

National research universities as centres for innovative development of Russian engineering and technology education

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Opening Address

ABSTRACT: The results of the priority in governmental support given to leading universities of technology in Russia and who form a network of 29 National Research Universities (NRU) are described in this paper. The activities of these universities provide a systemic influence on the innovative development of engineering and technology education. This is achieved through new educational standards and academic programmes; developing educational technologies, specifically information and communication technologies; training, including continuous training; the improvement of proficiency levels and attestation for scientific-pedagogical personnel; establishing centres for joint usage of unique equipment; and finally, by forming strategic partnerships with high-technology industry and business organisations. In this paper, the authors have endeavoured to demonstrate the status and objectives of the Priority National Project called *Education*.

INTRODUCTION

The establishment of the National Research Universities (NRU) network began in Russia in 2008, within the framework of the Priority National Project called *Education*. The project searches for, selects and, then, supports leading institutions of higher education that are able to create and test innovative methods of management and economic operation. The aim is to increase educational, scientific and innovative activity. Within the bounds of the project to establish the NRU network, the governmental support of academic programmes in universities is exercised on a competitive basis. The academic programmes ought to be developed independently by the universities guided by the main requirement to support the modernisation of the Russian economy, and having regard for the requirements of the universities' own institutional developments.

MAIN DIRECTIONS OF NATIONAL RESEARCH UNIVERSITIES' INNOVATIVE ACTIVITIES

The NRU development programme already has resulted in a breakthrough in the diversification of engineering and technology education that complies with up-to-date requirements for professional, creative and social skills, and competences of graduates. Other achievements are: an independent elaboration of institutions' own educational standards and new academic programmes; flexible academic programmes for various levels of education - first of all, at Masters level in the priority areas of the development of science, technology and associated techniques; close co-operation and interaction with strategic partners in identifying topical competences and content of fundamental and complementary education; and mass transition to multilevel training.

Actualisation and diversification of the content and technologies used by academic programmes are ensured through innovative solutions in the following major areas:

- an interdisciplinary approach as the key principle in the development of new academic programmes;
- the modality of academic programmes to allow individual *trajectories* of education, both to meet the requirements of students and the requirements of possible future employers;
- strengthening the scientific aspect of training, first of all, in programmes at Masters level;
- the introduction of interactive methods of training, based on a qualitatively new level of the usage of information and communication technologies;
- practice-oriented academic programmes that attract specialists from sectors of the economy, both to the development of these programmes and to the process of training, as well as involving students in professional activities in industry [1].

Every university takes steps to ensure an inflow of young and creative staff to scientific-pedagogical work. The common practice is to provide young specialists with scientific scholarships and grants for scientific research and thesis preparation. They may also apply new training methods and further develop the methodical basis of the academic process. Moreover, as a matter of priority, young academics are assigned to special extension courses at leading scientific-educational centres and industrial companies or nominated to head positions in creative teams [2].

Radical modernisation of the material-technical base for research is provided by support funding from NRU development programmes, as well as being enabled by special resolutions of the Russian government and by special-purpose federal programmes. This multilateral support also stimulates the establishment by universities of small-scale innovative enterprises and the realisation of joint university-high-tech industry projects. Simultaneously, measures are taken for the protection of intellectual property and the publication of scientific journals.

One of the features of the support provided to the programme for the development of Russian universities is the possibility of allocating funding to actions and arrangements aimed at improving university administration. These include, among others:

- optimisation of an institutional structure: for example, integrated institutions, centres for the joint usage of unique equipment, subdivisions of innovative infrastructure, establishment of joint structures with strategic partners (scientific-educational centres, specific problem laboratories, etc);
- accreditation of academic programmes, including international accreditation and certification of systems of management of educational and research quality;
- establishment and development of corporate information-analytical structures to support university administration;
- authorities, business community and structures of civil society moving to collective forms of administration (managerial, co-ordination, expert councils) [3].

As an example of an institution's successful and dynamic development, the authors can name the National Research Tomsk Polytechnic University, located in Tomsk, Siberia. The University trains specialists according to its own educational standards, which take into consideration up-to-date international requirements, within the framework of a specially-created personality-oriented educational environment. Tomsk Polytechnic University was the first Russian institution of higher education to join the international project CDIO (Conceive - Design - Implement - Operate) on the modernisation of engineering education.

The realisation of the University development programme has allowed substantial strengthening of its material-technical base, with the establishment of six integrated research-educational institutions and 12 centres for joint usage of unique equipment; the setting up of a complete innovative infrastructure that is a project-designing institute, model shop, three business incubators, 10 innovative scientific-educational centres, 32 small-scale innovative enterprises, and divisions for prognostication and protection of intellectual property. Tomsk Polytechnic University has become the leader among engineering institutions in the volume of completed research and design work, and participates in 20 national technological platforms.

As an important consequence of realisation of the NRU development programme, the aim should be to establish university complexes in the sphere of science-intensive technologies that are able to realise the potential of Russian science and ensure the preparation of a highly qualified scientific-technical professional community supporting the priorities for the modernisation and technological development of Russia [4].

As a result of governmental support, the National Research Universities have provided basic elements of an innovative system for the whole country and its regions, capable of using their personnel and infrastructure resources in a successful transfer of scientific achievements into various sectors of the economy [4].

CONCLUSIONS

The positive results of the initial stage of the functioning of the NRU network leads to the conclusion and acknowledgement of the fact that this particular segment of the Priority National Project *Education*, has become an effective innovation scheme in the sphere of governmental management of the system of Russian higher engineering and technology education.

Further, the institutionalisation of this new variety of higher educational institutions by means of competitive appropriations by category to *National Research Universities*, for the period of 10 years will permit the perfection of new approaches to the modernisation of science and education, with the purpose of producing better personnel and realising the scientific potential of the high-technology sector of the Russian economy.

REFERENCES

1. Дьяконов, Г.С., Жураковский, В.М., Иванов, В.Г., Кондратьев, В.В., Кузнецов, А.М. и Нуриев Н.К., Подготовка инженера в реально - виртуальной среде опережающего обучения (Training of engineers in a

real-virtual environment of advanced education). под ред. Дьяконова. С.Г., Казань: Изд. Казан. гос. технол. ун-та, 498 (2009).

2. Жураковский, В.М. и Сазонова, З.С., Повышение квалификации научно - педагогических кадров: поиск новых организационных форм (Professional development of scientific-teaching staff: the search for new organisational forms). *Высшее образование в России*, **2**, 27-31 (2010).
3. Жураковский, В.М., Управление программами развития университетов как механизм формирования и апробации новых технологий университетского управления (Management of the development programmes of universities as the mechanism of formation and validation of new technologies in university management). *Ректор вуза*, **6**, 6-9 (2012).
4. Жураковский, В.М. и Аржанова, И.В., Развитие системы НИУ: некоторые итоги (Development of the system of NIU: some results). *Высшее образование в России*, **11**, 47-54 (2011).