Training of lawyers in the field of megascience projects: innovations in legal education

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Abstract. The article is devoted to the analysis of the prospects for the development of educational programs aimed at training lawyers in the field of megascience projects. Legal support of megascience projects involves legal support of intellectual resources and protection of the results of intellectual activity, legal regulation of financing of these projects, international legal regulation of scientific and technical cooperation, legal support of cyber security, information-law (including anti-defamation) support of media security of these projects, etc. The authors consider the model of educational training of lawyers for megascience projects in the paradigm of interconnection and interdependence of innovative social relations, science, and education. R&D intensity (knowledge-intensity) of educational training of lawyers in the field of megascience is justified and considered as a feature that is no less significant than practice-orientedness (applied directedness), ensuring not only the short-term competitiveness of educational products, but also their long-term and stable prospects due to the incorporation of the latest cutting-edge R&D achievements into education. The authors suggest a term ‘innovative programs for forward-looking areas’ and analyze their capacity for legal support of megascience projects (the current innovative programs implemented at Kutafin University (MSAL) and the MSAL scientific projects that can be the basis for new educational programs). The authors consider the principles for the implementation of innovative programs for forward-looking areas: fundamentality and practice-orientedness (including the institution of ‘community of practice’ and the mentoring institution), R&D intensity, networking, meta-learning etc.

1. Introduction
According to E. Inshakova and A. Voloshina, megascience centers are a mega-economic form of the production of globally significant intellectual products. This form is based on international or transnational capital in accordance with the principle of international collaboration [1].

As noted by Ya.S. Kozheurov and E.S. Teymurov, the term ‘research infrastructure’ is used much more often (with various epithets - large, large-scale, momentous, global, etc.) in legal texts, while the term ‘megascience’ is more typical for non-legal literature[2]. At the same time, these scholars emphasize that the concepts of ‘megascience’ and ‘large (global) research infrastructure’ cannot be equated, as ‘Science is an activity (sphere of activity), and infrastructure includes material world objects that provide this activity’ [2]. In this regard, in our opinion, we should discuss the legal support not for global research infrastructures, but for megascience projects implementation, since in this case, we consider complex dynamic systems that include not only objects of the material world (devices,
installations, etc.), but also a significant information and communication component involving tremendous intellectual resources.

2. Discussion

2.1. Relations in the field of megascience & law & education

Legal support of the megascience projects implementation involves, among other things, legal regulation of financing of these projects, legal support of intellectual resources and protection of the results of intellectual activity, international legal regulation of scientific and technical cooperation (functioning of megascience in the forms of ‘transnational and supranational legal entities, international consortia without the status of a legal entity and European consortia of research infrastructure’, ‘legal mechanisms for the deployment of international megascience installations on the territory of the Russian Federation’ [3], etc.), legal support of cyber security, information-law (including anti-defamation) support of media security of these projects, etc.

Moreover, cutting-edge scientific research on megascience projects is aimed to solve problems of global importance. Therefore, the results of implementation of these projects should entail changes in the structure and nature of existing social relations that are subject to legal regulation. Consequently, it is necessary to predict and model such social relations in order to timely consolidate their legal regulation and avoid the use of such research results for inhuman purposes.

Law is one of the social regulators of social relations, therefore, legal science develops the legal ‘shell’ of these relations. Skills of implementing the legal mechanisms provided for by this ‘shell’ should be translated into the educational process of training of lawyers.

Fig. 1 shows a diagram on which SR2 - social relations requiring legal regulation due to the rapid development of science and technology and, thereby, changes in the social structure; they require understanding and conceptualization in legal science paradigm and the further implementation of such legal academic research in the educational process, i.e. creation and realisation of educational programs that ‘look beyond life’. As the Chinese wisdom says, ‘the best time to plant a tree was 20 years ago’.

![Diagram](image)

**Figure 1.** The cyclical nature of the relationship between social relations, science, and education.
2.2. R&D intensity of educational training of lawyers in the field of megascience

A modern university is an educational hub for navigating an individual educational route in a collective learning environment. Kutafin Moscow State Law University (MSAL) adheres to this principle, acting as an integrator and provider of an end-to-end process of knowledge transfer from legal science to legal practice through education. The undoubted MSAL’s resource advantage in this process is the abundance of recognized scientific schools that create innovative projects (Fig. 2) on the most pressing problems of legal regulation of innovative social relations (projects are supported by the Russian Foundation for Basic Research (RFBR), the Russian Science Foundation (RSF), and other organizations).

Figure 2. MSAL as an integrator.

The research teams of these projects consist of the University departments lecturers which ensure the ‘seamless’ implementation of the results of such fundamental and applied academic research in the educational process (when teaching 1) certain topics of courses assigned to the departments; 2) special courses created as a result of the implementation of scientific projects).

Along with such an urgent trend in the field of higher education as practice-orientedness (applied directedness), the R&D intensity (knowledge-intensity) of education should be no less significant, ensuring not only the short-term competitiveness of educational products, but also their long-term and stable prospects due to the incorporation of the cutting-edge R&D achievements into education. In this regard, educational products should acquire the properties of scientific-educational complexes, which are not only integrated into the curricula, but also are being developed in scientific-educational laboratories (strategic academic units), ensuring the early involvement of students and graduate students in legal science.

The process of training of lawyers in MSAL ensures the synergy of legal science (which is characterized by innovation, fundamentality, interdisciplinarity, integration with practice, predictability) and education (which is characterized by academicism, professionalism, anthropocentricity, fundamentality in combination with practical (applied) orientation). Such synergy can be metaphorically labeled as ‘university DNA’ (Fig. 3). This ‘scientific-educational DNA’ is fully implemented in the new program of higher education in Law ‘Innovative jurisprudence’ (bachelor degree), where the principle of the priority of university (academic) science in terms of determining the educational program content is applied.

The variable part of this educational program includes a wide range of disciplines (courses) of an economic, international legal nature, disciplines in the field of bioeconomics and biosafety, digital law and other innovative educational products that reflect the evolution of modern law and legal education in a networked society.
2.3. *Innovative programs for forward-looking areas: capacity for legal support of megascience projects*

As S. Yu. Kashkin asserts, ‘... life itself challenges legal science, giving the task of creating and developing a new complex branch of law - the law of science (scientific research law). For this, it is necessary to develop and use all the developed by mankind toolkit of science and methodology which could be effectively used in this area of social relations’ [4].

Within the framework of higher legal education at the master's level (LLM), the MSAL implements the program named ‘Lawyer in Science and Technology’ which provides lawyers of the 21st century with knowledge and skills in the field of legal regulation of science, innovations, and technology in modern Russian, foreign, international, and European law. This program includes the following disciplines: ‘Legal regulation of megascience’, ‘Legal protection of intellectual property in the field of science and technology’, ‘American science law’, and other unique courses (disciplines).

In addition, a number of other Master of Laws (LLM) programs (branch 40.04.01 Jurisprudence) related to the legal support of the implementation of megascience projects are being successfully realized at the Kutafin Moscow State Law University (MSAL): ‘Master in Intellectual Property and Law of New Technologies’, ‘IT-LAW Master’, ‘Lawyer in the field of global economy’, ‘Legal regulation of Blockchain technology’, ‘Master of law in the financial sector’, etc.

We propose to call the considered in this article educational programs (‘looking beyond life’ programs) ‘**Innovative programs for forward-looking areas**’. These programs are interdisciplinary programs focused on training lawyers to ensure the regulation of social relations which are predictable, emerging or new in nature (requiring legal regulation due to the rapid development of science and technology and, as a result, changes in the social structure).

In our opinion, department and interdepartmental MSAL research projects have the potential for further deepening and differentiation of LLM programs aimed at training lawyers in the field of megascience projects and other research infrastructures. These projects can be summarized as follows

1. Models of legal regulation of unique scientific installations of the ‘megascience’ class at the national and international levels in the context of the technological development of the Russian Federation.
2. Models of scholarly and scientific-technical cooperation: features and prospects of international legal regulation.
3. Theoretical and applied research of legal regulation of creation and functioning of unique scientific installations of the ‘megascience’ class in the context of development and implementation of the 4th generation Specialized Synchrotron Radiation Source SSRS-4 project.
4. Legal support of the system for recording rights to the results of intellectual activity in the digital environment: development prospects.
5. Scientific substantiation and development of a model of legal regulation of scientific and technical cooperation between the Russian Federation and the countries of the CIS and the EAEU in the fuel and energy sector on the problems of rational use of natural resources, ecology, and environmental protection within the framework of a unified scientific and technical policy.
6. Exclusive rights to patented objects: boundaries, limits of implementation, protection.
7. International energy associations in the modern world: law and practice.
8. Conceptual foundations of legal regulation of the procedure for selection of genetic material for the purpose of in vitro fertilization.
9. Blockchain technologies for countering the risks of cyberterrorism and cyberextremism: criminological legal research.
10. Methods, models, and problems of regulation and protection of subjective rights in the field of obtaining, using, disseminating, and protecting the scientific activities results and scientific information.
11. The concept of legal regulation of genomic research relations in the field of creation and use of bioprinted human organs.
12. The concept of civil legal protection of citizens' rights when using genomic technologies.
13. Formation of conceptual foundations of the mechanism of legal regulation of genome diagnostics and genomic editing.
14. The concept of intellectual rights in the field of virtual and augmented reality technologies (VR and AR).
15. Cryptocurrency as a mean of payment: private law and tax law aspects.
16. Legal support of the environmental safety of the Arctic region in framework of genomic technologies implementation.
17. Evolution of Russian and foreign standards of legal regulation of genomic research: theoretical and comparative analysis.
18. Legal categories, principles, and methods of state regulation and self-regulation of research and developments in the field of the human genome and their practical use in Russia and the world.
19. Artificial intelligence and robotics: a comparative research of legal regulation models in modern states, international organizations, and integration associations.
20. Intellectual law in the context of the big data technology development. Database as an object of intellectual and other rights.
21. Forensic assurance of the safety of the artificial human reproduction process from abuse and crime.
22. Theoretical foundations for building legal models of human interaction with cyber-physical, cyber-biological and artificial cognitive systems.
23. Network law in a network society: new regulatory models.
24. Conceptual framework for the formation of a legal mechanism for self-regulation in the field of genomic research.
25. The use of genetic screening in the management of pregnancy: scientific theoretical substantiation of the concept of legal regulation.
26. Legal regulation of genomic research and the implementation of their results in medical practice.
27. Results of genomic research as an object of intellectual and other rights.
28. Legal problems of protection of genetic information.
29. The law of digital technologies in the legal regulation systems of modern states, international organizations, and international integration associations: a comparative legal research.
30. Storage and protection of full genome sequencing data: development of a conceptual model of legal regulation.
31. Unmanned vehicles: new challenges to transport safety and issues of criminal law regulation.
32. State regulation of genetic engineering activities: a comparative analysis of the legal norms of the Russian Federation and Germany.

2.4. Principles for the implementation of innovative programs for forward-looking areas

The creation and implementation of innovative programs for forward-looking areas requires special attention to the combination of the principles of fundamentality and practice-orientedness.

Fundamentality presupposes scientific character, completeness, and depth of transmitted knowledge based on the preservation of the traditions of legal scientific schools. The indicators of compliance with this principle are as follows: 1) the holder of the program has scientific schools in the fields of legal knowledge corresponding to the educational program and / or its disciplines (courses); 2) the presence of disciplines (modules) based on the scientific projects results in the educational programs; 3) the presence of scientific publications on the subjects of the taught disciplines among lecturers involved in the implementation of the master's programs.

Practical (applied) orientation involves the implementation of the institution of ‘community of practice’ and the mentoring institution.

A community of practice is a group of people who share common interests and support each other in improving and transferring skills in their area of their interest. The term was proposed by cognitive anthropologist Gene Lave and education researcher Etienne Wenger in their work ‘Situated Learning’ [5]. Such a group of people (a community of practice) is a student group that is at the university to learn with the best specialists from the best theorists and practitioners.

The institute of mentoring implies the involvement of practicing lawyers who are not just lecturers, but mentors. These mentors create an atmosphere of intellectual search, teach their ‘apprentice’ (students) the legal craft, work on team building, the development of social and emotional intelligence of students.

The implementation of this principle is possible not only by involving practicing lawyers in the educational program as an employee of an university, but also by developing network educational programs. The Russian legislator did not limit the list of organizations that can be involved in the implementation of network educational programs: educational organizations, scientific organizations, medical organizations, cultural organizations, sport organizations and other organizations that have the resources necessary to implement educational program using the network form[1]. Most of the megascience projects have their own educational infrastructure [6, 7] that facilitates their inclusion in the educational program as a partner organization.

The development of partnerships with the following organizations seems to be perspective: the Skolkovo Innovation Center, the State Corporation for Assistance in the Development, Production and Export of High-Tech Industrial Products ‘Rostec’, the State Corporation for Space Activities ‘Roskosmos’, Joint Stock Company ‘RUSNANO’, as well as scientific-research centers and enterprises creating key components of the FAIR international accelerator complex (FAIR - Facility for Antiproton and Ion Research, Center for the Study of Ions and Antiprotons) and other mega-science class projects: National Research Center ‘Kurchatov Institute’; National Research Nuclear University ‘MEPhI’;  

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[1] Federal Law of December 29, 2012 No. 273-FL (as amended on April 24, 2020) ‘On Education in the Russian Federation’ // RF CL. 2012. No. 53 (part 1), Art. 15.
Institute of Nuclear Physics named after G. I. Budker (Siberian branch of Russian Academy of Sciences); Joint Institute for Nuclear Research; experimental plant of Scientific Research Institute of Electrophysical Equipment named after D. V. Efremov and other stakeholders of the scientific and technical industry.

Network interaction as a necessary attribute of a modern university was emphasized by J. G. Wissema in his book ‘Towards the Third Generation University: Managing the University in Transition’. In his opinion, Universities 3.0 are network universities that cooperate with companies from different industries, investors, private research and development organizations, professional service providers, and other universities in a ‘know-how carousel’ model [8].

3. Conclusion
It should be noted that the following skills are extremely necessary for lawyers in the field of megascience projects: to ‘learn to learn’, to be ready to adapt to changing conditions and immerse themselves in the rapidly changing relations tied with global research infrastructures, delving into not only the legal aspects of their functioning. In this regard, the need for the development of meta-skills - the meta-learning implementation (meta-education) - is clearly actualized.

As Ch. Fadel, B. Trilling, M. Bialik note, at the meta-level of learning, learners reflect, become aware of how they learn, adopt a developmental mindset that inspires them to exert, and learn to adapt their own learning and behavior to suit their goals [9]. In this regard, it is necessary to create conditions for the development of metasubject (metadiscipline) competencies in the educational process of training a lawyer, as they ensure the creation of new knowledge and enhancement of skills in the process of professional activity and self-education.

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