NETWORK INTERACTION OF RUSSIAN UNIVERSITIES

Andrey Ponomaryev [1], Sergey Vahrushev [2]

[1] *Perm National Research Polytechnic University, Perm, Russia*
614990, 29, Komsomolsky prospect, Perm
e-mail: andreypab@mail.ru
[2] *Perm National Research Polytechnic University, Perm, Russia*
614990, 29, Komsomolsky prospect, Perm
e-mail: spstf@pstu.ac.ru

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Abstract. There are presented models of network interaction between russian and foreign universities of Russian Academy of Architecture and Construction Sciences (RAACS) in the implementation of educational specialists's programmes in a priority development direction of "Urbanistics". In the article are given examples of network implementation models with the participation of the department "Building production and geotechnics" of Perm National Research Polytechnic University.

Introduction

The modern conditions originate a necessity for training of highly qualified engineering staff in one of priority directions of scientific and technological complex of Russia "Urbanistics". The main difficulty in solving of this problem is the lack of resources for the logistical support of modern scientific and laboratory facilities of higher education institutions (HEI) and the lack of a sufficient number of scientific and pedagogical staff - doctors.

Russia national research universities (NRU) network Development has created the necessary scientific and laboratory facilities for the preparation of engineering and scientific personnel. At the moment rapidly establishing research and educational centers (RECs) within the integration of education and science, combining the resources of several universities, with the participation of leading Russian and foreign experts on various priority science, engineering and technology directions. Traditionally, they are created for the main scientific direction, specific to the region, the university, the scientific school, which are the basis of the REC. Their goal is to achieve world-class scientific results on a wide range of research, consolidation in the field of science and education of scientific and pedagogical personnel, the formation of effective and sustainable research teams [1].

The following options are proposed for possible universities network interaction models in the preparation of engineering and scientific personnel on "Urbanistics" priority direction.

1. Model of network interaction within the interuniversity cooperation

Within the interuniversity cooperation the simplest model of network cooperation between universities with the Russian and foreign experts involvement is presented. There is a consolidation of higher educational institutions into the system, in which the university, being before the former completely independent unit, is becoming accepted as one of the cells. At the same time network of such cells is very different, and the cells themselves are too.

The network interaction advantage of this type is that it allows to realize specific basic educational programme training in the framework of higher education by breaking it into separate educational modules, which could be learned in various universities. In this case, the student has the right to choose a place of learning a particular individual educational module in the university, where, by his opinion, there is a competitive advantage and is guaranteed the highest quality training in this section of the educational programme. This allows to provide an students academic mobility, which is an important mechanism for implementing competence-modular approach in education.

Within the framework of interuniversity cooperation, Russia is represented in the European Network for Accreditation of Engineering Education (ENAEE) and, along with the public-professional organizations of Great Britain (ECUK), France (CTI), Germany (ASIIN) and other countries, has right to assign to accredited programs European quality mark EUR-ACE® Label http://www.enaee.eu [2]. This network interaction contributes to exchange of students and established in teaching on the dual educational programmes particularly well. Students, which are studying in this network, get a wider scientific and technical high level education, together with the cultural experience by visiting educational institutions in two or more leading technical universities.

At present time there are signed the contracts of mutual cooperation between the Perm National Research Polytechnic University (PNRPU, Russia), Technical University of Vienna (Austria), University of Applied Sciences (Germany), Volgograd State University of Architecture and Civil Engineering (VSUACE, Russia), Kazan State University of Architecture and Construction (KSUAC, Russia), Novosibirsk State University of Architecture and Construction (NSUAC, Russia), St. Petersburg State University of Architecture and Construction (S-PbSUAC, Russia), Northern (Arctic) Federal University (NFU, Russia), South-Russian State Technical University (SRSTU, Russia), Poltava National Technical University (PNTU, Ukraine), Technical University of Prague (Czech Republic).

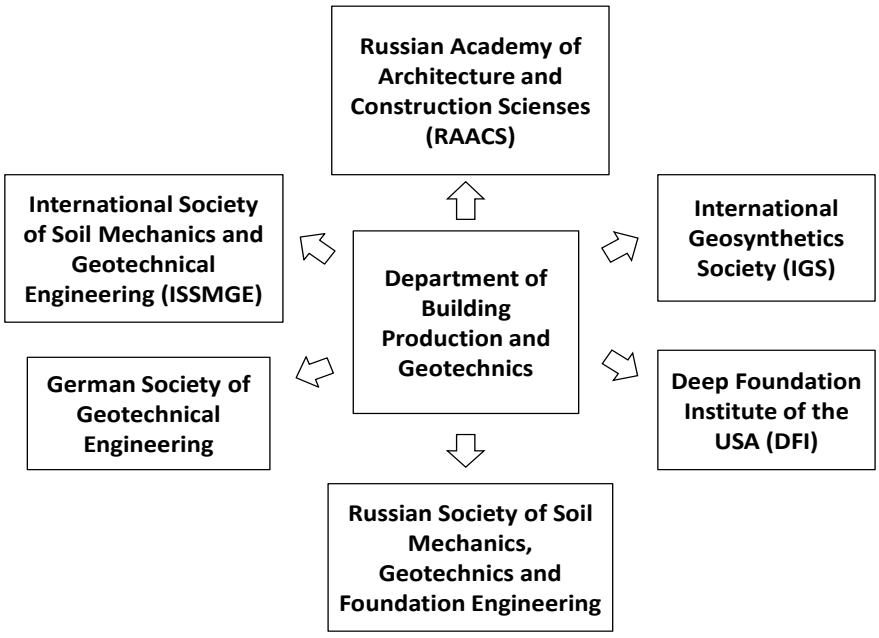

Fig. 1. The BPG department teaching staff participation in international and domestic public organizations

A new form of educational and scientific activity is a short-term involvement of leading professors of Russian and foreign universities in the organization of master classes with the participation of leading experts of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), the International Geosynthetics Society (IGS), the German Geotechnical Society (DGGT), Russian Society for soil Mechanics, geotechnical and Foundation-building (RSSMGF).

In the framework of studies on the higher education problems development the employees of the Building Production and Geotechnics department participated in All-Russian National Conference with international participation "Deep footing and geotechnical problems of the territories" in the period from May 29 to May 31, 2017. The conference was held at Perm National Research Polytechnic University (Russia).

Master classes of leading European geotechnical specialists were held:

- Mario Mansero (Italy), The Polytechnic University of Turin professor with the report "The swelling and osmotic properties of clay soils Modeling";
- Erol Guler (Turkey), Bosphorus University professor with the report "Advantages of using geosynthetics";
- Rolf Katzenbach (Germany), Darmstadt University of Technology professor with the report "Optimized design and independent peer review of foundations and other complex underground structures";
- Serge Varaksin (France), the "Menard" company director with the report "European contribution to soil improvement related to major historical events in the quality control field and application in Russia".

Fig. 2. Participants of the summer geotechnical school on the basis of PNRPU (Russia) together with the Magdeburg-Stendhal University of Applied Sciences (Germany) on June 13-17, 2017

25 German students of the Civil Engineering Faculty from the Saxony-Anhalt state capital accompanied by professors Ulrich Turchinsky and Sven Schwerdt listened to leading

geotechnical experts lectures, got acquainted with the laboratories, new master's programs and research results carried out at the “Building Production and Geotechnics” department.

In addition to valuable scientific knowledge, the school participants received unforgettable impressions from visiting the Perm museums, the planetarium and the Kungur ice cave.

- *It was an unforgettable trip. We really liked Perm. We visited many interesting places. Also we listened to the lectures of leading specialists, visited the laboratory of the “Construction Technology and Geotechnics” department. I and my group mates seriously thought about the possibility of studying at a magistracy at Perm University,* - the Magdeburg university student (Christian Dannenberg) shared.

At the “Building Production and Geotechnics” department it is proposed to establish scientific and educational center to support the construction of urban areas within the priority development direction "Urbanistics" for carrying out world-class research and development, for implementing effective principles and intergration forms of building science, education and business.

On the internships scientific and pedagogical staff basis there is carried out the scientific and methodological support of the international scientific and educational cooperation. There have been further developed joint scientific and educational programmes and projects with foreign partners. The problems of harmonizing regulations of construction documents in Russian and Germany with the geotechnical aspects in the construction in large urban agglomerations are investigated.

2. The regional model of networking of higher education institutions on the national research universities basis

At the present stage of economic development, the construction industry in Russia and abroad is experiencing a significant need for qualified specialists in the design and implementation of construction works "zero cycle" in dense urban areas. The current situation in the market of construction services shows that the most attractive thing for potential investors is the construction at central regions in large cities. Transition from standard construction on the free territory to reconstruction and new construction in difficult conditions of dense urban development is an urgent task for all participants of the modern construction complex in Russia, in the near and far abroad and in the Perm region in particular.

Therefore, at the present time, both for the construction contractors and for designers there is the challenge in the speedy implementation of modern Geotechnology construction, providing on the one hand, production work sparing modes on the existing buildings and engineering structures, and on the other hand guarantees the newly constructed building objects high reliability. One of the limiting factors in the widespread development of such technologies in the Perm region of Russia is currently the lack of civil engineers capable of solving complex geotechnical problems for the development of underground space and urban areas, taking into account the existing historical and cultural development.

One of the important mechanisms for the scientific principle implementation is research and education integration, which results in the creation of scientific and educational center on "Urbanistics" priority direction.

It should be emphasized that the scientific and educational center results should not be the new scientific product only, but a graduate student also, who can introduce scientific development into real production. In this sense, Education and Research Center (REC) is a business incubator that allows young researchers to inculcate the skills of innovation.

It can be distinguished the following types of research and educational centers:

1. Independent institutions realizing research, education and innovation.
2. Interuniversity research and education centers.
3. Independent innovation division leading university, implementing interuniversity cooperation in the selected research directions.
4. Research and Education Center at the university that is developing fundamental scientific directions.

The scientific and educational center is created as a structural subdivision of the University to perform the following tasks:

– meeting the needs of the individual in the intellectual, cultural and moral development through the receiving of higher and postgraduate education;

– meeting the needs of enterprises for qualified specialists with higher education and highly qualified scientific personnel;

– organizing and conducting fundamental, search and applied scientific researches on priority direction of "Urbanistics";

– attracting highly qualified specialists of sectoral international research institutes and the Russian Academy of Sciences in joint educational activities;

– development of new programmes and methods to advance implementation of international practices in the university effective integration of science and education;

– development of programmes to support young scientists.

The regional network interaction model of Higher education institutions on the REC basis is presented in Fig. 3.

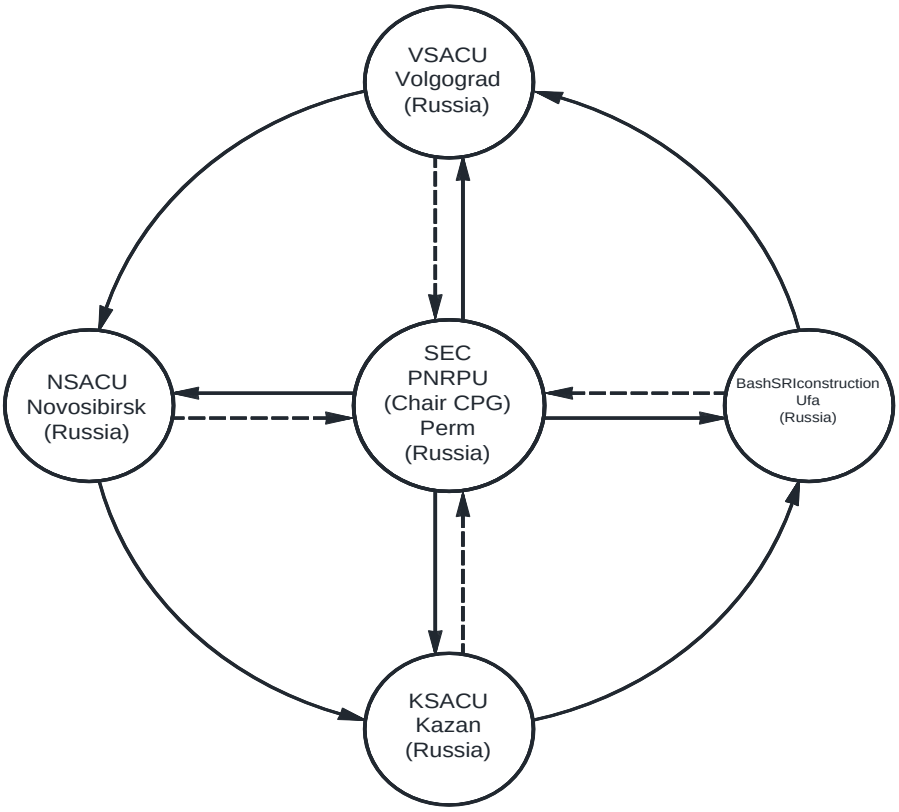

Fig. 3. A regional model of network cooperation between universities on the basis of REC NRU

The network interaction is carried out in the preparation of masters in the direction of "Construction", carried out on the basis of the REC at the Department "Building production and geotechnics", which was created in PNRPU (Perm), together with the Research Institute BashNIIstroy (Ufa), VSUACE (Volgograd), KSUAC (Kazan), NSUAC (Novosibirsk).

The realizing Master Programme "Underground and Urban Construction" focused on the specifics of the subjects participating in this educational network, on the needs of the regional labor market, distance learning technologies and scientific innovation tasks of networking in the framework of the development "Urbanistics" priority direction [3].

The Master program meets the requirements of the criteria of international social and professional accreditation of the Accreditation Center of the Association of Engineering Education of Russia (AEER). It provides for the knowledge of a foreign language at a professional level, deepened fundamental training in the disciplines of general scientific and professional cycles, the mastery of modern information and computer technologies, the formation of a set of competencies, knowledge, skills, methodological culture, internships in Russian and foreign universities providing training for undergraduates to conducting applied research in the framework of research activities in the field of underground and urban of construction in Russia and abroad.

The main employers are:

- design and construction organizations;
- customer services of operating organizations;
- departments of administrations of municipalities;
- development organizations.

Graduates of the master's program "Underground and urban construction" are published in scientific journals that have international and Russian citation indexes, and are prepared for professional activities in the field of design, erection, operation and reconstruction of buildings and structures, design and survey works, design of foundations and foundations , the development of technologies necessary for the construction of underground structures, construction in urban areas, construction on karstopas and additional territories, a survey of the technical condition of buildings and structures, the conduct of scientific research and educational activities.

Competitive advantages consist in formation of such unique specialized competence of masters, as:

- readiness for professional operation of modern research equipment and instruments that allow controlling various parameters of structures during construction and operation in the underwork and karst-dangerous areas;
- the ability to analyze the data of engineering and geological surveys and, on their basis, to select the most rational methods of construction in urban areas;
- mastering the skills of assessing geotechnical risk and forecasting the geotechnical situation when building on an urbanized territory.

3. Model of network interaction of universities on the basis of the REC network within the integration of science and education and intercollegiate cooperation

The presented model best of all meets the requirements of Art. 14 Network Forms of educational programmes of the Law “On Education in the Russian Federation” № 273-FL

from “29” of December 2012. It defines the possible participants in the network form of educational programmes: scientific and industrial organizations with the necessary resources to carry out training; educational and production practices and other learning activities, provided with the appropriate educational programme.

Practically, this model is the union of the first two models. It should be noticed that the REC network is created on the basis of universities with different state status. Within the overall network are formed local networks, thus expanding the networking opportunities and to create conditions to better meet the needs of each student in the implementation of individual educational path [4].

On our point of view, networking has some significant advantages:

– exchange information on current developments in the educational process and scientific research;

– ensures the exchange of delegations of executives, the teaching staff, researchers, graduate students and students;

– organizes internships and retraining of scientific and pedagogical workers;

– creating innovative small groups in goal to carry out research on actual problems;

– organizes conferences and seminars to discuss the results of the joint projects;

– carrying out joint publications on the results of the completed research, review scientific works of the teaching staff, graduate students and students;

– providing the release of periodic joint publications on topical subjects, as well as monographs, educational and methodical manuals;

– joint participation in competitions for grants in the field of education and science;

– using the innovative educational technologies in the educational process;

– expansion of the nomenclature of suggested educational programmes by programme integration with other universities, including foreign;

– improving the quality of education, including with regard to monitoring the quality of education from the partner universities;

– the rating upgrade of the University within the country and abroad;

– integration of material and technical (audience, libraries, technical training aids, campuses, etc.) and human (teaching staff, educational, support and administrative staff) resources of educational institutions - participants networking.

Within the overall network there are formed local networks, thus expanding the networking opportunities and to create conditions to better meet the needs of each student in the implementation of individual educational path. This allows for a specific educational training programme within the framework of higher education by breaking it into separate training modules, which learning is possible in different universities and different countries. In this case, the student has the right to choose their place of study, taking into account the competitive advantages of universities. Thereby providing an academic mobility of students, which is an important mechanism of realization competence-modular approach in education.

Conclusions

The suggested model of network interaction of Russian and foreign universities have proved themselves during teaching in the dual education programmes, where students have an opportunity to double degree with advanced study of a foreign language in two directions (specialties) or two diplomas from various universities during the study of a basic educational programme on the basis of two universities.

The practical importance of carried out innovative research is that the international networking of Russian universities in realization of educational programmes in the preparation of engineering and scientific personnel on priority direction of "Urbanistics" has great potential in various regions of the world.

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