form of individualization of learning is the student's independent work at school and at home. The peculiarity of I. E. Unt's methodology is the use of individual educational tasks for independent work, which are included in the teaching aids (Baranova, 2012; Kovaleva, 2010; Unt, 1990; Lebedintsev, 2013; Shadrikov, 2000; Siberian School of Geosciences [Electronic resource]).

I.E. Unt classifies existing individualization options, dividing them into three main groups:

- 1) differentiation of learning (grouping students based on their individual characteristics; thus creating homogeneous groups and classes);
- 2) intraclass (intragroup) individualization of educational work;
- 3) completing the training course at an individually varying pace.

The main advantage of individual learning is that it allows you to completely adapt the content, methods and pace of a child's educational activities to his characteristics, monitor his every action and operation when solving specific problems; monitor his progress from ignorance to knowledge, "make timely necessary corrections to the activities of both the student and the teacher, adapt them to the constantly changing, but controlled situation on the part of the teacher and the student."

(2) Professor A.S. Granitskaya developed her own method of individualizing the learning process, the so-called "adaptive learning system" (ATS), which was published in 1991 in the work "Teaching to Think and Act" (Granitskaya, 1991). Prof. herself Granitskaya defined her system as follows: "The adaptive learning system (ATS) is understood as a teaching method that ensures adaptation to the individual characteristics of students and

contributes to the intensification of the educational process by changing its structure” (Granitskaya, 1991). The author defined the purpose of ASO as: “identifying unrealized reserves and opportunities in the educational process” (Shipareva & Menshikova, 2023; Menshikova & Primakova 2023; Baranova, 2012; Kovaleva, 2010; Unt, 1990). At the same time, within the framework of the class-lesson system, it is possible to organize class work in such a way that the teacher can allocate 60–80% of the time for individual work with students (Shipareva & Menshikova, 2023; Menshikova & Primakova, 2023; Baranova, 2012; Kovaleva, 2010; Unt, 1990).

Author Bespalko V.P. This is how the essence of A.S. Granitskaya’s method is formulated, which consists “in the simultaneous work of the teacher in:

- managing the independent work of all students;
- working with individual students - individually;
- taking into account and realizing the individual characteristics and capabilities of children;
- maximum inclusion of everyone in individual independent work.”

For this purpose, the author of the method proposes to use multi-level tasks with adaptation in the educational process. It is clear that the volume and complexity of these tasks increases from level to level. The initial level is determined based on the results of preliminary diagnostics of students. It follows that the creation of educational materials for students’ independent and paired work in subjects becomes an important independent task for the teacher.

The main emphasis is on the independent work of students, which is carried out mainly in pairs (small groups):

- “static pair” — students sit at the same desk and work in pairs with each other. Modes of operation: mutual training and mutual control;
- “dynamic pair” — a group of 4 students sitting at adjacent desks and working in pairs (in total, each person gets three pair options). Working hours: collective interaction;
- “variation pair” — a small group of 4 students, the exchanged educational materials are worked through by each group member. Operating mode: processing of various materials.

To save the teacher’s time, the approach involves training assistants from among well-performing students (as was customary in parochial schools before 1917). And this also takes its time. A certain paradox arises: “a vicious circle of time shortage.” “The teacher’s individual work in the lesson consists of the teacher’s cooperation with each student: attitude, help, advice, encouragement;” “in the included” control, during which the teacher determines the degree of independence of students, looks at how they carry out mutual control, how they help a friend, and whether they are being too strict when assigning grades for this stage of work; in “disconnected control,” which involves the teacher working with students on materials differentiated by level of complexity.

What are the criteria for a successful lesson? This is the composition of the elements that determines the effectiveness of the lesson, the author I.S. Kuchina:

- active mental activity of each student throughout the lesson;
- ensuring the student’s emotional involvement in his own activities and the activities of others;
- motivation of the student’s cognitive activity;
- ensuring reflection and self-control of students in the process of activity throughout the lesson;
- presence of independent work or creative tasks in the lesson;
- assessment of the level of mastery of complete knowledge (all students receive marks in the lesson);

“The main goal is the development of intelligence.”

A lesson involves following key stages:

- 1) Teacher’s explanation of new material (no more than 10 minutes).
- 2) The teacher issues assignments that students independently complete in class under the teacher’s supervision.
- 3) Mutual control of students. At the same time, the teacher evaluates not only the work performed itself, but also the quality of its assessment by the supervising student.
- 4) Independent work of students within the framework of the subject being studied, built on the principle of progression from a simpler level to a more complex one (Timofeeva N.). In other words, A.S. Granitskaya proposed an original non-linear lesson design: part one — teaching everyone, part two — two parallel processes: independent work of students and individual work of the teacher with individual students.

(3) A feature of V.D. Shadrikov's individualization technology is the creation of teaching aids or programs for 6 levels, the distribution of which depends on the level of knowledge of students and their capabilities. The initially selected level is not static; it is quite flexible and changes with the development of abilities and the increase in the level of knowledge of the student (Shadrikov, 2000). The chosen level should be feasible for everyone. Students master the curriculum at their level, but the methodological complex and the program are completed in the same way. Technology of individualization of training V.D. Shadrikov is built on the principle of "from simple to complex", and at the end of the lesson, the final stage of the teacher's work is to increase the motivation of students by engaging them with new upcoming material.

The considered examples of individualization technologies, as well as modern modifications, allow us to highlight the general features of designing individual educational trajectories:

- Providing freedom to choose a number of elements of the learning process;
- Formation of general educational skills;
- Use of technical teaching aids, including digital tools;
- Taking into account the factors that cause students' underachievement (gaps in knowledge, defects in thinking, in academic work skills, decreased performance, etc.);
- Ways to overcome individual deficiencies in knowledge, skills and abilities, in the process of thinking;
- Individual form of organizing work in the lesson;
- Taking into account and overcoming the shortcomings of family upbringing, as well as underdeveloped motivation and weakness of will;
- Optimization of the educational process in relation to capable and gifted students;
- Formation of adequate self-esteem of students.

Individual educational routes can be designed taking into account the problem-reflective approach (I. Semenov, G. Tur, I. Shapovalyants); activity approach (L. Vygotsky, Davydov, A. Leontiev, S. Rubinstein); socio-pedagogical approach (N. Gubanova, Yu. Matyukha, I. Miloslavova, S. Savchenko, N. Sokolova, V. Streltsova).

Table 1. Content of problem-reflective, activity-based, social-pedagogical approaches for designing individual educational trajectories

Problem-based and reflexive approach	Activity approach	Socio-pedagogical approach
I. Semenov, G. Tur, I. Shapovalyants	L. Vygotsky, Davydov, A. Leontiev, S. Rubinstein	N. Gubanova, Y. Matyukha, I. Miloslavova, S. Savchenko, N. Sokolova, V. Streltsova
<p>"Individual educational route" based on a problem-reflective approach (V. Lefevre, I. Semenov, G. Tour, I. Shapovalyants) is based on the motivation of students to deep self-reflection with subsequent reliance on character strengths, as well as those skills and abilities which are best developed.</p> <p>Collaboration is a core part of the problem-reflective approach.</p> <p>Together with the teacher, it is important for students to analyze past experience and focus on it when planning the future.</p>	<p>The basis of the activity approach (L. Vygotsky, V. Davydov, A. Leontiev, S. Rubinstein) in relation to the design of "individual educational routes" is the fact that the formation and development of personality occurs in various types of activities. When designing the educational process, various models of practical-pedagogical, design-pedagogical and scientific activities can be applied.</p>	<p>The use of a socio-pedagogical approach (N. Gubanova, I. Miloslavova, S. Savchenko, N. Sokolova, V. Streltsova) in the design and implementation of individual educational trajectories provides for:</p> <ul style="list-style-type: none"> - A thorough study of the educational needs, achievements and personal and professional aspirations of students and the capabilities of the educational environment of institutions, in meeting needs, in developing achievements and intentions; - Assistance to students in understanding their own educational problems, designing an individual educational trajectory and its description (goals, stages, methods and forms of achieving goals, expected results); - Assistance in the consistent implementation of an individual educational trajectory (assessment and self-assessment of current results, adjustment of the route, support for educational success) (Evdokimov, 2009)

When designing individual educational trajectories, it is important to take into account not only approaches and technologies, but also the types of individual forms of organizing tasks.

An individual form of work organization is a form of work in a lesson, which assumes that each student receives a task for independent completion, differentiated in level of complexity taking into account the student's capabilities. Such tasks may include working with a textbook, other educational and scientific literature, various sources (reference books, dictionaries, encyclopedias, etc.); solving problems, examples, writing summaries, essays, abstracts, reports; carrying out all kinds of observations and research.

In the pedagogical literature, two types of individual forms of organizing task completion are distinguished: individual and individualized. The individual form of organizing assignments implies that the student's activities in completing general assignments are carried out without contact with other students, but at the same pace for everyone. An individualized form of organizing the completion of tasks is the educational and cognitive activity of students on the completion of individual tasks, differentiated by the level of complexity or interests of the students. Thus, one of the most effective ways to implement an individual form of organizing students' educational activities in the classroom is differentiated individual tasks, and these tasks can be presented in electronic format or be part of an educational module.

The second important element is the teacher's control over the progress of assignments and his timely assistance in resolving any difficulties that students may have. Moreover, for low-performing students, differentiation should manifest itself not so much in different levels of complexity, but in the teacher's help in systematically eliminating gaps in knowledge.

Initially, students work on materials developed in detail by the teacher: these can be individual questions and assignments. As they master educational skills, the degree of independence increases: students can work on more general, non-detailed tasks, without the direct intervention of the teacher. Gradually, research work is gaining more importance. For low-performing students, it is necessary to create tasks that contain sample solutions and problems to be solved based on studying the sample; various algorithmic instructions that allow the student to solve a specific problem step by step.

Let us consider the stages of a student's educational activity organized by a teacher, which allows for the implementation of an individual trajectory in a specific educational field, section or topic (Soldatova, 2014; Basharina, 2020; Order No. 41 dated January 24, 2020 on approval of methods for calculating indicators of the federal project "Personnel for the Digital Economy").

1st stage. Diagnosis by the teacher of the level of development and degree of expression of the personal qualities of students necessary for the implementation of those types of activities that are characteristic of a given educational field or part of it. The teacher determines the initial volume and content of students' subject education. The teacher establishes and classifies the motives and types of activities of students in relation to the educational field, as well as the forms and methods of classes.

2nd stage. The student determines, with the support of the teacher, fundamental educational objects in the educational field in order to designate the subject of further knowledge.

3rd stage. The student formulates a personal attitude and priority in goals for the system of fundamental educational objects.

The student, together with the teacher, fixes the priority areas of their attention in the upcoming activity, and clarifies the forms and methods of this activity.

4th stage. The student, together with the teacher, designs an individual educational trajectory.

5th stage. Activities for the simultaneous implementation of individual educational trajectories of students and a general collective educational program.

6th stage. Reflective-evaluative. Demonstration of students' personal educational products and their collective discussion. Based on a reflexive understanding of individual and collective activities, as well as with the help of control means, the assessment and self-assessment of the activities of each student takes place, taking into account pre-formulated goals.

7th stage. Adjustment of educational goals, as well as individual educational trajectories. As a result, the student becomes a subject, a designer of his own education.

It should be noted that in the process of designing individual educational trajectories, the student masters universal skills and abilities necessary for future life and work. The design technology includes the following main elements:

A. Goal setting includes:

- the student's choice of activity goals, taking into account the goals proposed by the teacher;

- students' formulation of their own goals from previously known ones;
- formulation of tactical and strategic goals;
- inclusion of goal setting as an element of any educational activity.

B. Planning includes:

- drawing up an action plan for a separate operation;
- developing a plan to solve the problem;
- drawing up research plans;
- project development.

C. Mastering the methods of educational activities implies understanding:

- types and methods of activity inherent in the discipline being studied;
- ways of knowing fundamental educational objects;
- increasing the number of learned techniques, techniques and technologies of cognition;
- mastery of forms, methods and means of teaching.

D. Mastering the methods of rule-making includes:

- building algorithms for solving problems;
- designing rules for conducting didactic games;
- ways of organizing group work;
- ways to build principles of educational activities.

E. Mastering the reflection of activity includes:

- analysis of the level of achievement of your results and methods of obtaining them;
- identification of existing or emerging contradictions;
- reflection of the educational section on the topics studied;
- construction of a multi-level reflective model that describes the technologies of activity of individual participants in the educational process in their interaction (together with the teacher);
- building a three-dimensional model of individual-collective activity, including the entire range of trajectories, spheres and products of activity, as well as emerging problems of the subjects of this activity and ways to solve them (participation in the activities of the teacher organizing the class).

For each of the listed procedures, the teacher plans the student's movement from fragmentary application of its individual elements to holistic implementation in the form of a system.

2.1 Organization of the Educational Process Based on Individual Curricula

Models for organizing education according to individual curriculum plans (IEP) solve the problems of humanization of education, as they are aimed at a person-centered approach to learning, focused on the implementation of the basic rights of the child in the field of education and allow for free choice of an individual development trajectory. An individual curriculum (IEP) is a set of academic subjects selected for mastering by students from the curriculum of a general education institution, compiled on the basis of the federal basic curriculum (Basharina, 2020; Order No. 41 dated January 24, 2020 on approval of methods for calculating indicators of the federal project "Personnel for the Digital Economy"; Khamidullina, 2012; Davydova, 2016; Escudero, 2019). As part of the network interaction of educational institutions, when compiling an IEP, it is possible to use educational subjects from several educational institutions (organizations). The use of an individual curriculum for specialized training makes it possible to differentiate the level of training in individual disciplines.

- Russian Federation Law "On Education", which indicates that "... students of all educational institutions have the right to receive education in accordance with state educational standards, to study within these standards according to individual curricula, to an accelerated course of study";
- The concept of specialized training at the third stage of general education is based on the variety of forms of its implementation. Along with the creation of specialized classes and groups, based on sample curriculum plans for profiles, it is important to provide the student with the right to master educational programs based on the IEP;
- Order of the Ministry of Education of Russian Federation dated March 9, 2004 No. 1312 "On approval of the federal basic curriculum and model curricula for educational institutions of Russian Federation implementing

general education programs” (with amendments and additions from 02/01/2012);

- Charters of educational institutions implementing the practice of IEP.

In the relevant sections of the charters of these educational institutions, it is advisable to stipulate:

- a) availability of students’ rights to study according to the IEP;
- b) the possibility of organizing the educational process for students using the IEP (including using accelerated training courses, external studies);
- c) a special procedure for assessing intermediate and in some disciplines final certification when studying according to IEP;
- d) the procedure for developing, approving and periodically adjusting the students’ IEP (this may also be within the competence of the school administration, pedagogical council, school government bodies, etc.).

Building education on the basis of individual curricula changes the principles of forming the curriculum of a general education institution, as well as drawing up a school schedule. First, a general educational institution determines the general set of disciplines offered for mastering, then individual educational plans for each student are formed, and only then their totality determines the curriculum and class schedule for this institution as a whole. In general, educational institutions working on the basis of the IEP.

The practice of students studying all academic subjects in the same class is changing. Individual curricula create conditions for increasing opportunities for students to choose models for their further education. The implementation of individual curricula in a school should begin with an analysis of available resources:

The transition to individual curricula involves several stages. At the first, preparatory stage, it is necessary to highlight the levels of differentiation in the content aspect, which will become the basis for an individual plan (Khamidullina, 2012; Davydova, 2016; Escudero, 2019, Moskovskaya, 2019). The problem of students choosing a direction (profile) and disciplines for in-depth study is the main problem when drawing up individual plans. To help in professional determination, once a year, starting from grade 7, professional diagnostics are carried out. Also, psychologists and teachers should monitor, starting from grade 7, and enter information into the student’s portfolio the following parameters: 1) success of training; 2) psychological comfort in the group; 3) sustainability of interests in accordance with the chosen direction.

On the second, at the organizational stage, the main problem is drawing up an individual schedule. The principle of drawing up an individual schedule is somewhat different from drawing up a general school schedule. First, regardless of the days of the week, it is necessary to create a combination of lessons in study groups that would involve the largest number of students. Next, add to the schedule taking into account the individual educational plans of each student. At the same time, it is reasonable to provide for different formats of classes (face-to-face or distance/hybrid — which will affect the classroom fund) depending on the teacher’s schedule, and also, in the variable part, to provide for the implementation of disciplines in mixed groups as one of the possibilities.

At the third stage implementation of the IEP, the main problem lies in monitoring the implementation of the IEP, as well as organizing support for individual educational trajectories. For this purpose, it is advisable to organize not only a psychological service, but also tutor support or a mentoring service. Class teachers and/or tutors draw up a portfolio for each student, which includes the results of academic performance, as well as feedback and characteristics from teachers and psychologists.

At the fourth analytical stage based on the materials of diagnostic activities carried out during the year, the main results of the work are analyzed.

At the final stage work, it is necessary to conduct a study-to-study satisfaction with the choice made, study attitudes towards the IEP on the part of students, their parents, and teachers, exploring the degree of psychological comfort in groups, opinions regarding the quality and convenience of drawing up an individual schedule, and the compliance of the individual plan with the further educational trajectory.

3. Using Digital Technologies to Personalize Learning

Modern trends of globalization and the emphasis on individualization of the educational process dictate the need to enter a single global educational space. With the help of modern information technologies, it becomes possible to receive education not only full-time, but also remotely, or using hybrid forms of education.

When moving to distance learning formats, both the formats of classes and the educational technologies and types of activities used change. In the literature (Escudero, 2019, Moskovskaya, 2019; Roberts, 1995) propose to consider four main models of training organization:

- 1) Use of electronic resources as additional material;
- 2) Blended learning with partial use of electronic content to master the discipline in full-time classes;

- 3) Hybrid (mixed) learning format, with full-time and distance learning using electronic content;
- 4) Exclusively distance learning.

Mixed (hybrid) learning formats are often classified as asynchronous, which means that students learn part of the material individually without the help or presence of a teacher. When implementing asynchronous learning, it is possible to organize communications in chats, mail, or organize commenting on resources on the platform, as well as individual / group completion of tasks. A comparative analysis of full-time, distance, and mixed (hybrid) learning formats showed that in full-time formats it is possible to implement active teaching methods, which leads to greater student involvement and an increase in the proportion of time for face-to-face communication between teachers and students. Online learning allows for greater variability in pedagogical technologies, a combination of individual and group learning styles, face-to-face and distance learning formats. When implementing distance learning formats, there are many digital approaches to attract and retain attention — different video formats, the use of various audio materials and applications, as well as the use of gamification approaches when developing assessment tools or training materials. In general, the implementation of blended learning formats implies more flexible learning, which, due to the variability of styles and technologies, can be more student-oriented.

Among the areas of preparing a school for the transition to a hybrid format of education, three main ones can be distinguished: analysis of existing material and technical equipment and finances, analysis of the level of development of information and computer literacy of teaching staff, as well as modification of educational programs using digital technologies. More detailed information is presented in Table 2, which reflects a version of the roadmap for preparing universities for the transition to a blended learning format (Hurajova, 2015; Vuorikari, 2016).

Table 2. Roadmap for preparing a school for the transition to a blended learning format (Kondakov, 2021; Rusli, R, 2020)

1. Analysis of the availability of financial and material resources (taking into account material and technical equipment, as well as a stable connection to high-speed Internet);
2. Assessing the level of development of computer literacy of teaching staff and diagnosing readiness to conduct classes in distance or mixed formats;
3. Analysis of the availability of recorded online courses and increasing their number, creating a database, as well as choosing from massive open online courses (MOOK);
4. Modification of educational programs taking into account the blended learning format should lead to modernization of the following areas:
- educational environment;
- ways of acquiring knowledge (course goals, optimal educational technologies, the possibility of using inverted classroom technology);
- structuring and systematization of data.

Moreover, according to the literature (Rusli, 2020; Atchoarena, 2017; [Electronic resource: Project “Artificial Intelligence”) online learning has undergone 3 waves of development (Table 3).

During the first generation, the focus was on changing material formats. In addition to paper media, electronic books, audio materials, video conferences, as well as various software have been actively used, which has made the educational process more personalized.

Table 3. Stages of modernization of online learning (Kondakov, 2021; Jansen, 2020; Rusli, 2020; Atchoarena, 2017)

Online training	Types of materials
<i>1st generation</i> Focus in online learning on different formats of materials	<ul style="list-style-type: none"> • Paper media • E-books • Audio materials • Video conferencing • Software

<p><i>2nd generation</i></p> <p>Focus in online learning on technologies that can be applied in the virtual classroom</p>	<ul style="list-style-type: none"> • Video channels • Online materials • Organization of interactive communication: email, chats, etc.
<p><i>3rd generation</i></p> <p>Focus in online learning on a flexible model taking into account the individual characteristics of students.</p>	<ul style="list-style-type: none"> • Specially developed online materials • Resources for self-reflection (blogging, e-portfolio, etc.) • Simulations, virtual technologies and extended reality technologies • Applications

During the second generation, the focus of change was shifted from the modification of educational materials to the active development and use of digital technologies that can be used in the virtual classroom. The organization of interactive communication implied the use of such resources as: video channels, materials from Internet sites, etc. The structure of educational courses was modernized. As a result, the following recommendations were made for the development of an online course (Rybnikova, 2008; Belenko, 2020; Menshikova, 2023):

- 1) Study of educational needs. SWOT analysis;
- 2) Roadmap of the development;
- 3) Educational program design (macro level);
- 4) Drawing up a work program for the discipline;
- 5) Selecting an LMS;
- 6) Discussion of the required number of teaching staff;
- 7) Development of training materials;
- 8) Deciding on the type of certificates or any other identification documents.

During the third wave of changes in online education, there is a transition to individual educational trajectories of students, and a path from individualization to personalization and adaptive personalization is being outlined. Active work is beginning to be carried out not just on the development of educational digital platforms, but on the development of adapted personalized digital platforms. One possible example would be the Knewton digital platform, which allows students to adjust their individual educational trajectories depending on the results of their intermediate assessments. During the periods of the second and third waves of changes in online education, there is an active development of informal educational formats and resources (chat rooms, social networks, bots). Within the framework of virtual classes, activities such as online consultations, organizing discussions and completing tasks in communities, various types of organizing written communications (chat rooms, blogs, online communities); local communities dedicated to educational topics are also actively developing. As part of the educational process, organizations are expanding subscriptions to various types of periodicals.

In addition to distance learning formats at universities, massive open online courses (MOOCs) are becoming increasingly popular, implementing a system of additional professional education. Among the shortcomings in the works (Rybnikova, 2008; Belenko, 2020), it is noted that teaching students in an online format, for example in the form of a MOOC, requires significant efforts to attract, motivate and retain the attention of students.

At the same time, among the main trends in education we can highlight not only digitalization, but also:

- massification of education;
- dissemination of the long-life learning paradigm;
- changing different formats for knowledge assessments and levels of competency development;
- dissemination of team forms of project implementation, as well as mentoring and leadership formats in the coaching format;
- integration of a person-centered approach;
- individualization of the learning process;
- dissemination of gamification approaches.

A separate difficulty is the organization of the process of studying natural science disciplines in a distance format. As a possible solution to this problem, the integration of the gamification approach, as well as the use of virtual

(VR) and remote (remote) laboratories, can be used. At the same time, the gamification approach cannot be understood only as the development of game-based educational content; at the moment, a large number of educational interactive applications are appearing that allow one to assess the level of development of universal and professional competencies.

If we analyze the possibilities for organizing practical classes in natural science disciplines, then partial integration of distance learning experiments into educational programs is promising. Many organizations are actively working on the development of virtual laboratories. In (Evdokimov, 2009), an analysis of the structural diagrams of remote laboratory systems that operate at the Norwegian University of Science and Technology (NTNU) was carried out; Polytechnic Institute of Kjeller; National University of Singapore; National Institute of Serbia, as well as Mysore Engineering College. The work (Evdokimov, 2009; Arkhipova, 2022; Berntzen, 2001) describes the requirements that must be taken into account when developing and implementing remote laboratory systems in the educational process:

- remote access to remote laboratory resources through public telecommunication networks;
- the ability to use several remote laboratories;
- possibility of simultaneous work of users in time sharing mode;
- organizing and processing a queue of requests;
- processing user requests based on real measurements on physical objects;
- the ability to supplement real research objects with their virtual models.

The experience of using Internet resources in teaching has revealed the problem of information oversaturation and disorientation of students. When using Internet resources, a student must be able not only to assimilate, but also to create own educational products. In order to implement this focus in distance learning, the following pedagogical principles have been defined.

1) Productive orientation of learning. The main goal of online classes is for students to create their own creative products in educational areas studied via the Internet, and to use information and web technologies to demonstrate and discuss the results achieved. Educational products for distance learners can include their methods of solving educational problems, constructed graphic images, information found on the Internet and systematized in a certain way, telecommunication discussions or distant cooperation on a common topic with peers from other schools and cities.

2) Individualization of training. The organization of projects, competitions and other forms of distance learning is based on the individual characteristics, level of preparedness and motivation of the subjects of activity. The system for monitoring students' external educational products allows them to adequately diagnose their personal educational development.

3) Openness of the content of education and the educational process. Interaction with educational arrays and remote students develops universal skills in distance learning, which are not formed in traditional education, but are a condition of life in modern society. In an open educational space, the student builds an individual educational trajectory. Forms of selection and structuring of distance education content allow the use of data that does not have a single information source, which significantly expands the potential educational environment.

4) Priority of activity content over information content. The traditional content of education is concentrated in uniform sources — textbooks and manuals, the main purpose of which is to transmit selected content to students. The increase in the volume of educational Internet resources and the possibility of quick access to the world's cultural and historical achievements of mankind are changing the usual role of educational content. The significant volume, openness and accessibility of information on the Internet do not require the student to fully assimilate and reproduce it. The emphasis in this case shifts to the activity of the student, to the technology with which he creates the planned educational product. Learning using the Internet allows you to use telecommunication methods for constructing knowledge, in which there is no single information source for everyone, and the focus of learning does not relate to the material, but to the activity itself, carried out by students using distance creativity methods. These methods include: methods of participation in remote conferences, remote brainstorming, methods of creating interactive web pages, online creative works, etc. Analysis of the features of Internet learning and its forecast for the near future allows us to identify at least five types of distance learning, differing in the degree of distance, individualization and productivity:

1st type: "Educational institution – Internet". Distance learning solves the problems of face-to-face learning.

2nd type: "Teaching – Educational Institution – Internet". The main educational process takes place in full-time school. Internet access and its information capabilities are used.

3rd type: "Student – Internet – Teacher". Distance learning partially replaces face-to-face learning. Students

study full-time in a traditional school, but in addition to full-time teachers, a remote teacher works with them occasionally or continuously. Classes are conducted via email, chat, web resources and are aimed at in-depth study of a subject or topic, preparation for entering a university, etc.

4th type: “Student – Internet – Center”. Distance learning in this case acts as a means of individualizing education. The task of telecommunication technologies is to strengthen the personal orientation of learning, to provide students with a choice in the forms, pace and level of their general educational training.

5th type: “Learner – Internet – ...”. Distance learning performs the functions of education distributed in space and time. The educational process and schedule are designed taking into account several places of study, as well as open online library resources.

3.1 Prospects for the Use of Artificial Intelligence in Education

When it comes to integrating digital technologies into the educational process, the most promising direction seems to be the use of artificial intelligence (AI). AI’s ability to make connections between disparate data sources will help students identify areas where they need real-time interaction or additional assistance. As a result, AI makes it possible to develop an individual educational trajectory for each student, taking into account his strengths and weaknesses, abilities and assigned tasks. Predictive analytics and machine learning also have significant potential for developing the social and emotional skills needed in learning by allowing educators to personalize the learning experience based on the analysis of both qualitative and quantitative data.

Despite the potential of AI, some serious challenges remain, especially regarding equality of opportunity, such as access to the Internet and the ability to share data. Today, about 43% of the world’s population does not have access to the Internet. Moreover, some artificial intelligence programs may violate human rights. Of great importance when integrating AI into the educational process are the issues of safety in the use of AI mechanisms, taking into account ethical aspects, which are now actively discussed in most countries (Belenko, 2020; Menshikova, 2023; Menshikova, 2023; Polyakova, 2008; Khubieva, 2008).

Artificial intelligence will play an important role in solving another major challenge facing edtech professionals: personalized learning assessment. Taking into account the Bloom diagram, at the moment, most forms of intermediate and final assessments are aimed at testing knowledge and understanding of information, a smaller number — on the ability to analyze information, as well as apply it to solve problem cases, and a few examples of forms — on the ability to synthesize information, as well as experimental or research design. Moreover, most existing forms of assessment do not take into account the possibility of quantitatively assessing the level of development of universal and professional competencies, which makes it difficult to draw up a portrait of a university graduate.

At the moment, the “Artificial Intelligence” project is developing quite quickly, organized by 20.35 University, the Agency for Strategic Initiatives, and NTI University (Digital footprint standard; Roux, 2018; Dziuban, 2018; Galvis, 2018; Bralic, 2018). The project is aimed at providing open access to practice-oriented (case — methods) educational programs on artificial intelligence from the best Russian and world universities (115 courses). During the training process, participants solve cases from leading IT companies and participate in NTI University events, developing practical work skills. The acquired knowledge and skills form a digital profile of the participants, confirmed by a certificate of conformity to a specialist in the field of Artificial Intelligence, taking into account professional standards.

In matters of assessing the level of development of students’ digital competencies, the concepts of digital portfolio and digital footprint become of great importance. Thus, the 20.35 University developed a digital footprint standard (Digital footprint standard; Roux, 2018; Dziuban, 2018; Galvis, 2018; Bralic, 2018). A description of the types of data that make up a digital portfolio and a digital footprint is provided, criteria for the quality of a digital footprint are listed, as well as algorithms for working with a digital footprint (Bralic, 2018).

Data characterizing a person’s educational and professional activities, reflecting the dynamics of his competence development, include (Digital footprint standard, Rybnikova, 2008; Belenko, 2020):

- *diagnostic data:* indicators of competence, indicators of meta-subject competencies and personal qualities;
- *intent data:* information about the articulation of the focus of attention, choice, preferences or intentions of participants in the activity;
- *educational content data:* information on the content of educational modules, programs and other educational activities, including thematic and curriculum plans, software and methodological complexes, funds of assessment tools, control, measurement and reference materials, as well as educational events recorded electronically;
- *educational process data:* information about actual participation in an event or activity, information

about the interaction of activity participants with each other and with information systems, including information about user actions, as well as communication data;

- *educational experience data*: information about the qualitative and quantitative characteristics of human activity and/or groups of people, including a description of the goals, objectives and criteria for the quality of activity, the projected and actually achieved result;
- *activity participation data*: information about the description of the activity, competency-based marking of the activity, the expected image of the result of the activity, criteria for the quality of the result of the activity;
- *educational outcome assessment data*: information about the performance assessments received, including reflective assessments, formal assessments for passing control and measurement tests, mutual assessment and other types of assessments, including those generated by an outside observer;
- *state data*: information about the physiological, psycho-emotional and cognitive state of the participants in the activity, as well as the state of the educational environment.

The formation of a digital portfolio and digital footprint of students will make it possible to create a matrix of competencies of graduates of an educational institution, which will take into account quantitative indicators of changes in the level of development of universal and professional competencies of students.

4. Analysis of Educational Institutions Implementing the Concept of Individual Educational Trajectories of Students

Analysis of examples and methods of organizing individual educational trajectories, which are implemented in some public and private schools, allows us to identify the main trends. The examples of educational institutions selected for study can be conditionally divided into two types depending on whether the educational institution is located at a university or not:

1) Schools which activities are coordinated by the university: lyceums at the National University Higher School of Economics (HSE) and the National Research Nuclear University MEPhI (NRNU MEPhI), pre-universities of Moscow Pedagogical University, Russian State University for the Humanities, Moscow State Linguistic University and Perm State Medical University named after I.M. Sechenov, University Gymnasium and Specialized Educational and Scientific Center of Moscow State University named after M.V. Lomonosov;

2) Private schools (not coordinated by any types of universities): private school “Good school”, private school “New School”, private school “Letovo School”.

Both types of schools have specific missions and goals. The main goal of the group of schools at universities is to provide pre-university training for applicants. The implementation of the educational process using the design and research model additionally motivates students and increases interest in scientific activities and the quality of the work performed. The Higher School of Economics National Research University highlights the following as the main goal of the lyceum: “The main task of the lyceum, set for it by the university, is that the lyceum prepares applicants of a certain type, who have two fundamental features: a high level of educational independence and a high level of responsibility. It is necessary that they themselves can learn and have the competencies for independent learning activities.”

And the university considers the main goal of the MPGU pre-university to be the formation of a student’s system of ideas about himself (the so-called “I-concept”) and the design of an individual educational trajectory within the framework of developmental education [53-56]. University Gymnasium of Moscow State University named after M.V. Lomonosov was created, according to the rector, V.A. Sadovnichy, to organize a multidisciplinary educational environment in which it will be possible to maximize the potential of gifted children both in learning and in the implementation of practically significant projects (Polyakova, 2008; Khubieva, 2008; Kutepova, 2018; Abramova, 2019).

In turn, private schools such as “New School” and “Letovo” are united by the goal of creating conditions for the discovery and subsequent development of a child’s abilities, as well as teaching them to make informed choices and be independent — initially, the educational model is based on a scholastic approach. The Letovo school provides training for students from grades 7 to 11. When admitted to grade 7, students undergo psychological diagnostics, as well as preliminary entrance tests to determine their level of knowledge. Based on the results obtained, the mentor, psychologist and administrative staff develop individual educational trajectories, and also create an individual schedule for each student. Individualization of the educational process is based on personality-oriented and practice-oriented approaches. When organizing the educational process, specialization is provided from grade 8 in 11 areas, as well as an expanded system of additional education, which includes the ability to choose from more than 150 elective disciplines, including with an emphasis on Olympiad preparation in individual disciplines. Formative and summative assessments are carried out according to a criterion system

taking into account an 8-point scale and the presence of 2 journals — for assessing academic performance (on an 8-point scale with subsequent transfer to a 5-point scale) and for assessing the level of development of universal competencies (soft skills) on a 4-point scale. At a New School, the educational model is built on the basis of the project method. At the same time, the educational process is organized in various formats:

- there are full-time forms of education with a classic daytime format of classes,
- there are classes that are carried out in the second part of the day,
- and online schools with full-time training on weekends.

Profiling begins in the 10th grade, but already in the 5th grade it is possible to choose elective disciplines in the afternoon.

If we separately analyze the issue of profiling and in-depth study of individual disciplines, then schools can be conditionally divided into “broad-profile” and “narrow-profile” (in the case of university schools, this depends on the specifics of the university itself):

1) “Broad-profile”: Lyceum of the National Research University Higher School of Economics, pre-university of the Moscow Pedagogical State University (MPGU), University Gymnasium of the Moscow State University named after M.V. Lomonosov, “Letovo”. In addition to mathematics and humanities classes, the Lyceum of the National Research University Higher School of Economics provides training in the areas of Oriental Studies, Design and Psychology. “Letovo” and the University Gymnasium of Moscow State University teach in areas of both the natural sciences and the humanities.

2) “Narrow-profile”: The lyceum of the National Research Nuclear University “MEPhI” (NRNU MEPhI), the gymnasium at the Russian University of Transport (MIIT), the pre-university of the Russian State Humanitarian University (RGGU), the Moscow Humanitarian Linguistic University (MSLU) and the First Moscow State Medical University them. THEM. Sechenov (PMSMU named after I.M. Sechenov), Specialized Educational and Scientific Center of Moscow State University named after M.V. Lomonosov, private school “Good school”. Profile training in the humanities is provided by the pre-universities of the Russian State University for the Humanities (humanitarian class) and the Moscow State Linguistic University (philological), and in the natural sciences by all others.

It is worth noting that most public and private educational institutions design the educational process taking into account the design and research model. Depending on the concept, primary school students are already familiar with the elements of research activity, then at the secondary level they prepare group or individual projects. After grade 8, research activities can be carried out on the territory of a university or company laboratory. Also, usually after the 8th grade, career guidance activities are provided: excursions, meetings with practitioners, career guidance tests, as well as case championships and master classes. Many public and private schools accredited by the International Baccalaureate system operate according to strict regulations for the implementation of project activities:

- in grades 3-4 — work on individual projects, which students present at the annual exhibition of elementary school projects;
- in grades 5-7 — social projects in groups;
- from 8th to 11th grade — individual research projects.

In this case, project activities can be considered as an independent activity for the development of research competencies, or the project method (sometimes referred to in the literature as the project method) can be used to organize a training session.

When analyzing educational models, it is immediately necessary to take into account the features of curriculum development. It is advisable to note that an individual curriculum (IEP) is a document reflecting a set of subjects that are the choice of a particular child in accordance with his educational needs and the capabilities of the educational organization. The scheme for constructing an individual curriculum is approximately the same: main (basic) and variable parts. The main part includes subjects with a number of hours that are regulated by the federal state educational standard. The variable part is that part of the curriculum that ensures the implementation of the principle of individualization. As a rule, it may include the selection of specialized subjects in accordance with the chosen field of study, a second foreign language (UG MSU).

In addition, the HSE Lyceum included in the IEP of each lyceum student a so-called “faculty day,” and the New School included professional tests and internships in the format of excursions to enterprises and organizations, internship programs in the chosen field of study. An important component of training under the IEP are the conditions of training (payment, accommodation, possibility of admission for non-residents). Some schools can provide students with free dormitories, which allows increasing the selection of applicants from the regions.

Based on the comparative analysis, we made the following conclusions:

- 1) Goals and vision of the principles of constructing the learning process in an educational institution, which must coincide with the educational goals, requests and expectations of the incoming child in order to avoid problematic situations;
- 2) The most attractive for students and their parents are wide-profile schools, since if a situation arises of reorienting a student to study in another field of training, there is no need to change the educational institution, or study in the current direction with additional training sessions in addition to the main load, and both options lead to a significant increase in workload, which is extremely undesirable in high school;
- 3) Selection mechanisms are quite different: from admission based on the results of the final exams after 9th grades with a portfolio of achievements, to four stages, including not only oral and written tests, but also additional interviews with subsequent participation in a summer school. If we analyze the types of entrance tests, then written diagnostic work alone is not enough to understand whether a child is ready to study within the framework of independent design of an individual educational trajectory. In these circumstances, it is important to determine whether the child's goals coincide with the goals of the educational organization, whether he is ready to participate in the design of an individual educational trajectory, and whether parents are ready to give the child the opportunity to make his own choice. The optimal test system is one that includes written work to determine the level of academic knowledge, an oral stage;
- 4) The individual curriculum consists of two parts: main and elective, the latter including a choice of specialized subjects, a second foreign language in some educational institutions, elective courses (modules), projects (individual and collective), as well as clubs. This scheme makes it possible to satisfy the educational needs of students with proper design of the IEP and the choice of forms of completing the curriculum;
- 5) We can separately highlight educational institutions, the opportunity to enter which is available not only to Moscow citizen, but also to nonresidents, with accommodation on campus (University Gymnasium of Moscow State University, Letovo school), which, among other things, allows students to get acquainted with the culture of different regions and the peoples inhabiting our country, fostering a sense of respect and instilling multiculturalism;

Thus, the considered examples of the functioning of educational institutions show that the main technological elements when designing individual educational trajectories include:

- an individual system for diagnosing the level of knowledge, as well as psychological traits and abilities of students;
- development of an individual curriculum and schedule;
- organization of the educational process in mixed groups, abolition of the functionality of the class teacher responsible for the constant number of students and the introduction of the position of mentor/tutor, who accompanies the educational process individually;
- profiling in several areas, as well as possible cooperation with academic partners using their resources and bases;
- differentiation of tasks by level of complexity, as well as the presence of several levels of training for elective disciplines in the system of additional education; development of original educational and methodological materials;
- integration of the competency-based approach, as well as the design and research model for the development of students' research skills;
- criteria-based assessment system, as well as a criteria-based approach to the development of control and measurement materials;
- formation of a student's portfolio taking into account academic and individual achievements;
- adaptation of commercial versions or development of your own digital platform (Learning Management System, LMS platform).

5. Pedagogical Conditions for Individualizing the Study of Individual Disciplines at School

The choice of pedagogical conditions for individualizing the study of individual disciplines usually comes down to such technological elements as differentiation of training according to levels of training, according to interests, and here profiling with in-depth study of individual disciplines becomes relevant. Most often, in educational institutions from grades 7-8, the educational process is organized in several areas, for example: physics and mathematics, humanities, chemical and biological classes; and subject to differentiation according to the interests of the designed specialty, engineering and economic classes are created. Work in specialized and

specialized classes requires deep scientific knowledge of the subject, the methodology of its scientific knowledge, modern problems of the science being studied and its practical application, as well as modern teaching methods.

Let us consider the features of differentiation and individualization of education in physical, mathematical and natural science classes, as well as in social and humanitarian classes.

The success of differentiation and individualization of the learning process in natural science subjects increases if the teacher is focused on studying and taking into account the cognitive-style characteristics of students in the educational process. Thus, there is a specificity of the cognitive sphere of students in physics and mathematics classes, who are prone to quickly making and putting forward mental decisions; are self-governing in behavior; use all means of information coding in training; when teaching, they tend to use both synthetic and analytical techniques; belong to the pole of rigid cognitive control. Among the pedagogical methods and techniques for differentiation and individualization of teaching in natural science subjects, one can name the case method, the project approach, as well as research tasks, including the stages of research planning.

For classes in social and humanitarian areas, the emphasis is on designing the educational process taking into account the competency-based approach, as well as methods and activities that develop the communicative characteristics of the individual.

For two directions, practice-oriented and personality-oriented approaches are preserved when organizing classes. When developing curricula, a modular system can be introduced, and the assessment system can be criterion-based and/or rating.

6. Features of the Organization of the Educational Process in a Multidisciplinary Educational Center (Non-State School “Fanskul”) Based on the Concept of Individual Educational Trajectories

As noted earlier, the design of individual educational trajectories by students together with teachers contributes to the development of responsibility for decision-making, as well as the ability to plan one's actions and bear responsibility for the results of choice. If we discuss the technological stages of designing individual educational trajectories, then it can be argued that the essence of designing IET is students making decisions based on a system of individual values and personal meanings, as well as general orientation in the world of education and work. The very term design can be defined as a way of flexible organization of the learning process, taking into account the individual characteristics of students, focused on self-realization of the student's personality through the development of his intellectual capabilities and creative abilities.

When developing technology for designing individual educational trajectories, which are implemented in the non-state multidisciplinary educational center “Funscool”, the following technological stages were identified:

- content-based (determining the educational needs of students and, on their basis, the content of education in the invariant part in accordance with the Federal State Educational Standard and the variable part as part of the development of a system of additional education);
- organizational (technologies, means, forms and methods determined by the individual educational trajectory);
- analytical (continuous analysis and self-analysis of the activities of the teacher and students and, on their basis, adjustment of the individual educational trajectory).

As a set of pedagogical conditions when organizing the educational process, the following technological elements were taken into account (Khutorskoy, 2011; Siberian School of Geosciences [Electronic resource]):

1. Basic organizational and management principles:
 - 1.1 principles of organizing management activities;
 - 1.2 diagram of the organizational management structure;
 - 1.3 principles of formation of management mechanisms;
2. A set of organizational and methodological measures:
 - 2.1 formation of a schedule and schedules for the functioning of a full-day school;
 - 2.2 job description of class teachers, teachers, tutors and psychologists;
 - 2.3 creation of an automated information management system, assessment of management quality;
 - 2.4 a system for diagnostics, intermediate and final assessment of the level of knowledge acquisition, as well as the level of development of the corresponding universal learning activities (ULA) of students;
3. A set of career guidance activities for the development of professional competencies of students:
 - 3.1 Model of early career guidance for primary general education;

3.2 A structural model of a career guidance center, implemented for a secondary school and aimed at developing cooperation with academic partners and companies;

3.3 A system for assessing the effectiveness of the career guidance process and professional self-determination of students.

Using the example of the functioning of the non-state multidisciplinary educational center “Funscool”, it is shown that individual educational trajectories of students are formed from the 1st grade with the assistance of class teachers and tutors based on the results of individual diagnostics.

The diagnostic system when drawing up individual educational trajectories included the following types of testing:

- individual gift card according to the Haan and Cuff method (for 3-9 years);
- tests to determine the psycho-physiological characteristics of students (author’s methodology);
- Torrance test to determine the level of development of creative abilities;
- career guidance tests using the Digital Human method (from 6th grade);
- diagnostic tests to check the level of residual knowledge in various disciplines or interviews with teachers for admission to 1st grade.

When drawing up curricula and basic educational programs, the fact that the educational center is open from 8.30 to 20.00 was taken into account, therefore the invariant part of the main educational program was compiled taking into account the requirements of the Federal State Educational Standard, and the variable part was a list of thematic modules (Table 4), each of which is dedicated to a specific field of activity and contributes to the formation of primary ideas and the development of professional competencies for the corresponding professional field.

Table 4. Types of modules in the system of additional education

Types of modules	Disciplines
<i>Technic Skills</i>	3D modeling, Python programming, robotics
<i>Art Skills</i>	Architecture and design, art, painting
<i>Mind Skills</i>	Logic and combinatorics, TRIZ
<i>Health Skills</i>	Taekwondo, psychology course “The Path to Success”, recreational activities in the pool, introduction to the principles of a healthy lifestyle within the framework of the International Program
<i>Language Skills</i>	German language, French language, foreign literature
<i>Social Skills</i>	Fundamentals of financial literacy, Social Sciences (in Eng)
<i>Science Skills</i>	Fundamentals of Natural Science, Biology (in Eng), Chemistry (in Eng)

For grades 1st-4th — the main educational program of primary general education is supplemented by in-depth study of the English language, and the part formed by participants in the educational process includes such disciplines as: 3D modeling and prototyping, robotics, logic and combinatorics, as well as visual geometry and design (Kovaleva, 2010; Unt, 1990; Lebedintsev, 2013; Shadrikov, 2000; Siberian School of Geosciences [Electronic resource]).

Grades 5th-9th — the main educational program of basic general education is supplemented by in-depth study of individual disciplines in the first half of the day within three profiles (mathematics, natural sciences and social and humanities), as well as the possibility of choosing elective disciplines in the afternoon (Khutorskoy, 2011; Khutorskoy, 2011).

Grades 10-11 — the main educational program of secondary general education is supplemented by in-depth study of individual disciplines in the first half of the day within five profiles (Table 5).

Table 5. Profilization system in the multidisciplinary educational center “Funscool”

Profile	Profile	Disciplines for in-depth study
<i>Engineering profile</i>	<i>Engineering</i>	Physics, mathematics (advanced algebra and

		geometry)
	<i>Computer Engineering Profile</i>	Mathematics (advanced algebra and geometry), Python programming, 3D modeling
<i>Economic and mathematical profile</i>	<i>Economics and IT profile</i>	Mathematics, economics, IT and English
	<i>Economics and Business Profile</i>	Mathematics, English, economics, basics of management and marketing
<i>Natural science profile</i>	<i>Physico-chemical</i>	In-depth study of physics, chemistry and mathematics
	<i>Chemical-biological</i>	Advanced study of chemistry and biology
<i>Social and humanitarian</i>		Social studies, history, Russian language and literature
<i>Socio-economic</i>		Economics, social studies, history, Russian language, literature

At the same time, from the 7th grade, in addition to school teachers, elective disciplines from partner universities are studied in specialized classes. Thus, in collaboration with Russian Technological University, students are given the opportunity to study various IT programming languages of Samsung School and the Yandex Academy Lyceum, as well as the opportunity to take part in excursions to the Inter-Institutional Training Center “Industry 4.0: Digital Robotic Manufacturing” and the Education and Research Center “Smart Manufacturing Systems” — mega laboratories of the Institute of Artificial Intelligence.

The career guidance model developed at Funscool also contributes to the implementation of individual trajectories of students. The career guidance model includes both an expanded program of additional education with several modules and systematically organized project activities. Elective disciplines are grouped into thematic modules, according to the competencies being developed, and every six months it is possible to select 1-2 disciplines, depending on the recommendations of the psychological, pedagogical and tutoring service (Table 6).

Table 6. Types of modules in the additional education system aimed at early career guidance for students

Types of modules	Disciplines		
	1-4 grades	5-9 grades	10-11 grades
<i>Technic Skills</i>	3D modeling Python Programming Robotics		Robotics and Electronics Profile physics Chemistry: solving Olympiad problems 3D modeling and prototyping Python Programming Programming in C++ Web design
<i>Art Skills</i>	Architecture and design Art Painting Animation Basics	Architecture and design Art and cinema Painting Urbanism Art and cinematography	
<i>Mind Skills</i>	Logic and combinatorics TRIZ	Math Slam TRIZ Olympiad mathematics	Advanced Mathematics and Statistics Economics and Entrepreneurship Management and marketing Digital technologies in business management Marketing and market analytics

<i>Health Skills</i>	Taekwondo, psychology course “The Path to Success”, recreational activities in the pool, introduction to the principles of a healthy lifestyle within the framework of the International Program	
<i>Language Skills</i>	German language, French language, foreign literature From 5th grade: professionally oriented translation	
<i>Social Skills</i>	Basics of financial literacy Social Sciences (in English) From 5th grade: Diplomacy Political science Economics and Entrepreneurship	
<i>Science Skills</i>	Basics of Natural Science Biology (in English) Chemistry (in Eng) Physics ProSkill Chemistry ProSkill Science Club	3D modeling and prototyping Bioengineering and bioinformatics “Smart materials” Practical chemistry: solving Olympiad problems Additive and digital technologies in medicine

As an example, let's look at the basics of 3D modeling, which are aimed at students who have an interest and inclination to study technical and natural science disciplines. Mastering this subject allows you to develop figurative and visual perception, as well as solve problems associated with the insufficient level of formation of abstract, algorithmic and systemic types of thinking. The equipment and software used are differentiated depending on the age group: for 7-9 years old, the emphasis is on developing practical skills in using a 3D pen, as well as recreating a three-dimensional image according to a diagram or silhouette. Older age groups (10-14 and/or 15-18 years old) work with software such as: Autodesk Tinkercad, Lego Digital Designer (10-14 years old) and Blender, KOMPAS 3D, FreeCAD (15-18 years old).

The main goal of the robotics course is to develop interest in engineering disciplines. In primary school classes, students develop the ability to program by controlling a robot, and also develop the ability to think creatively and systematically plan their activities from a hypothesis and idea to the release of a prototype. Robotics uses an interdisciplinary approach and allows you to establish cause-and-effect relationships with other disciplines, such as mathematics, the environment and logic. The work program and calendar-thematic planning include classes in which students defend work and project plans: the data presentation format allows them to develop the ability to express thoughts in a clear logical sequence, argue their point of view, analyze the situation and independently find answers to questions. Working in a team develops a number of “flexible” competencies in students: communication, time management, self-discipline, as well as the ability to interact in a team from the perspective of various roles. LEGO Education WeDo 2.0 constructors are used as educational props. Students use ready-made elements responsible for various functions of the robot to assemble a block diagram that allows the robot to complete the task assigned in the lesson. At the basic education level, the development of skills and competencies that were identified in primary school continues (Table 7). Students use ready-made elements responsible for various functions of the robot to assemble a block diagram that allows the robot to complete the task assigned in the lesson. At the basic education level, the development of skills and competencies that were identified in primary school continues (Table 7). Students use ready-made elements responsible for various functions of the robot to assemble a block diagram that allows the robot to complete the task assigned in the lesson. At the basic education level, the development of skills and competencies that were identified in primary school continues (Table 7).

Table 7. Types of universal learning activities (ULA) for the development of research and engineering competencies in the process of educational, research and project activities using WeDo 2.0 (Shipareva, 2023)

Project name	Universal competencies	Target	Programs and developed digital competencies
<i>Predator and</i>	Raising questions and	Modeling LEGO® representations for the behavior of predators and	<i>Speed Up Program:</i>

<i>prey (#1)</i>	formulating problems: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	their prey	1. Basic concepts of the algorithm. 2. Ability to build simple algorithms.
<i>Animal language (#2)</i>	Interaction and cooperation: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Modeling LEGO® representations for different modes of communication in the animal world	3. Understanding the sequence of operations.
<i>Extreme Habitat (#3)</i>	Data analysis and interpretation: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Simulate a LEGO® presentation on the influence of habitat on the survival of certain species.	“On-screen joystick” program: 1. Parallelization of processes.
<i>Space Exploration (#4)</i>	Application of mathematics and algorithmic thinking: <i>No. of projects:</i> 3,4,6,7,8	Designing a prototype LEGO® Rover that would be ideal for exploring distant planets	2. Assignment of execution of various commands to different buttons.
<i>Hazard Warning (#5)</i>	Formulating explanations and developing design solutions: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Development of a prototype LEGO® warning device to warn people and reduce the impact of hurricanes	“Zoom in and out” program: 1. Understanding the principle of operation of cycles. 2. Processing readings from sensors
<i>Ocean Cleanup (#6)</i>	Building an argument based on facts: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Developing a prototype LEGO® device that could help clean up ocean plastic waste	
<i>Animal Bridge (#7)</i>	Search and evaluation of information: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Developing a LEGO® prototype that will allow endangered species to safely cross a road or other hazardous area	Program “Control of two motors”: 1. Ability to work with multiple devices within one program.
<i>Moving an item (#8)</i>	Information exchange: <i>No. of projects:</i> 1,2,3,4,5,6,7,8	Designing a LEGO prototype of a device that can safely and efficiently move certain objects	2. Ability to build program branching with the presence of a condition

At the moment, the system of career guidance activities in schools is not built at the level of addressing issues of connecting relevant digital tools, as well as personnel policy (Shipareva, 2023; Menshikova, 2023; Baranova, 2012; Kovaleva, 2010). Only in certain organizations does a system of tutor support and mentoring begin to appear. At the university level, interest in this area has also increased in the last 3-4 years due to the emphasis in the development of individual educational trajectories, as well as attempts to integrate a competency-based approach into the educational process. At the level of basic and secondary general education, the system of tutor support is aimed at helping to determine the range of interests in a certain professional area, while the tutor does not act as an adviser, but helps with the help of questions to conduct deep self-reflection (Kondakov, 2019; Jansen, 2020; Rusli, 2020; Atchoarena, 2017; Project “Artificial Intelligence”).

Issues of organizing career guidance activities, as well as a criterion system for the success of completing assigned tasks, should be standardized for each region, taking into account territorial characteristics and staffing needs.

Thus, the concept of individualization of the educational process and the development of technology for designing individual educational trajectories represent urgent tasks of modernization of education in connection with the changes occurring in society. A methodology for organizing individual educational trajectories, containing several stages, namely: content; organizational and analytical - was tested within the framework of the activities of a multidisciplinary educational center. The following pedagogical conditions can be identified as

optimal (Khutorskoy, 2011; Siberian School of Geosciences [Electronic resource]):

- 1) Principles of organizing management activities;
- 2) A set of organizational and methodological measures;
- 3) A set of career guidance activities for the development of professional competencies of students.

The prospects for organizing the educational process using individual educational trajectories, starting from grade 1, are shown, taking into account the results of preliminary diagnostic tests. The participation of students in the design of individual educational trajectories allows them to develop universal skills, in particular responsibility for choice, the ability to make decisions, and plan the future taking into account their own goals and priorities.

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