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Novosibirsk State University. Integration of Education, Science, and Business

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Abstract—One of the most important directions of higher education reformation requires a combination of education, scientific research, and business, which is successfully implemented by Novosibirsk State University. The educational process at the university includes students' research work aimed at solving applied problems and interacting with business structures, which contributes to training of practice-oriented professionals.

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The history of reforming the educational systems of the Old and the New World demonstrates both various reasons for the necessity of reforms and the difference in their objectives. And while in relation to the mentioned educational systems it is possible to see certain logic in the necessity of reforms, unfortunately, in relation to Russian education there is mostly no such logic in justification of reasons and objectives of the reformation.

The approach, in compliance with which today's reformation concepts emerge, namely, numerical indicators go first and methods to achieve them follow, can be hardly considered optimal. Reformation has to be preceded by a search of development benchmarks, in our case – higher education development benchmarks.

Such concepts as "strategic partnership of science, education, and business," "integration of education and science," "innovative economy" etc., which have already become commonplace, are in fact the reference points determining directions for development both of the state in general and the scientific and educational sphere in particular. The main danger in conducting reforms is a result "as always." The success of socioeconomic modernization is directly related to the development of science and education. Far-reaching reforms have to be accompanied with investments into education and research.

Experience in integration of science and higher education in Russia is the repetition of the past taking into account previously learnt lessons (or ignoring them). Therefore, Novosibirsk State University's half a century of experience in interaction with academic (fundamental) science can be useful to determine vectors of development of the modern scientific and educational complex.

The history of creation, operation, and development of Novosibirsk State University (NSU) demonstrates the dialectics of development of a unique scientific and educational complex consisting of the Siberian Branch of the Russian Academy of Sciences (SD RAS) and Novosibirsk State University. The university was not established in compliance with the generally accepted rules and it is organized in a very specific way, which often led to a desire on the part of the governmental agencies responsible for education to put it into the framework of standard regulations and deprive it of its individuality.

Novosibirsk State University Today

Mikhail Alekseevich Lavrent'ev, one of the founders of the Siberian Branch of the Russian Academy of Sciences, wrote, "The creation of Novosibirsk State University was the first step in implementation of one of our main principles, which is to combine scientific research with training of personnel for science, higher education, and industry in Siberia. We were given a unique opportunity to create a higher educational institution that is ideally suited for integration of education and science. We

tried to make full use of the experience accumulated in this area by Moscow Institute of Physics and Technology, as well as by Moscow and Leningrad Universities. We had all conditions for that as both the founders of Moscow Institute of Physics and Technology and scientists who had been teaching in this Institute and at Moscow University for many years were among the NSU founders."

In March 1959, the Presidium of the Siberian Branch of the Academy of Sciences approved the general provisions on the principles of operation of Novosibirsk State University, which included involvement of senior students into research works carried out in the research institutes of Akademgorodok; involvement of researchers in teaching activities and supervision of the students' research works; and organization of the educational process in senior years of education in compliance with individual curricula, reflecting the current status of science.

For M.A. Lavrent'ev, S.A. Khristianovich, and S.L. Sobolev, the NSU founders, Novosibirsk State University represented a special type of an educational institution, in which the constituent elements of scientific knowledge mutually enriching each other were concentrated. Novosibirsk Scientific Center, a part of which is NSU, was created as a community of sciences with a significant representation of different areas of natural science knowledge, mathematics, and informatics. This community of sciences, this interdisciplinarity is one of the recognized university traditions.

In Novosibirsk Scientific Center the university was viewed by its founders as a catalyst for development of science and introduction of its achievements into practice. The strategy of anticipatory development of the university in relation to research institutes was absolutely evident. This strategy became a guarantee for development of the scientific center, for its mobility, and for creation of conditions for adequate response to new, continuously emerging research directions. Anticipatory training of young specialists was also a means of implementation and introduction of the fundamental science achievements into practice. Such an approach to training of specialists was reflected in the formula proclaimed by M.A. Lavrent'ev, the first Chairman of the Siberian Branch of the Russian Academy of Sciences, as follows: "science – personnel – production." This formula is still in force. In Akademgorodok, alongside with the Institutes of the SD RAS, there are other actively working institutions and companies, including Akademgorodok Technopark, SibAkademInnovatsiya and SibAkademSoft Associations of Small Innovative Enterprises, large IT-companies, and small innovative companies working under NSU. This special creative research environment contributes to the formation of innovative culture of the university graduates.

Novosibirsk State University is 50 years old. The outcome of half a century of work has demonstrated that integration of higher education and fundamental science in training of personnel in the scientific and educational environment of NSU – CD RAS – high tech in combination with a system for selection of talented youth has fully proved its value. Without losing its previous qualities, the university has acquired new ones.

Today Novosibirsk State University includes School of Physics and Mathematics, Higher College of Informatics, 13 faculties, postgraduate and doctoral programs, Institute of Professional Retraining, and a science and research section. More than 6500 students study at NSU. There are 15 bachelor and 46 master programs, one specialty of higher professional education and four specialties of secondary professional education.

At present, NSU is actively developing several directions of work.

No university can be considered a university if there is no science. Novosibirsk State University has always had a clearly expressed mission, which has not changed since the moment of its foundation. It is to train specialists for science, higher education, and business. The latter is, of course, a result of perestroika.

For five decades of the university operation science and education or education and science (in this context the order is not important) have been always going together. Scientific activities have been integrated into educational work and vice versa. It is most important.

There are no NSU teachers who are not busy with active scientific work. Lectures and seminars are based not simply on "book" knowledge, but on knowledge gained by teachers themselves in the course of their research works.

Such is the face of Novosibirsk State University; that is why its role and place in Novosibirsk, in

Siberia, and in Russia are quite clear. Let us provide some figures confirming the significance of NSU: in recent years 30% of young specialists entering the Academy of Sciences are NSU graduates, though, NSU is not a large university with only 6500 students.

Science in NSU develops both on the basis of the SD RAS institutes and on the basis of the scientific and research section of the university. Interesting research development works are carried out in NSU laboratories. Control tools created in NSU are used on all GLONASS satellites; laser systems are in demand both in Russia and abroad. Novosibirsk State University develops such promising areas of science as nanotechnologies, electronics, medical biotechnologies, laser systems, new methods of cancer therapy, molecular design of new pharmaceuticals, and biodegradation of oil field waste.

Science in NSU is not and will never be in opposition to science in the SD RAS. Our relationship is only getting stronger. Of course, the state provides funding for development of science in higher educational institutions; however, it only increases competition and activity and, in our case, enhances cooperation between those who are willing to cooperate and for whom new achievements and scientific breakthroughs are most important. Let us use a metaphor: to pull out a car that has got stuck it is necessary to rock it. Science also needs rocking. In addition, in our case it creates a lot of joint projects. At present, there is simply a "good rocking" of our scientific opportunities, both fundamental and applied, going on. There is a wide range of applied areas that are beyond the competences of the SD RAS institutes. As for NSU, the university science is aimed at addressing primarily applied tasks. Some laboratories of the NSU scientific and research section are even called "applied laboratories." As a result, we fill the niches that are not covered by the Academy of Sciences. In this sense, there is no competition between the applied scientific activities of the university and academic science; the university activities are a kind of a bridge in solution of common scientific and applied problems. It is a mutually beneficial cooperation, which contributes to development of the research institutes, the university, and Technopark in Akademgorodok. For example, an institute of the SD RAS achieves a breakthrough in a fundamental area of science, after which the university initiates applied research works, which can later turn into interesting projects implemented in Technopark.

It is possible to say that at present there is not a single Russian institution of higher education that is as much integrated with science as NSU. Neither are there such institutions abroad. In Japan and South Korea there are research centers that are organized in the image and likeness of Novosibirsk Scientific Center. However, such a deep integration with science as in NSU is achieved nowhere. At least, it applies to exact and natural sciences.

The ability to generate innovations is a key to future well-being. Significant activities of NSU are associated with innovative projects. For the last few years the university has implemented a number of large projects and development programs. It has given a new impetus to development of NSU.

In 2009 Novosibirsk State University received a status of a "national research university." One of the main points in the application of NSU was preservation and further development of the principle of integration of science, education and, business, as well as close cooperation with innovative business, state corporations, and enterprises. Five priority areas of the university development, embracing all faculties of the university, have been identified. Implementation of the program will allow NSU, among other things, to make a new step in training of masters, which is to switch to a project form of training of masters and postgraduate students. Teams of masters from different faculties will be formed for implementation of these projects; the team members will not only receive classical knowledge, but will also develop projects together with specialists from related areas.

In September 2010, Novosibirsk State University became one of the winners of the competitive selection of innovation infrastructure development programs (Resolution of the Government of the Russian Federation no. 219). The program is managed by a specially created NSU Centre for Innovative Development.

In October 2010, NSU together with Uniskan, an innovative company, was among the winners of the open public tender held by the Ministry of Education and Science of the Russian Federation, entitled to receive subsidies for implementation of complex projects on creation of high-tech production facilities (Resolution of the Government of the Russian Federation no. 218). The interdisciplinary team of NSU works on the creation of the physical, medical, and biological basis for a fundamentally new automatic device for monitoring blood pressure variations,

applying advanced photonics methods. The work is carried out on the basis of "NSU Laser Photonics and Optoinformatics" complex, which has a strong experimental basis for conducting modern research and scientific and technical development works.

At the beginning of November 2010 the Government of the Russian Federation supported 40 projects on research works to be carried out in Russian higher educational institutions under the guidance of the leading world scientists (Resolution of the Government of the Russian Federation no. 220). Novosibirsk State University was chosen as a site for implementation of six of these projects. Three well-known scientists came to work at the university. They are Evgenii Zakharov (by the way, a NSU graduate), Petr Chumakov, and Manfred Thumm, top experts in the field of physics and medical biology. Under their guidance a number of laboratories have been established on the basis of NSU; research works aimed at developing new oncological agents are carried out. Teams consisting of NSU staff members and students have been formed to implement these projects.

A little more than a year ago scientific organizations, including higher educational institutions, were legally allowed to establish small innovative enterprises. Nine enterprises of this type have been formed within NSU. Moreover, in NSU these innovative enterprises do not simply exist on paper, but they are real enterprises, which sign contracts, implement advanced technologies, and create new products.

There are great successes in the work of NSU. Let us use the Technoskan Company as an example. This company, headed by S. M. Kobtsev, Doctor of Physics and Mathematics, produces laser systems, supplied to the leading world research centers. Another example is represented by an electrical equipment testing system for space vehicles developed under the guidance of A.M. Zadorozhnyi in the department of atmospheric research of the scientific and research section of NSU.

Training of innovative and engineering staff is another very important task we also pursue.

International programs. Novosibirsk State University develops partnership relations with universities in Europe, Asia, and the United States. Student and academic exchange programs and joint scientific projects are implemented. German, Korean, Japanese, and French Centers, as well as Confucius Classroom have been created and successfully work in NSU.

Since 2005 a double degree program and master programs have been implemented together with the leading French universities. There is a practice of joint scientific supervision of NSU graduates who enter postgraduate programs in the United States, China, and New Zealand; academic supervision of international postgraduate students is performed, as well as other forms of international cooperation.

In 2009 NSU became a winner among the Russian higher educational institutions forming the Shanghai Cooperation Organization University in such an area of specialization as "Information Technologies." The university became a member of the consortium of the leading higher educational institutions in the post-Soviet space, forming the CIS Network University in such areas as "Economics" and "Management" for training of master students.

In summer 2011 Russian-Chinese Institute was opened in Harbin with the support of Novosibirsk State University. Teachers from NSU will conduct classes in the Institute in the Russian language and in compliance with the Russian educational standards.

A good infrastructure is a basis for NSU development. Our university is involved into solution of tasks related to construction activities in Akademgorodok. Technopark and NSU dormitories for master and postgraduate students are under construction on the territory of Akademgorodok. Novosibirsk Scientific Center cannot survive without the development of the infrastructure and the influx of investments. Otherwise, an outflow of personnel, which is going on even now, will increase in future and will be a serious hindrance to the development of the scientific center. The development of Novosibirsk Akademgorodok is impossible without the involvement of innovative structures and business entities, without decent salaries and interesting work, and without the creation of a comfortable environment (starting with comfortable housing conditions and ending with pram-friendly paths).

The problem of NSU development is lack of space for educational, scientific, and innovative activities. For many years the university has trained first-class specialists in extremely confined spaces. By now a design project of a new academic building of NSU has been developed and its construction has been started. The second dormitory for master and postgraduate students is under construction.

Successes of NSU students and graduates are an indicator of the quality of education. The development of any university and the success rate of any higher educational institution should be judged not by their positions in rankings (although NSU is stably ranked among the top five best higher educational institutions of Russia according to different sources), not by its infrastructure, and even not by the number of grants. High quality of NSU education is confirmed by the successes of its talented students and graduates. It is pointless to list all their achievements and victories as they are well-known. The most important is that education given by NSU allows its graduates not to get lost in the stormy sea of life and to find a way out of any situation.

As demonstrated by the analysis of reports of employment centers, there are almost no NSU graduates among the applicants. They adapt well and are in demand on the labor market. Many NSU graduates work in scientific organizations and government agencies, or are successful in business.

Every year more than 35% of the university graduates enter postgraduate programs of NSU and the institutes of the SD RAS. More than 20 institutes of the RAS are headed by former NSU graduates; they occupy management positions in higher educational institutions, in federal, regional, and municipal executive and legislative authorities, and in business entities; they have established different effectively operating enterprises of the federal level and more than 100 small innovative companies. Many NSU graduates work for large Russian and international companies.

Among Novosibirsk State University graduates there are winners of prestigious international awards and prizes (the Fields Medal and Prize and the European Physical Society Prize), more than 100 winners of the Lenin Prize and the USSR State Prize, Prizes of the Council of Ministers of the USSR and the RSFSR, Presidential Awards for science and education, prizes of the Government of the Russian Federation, and prizes of eminent scientists.

However, first of all, many NSU graduates are creative individuals. To be able to solve problems, to think, to find a way out of any situation, and to be not a simple specialists but a unique virtuoso are the most important things they learn in Novosibirsk State University.

A person possessing certain competences is simply a qualified researcher or a qualified worker. But it requires experts for the society to move forward. Our students and graduates possess not only skills and abilities, but also elements of expert knowledge allowing them to foresee and forecast. If a specialist can only reproduce something, this person is a performer who possesses certain knowledge, skills, and abilities. However, it is very difficult to think of something new, something that no one has done before. But how interesting it is!

Novosibirsk State University is a Higher Educational Institution of a New Type

In this section let us pay attention to the main characteristics of Novosibirsk State University allowing it to be one of the best universities. Inheriting the best traditions of Novosibirsk Akademgorodok, NSU is actively developing under continuously changing conditions. The university forms its own concept for training of specialists.

When talking about the fundamental principles of NSU, academician Ilia Nestorovich Vekua, who was the first rector of NSU, said, “The widespread popularity of our university was largely caused by the novelty of the conceived plan of its organization. NSU is a higher educational institution of a new type. Concentration of fourteen different institutes, provided with the latest scientific equipment, on a relatively small area and, finally, concentration of large teams of scientists in these institutes created absolutely unique conditions for restructuring of the traditional forms of university teaching. The university founders and its future staff members came to a unanimous decision that the entire system of education should be subject to the main goal, which is from the very beginning to give students skills and abilities for independent work, creating the widest opportunities for that, in particular, ensuring free access to the university laboratories. It was expected that senior students would be included into teams of researchers working on urgent problems and would gradually start learning scientific research methods.”

The complex structure of Novosibirsk Scientific Center opens new prospects for organization of the educational process. Scientists working in modern science are involved in teaching activities at all stages of the educational process in order to ensure new quality of education. Academician M.A. Lavrent’ev proposed a slogan, “There are no scientists without students.” The university is, first of all, communication between scientists and students; it is their community.

Novosibirsk State University is directly related to research institutes; according to the plan of the founders of Akademgorodok, students had to attend lectures of scientists "doing science in academic institutes." Even now classroom lessons alternating with classes in the university laboratories create an atmosphere of creative research in NSU. Continuity of generations and love for Novosibirsk University are achieved not only because the university gives fundamental knowledge in various areas of science, but also due to informal communication between teachers and students, well-known scientists and young specialists.

The relationship between the Siberian Branch of the Russian Academy of Sciences and NSU is still based on the principles of partnership and equality. Science and education are as closely interconnected in Novosibirsk Akademgorodok as 50 years ago. And as long as this fundamental principle works, both the Siberian Branch of the RAS and Novosibirsk State University can continue their development.

Novosibirsk State University uses the following approach in teaching students: students not only solve problems, the answers to which were found long ago, but they also take part in research works. Therefore, students pass both phases of education: classical ("small students" and "great teachers") and research (almost equal cooperation). This system is unique.

To get acquainted with the real research process students are involved in the work of the SD RAS institutes. Every year about 2500 students take part in performance of scientific projects in the laboratories of the institutes. General education, fundamental training takes three years and two more years are dedicated to very serious practical training in corresponding departments, which are located not only in NSU, but also in the institutes of the SD RAS. This system was formed in NSU when it was founded and it still works this way.

Novosibirsk State University sets very high requirements to bachelor, specialist, and, especially, master qualifying works. To enroll for master programs it is necessary for students to have published scientific works. Every year the university holds about 30 international, national, and regional scientific conferences and seminars, as well as scientific and education schools for masters and young specialists.

The specific feature of the university is a system of competitive selection and training of talented young people applied here. In NSU there is a multilevel model of continuing education – from school to doctoral programs and the system of additional higher education.

Novosibirsk State University supports and develops the system of continuing education, which fosters the students' interest in science. Since 1962 the Siberian open school children's competition in natural science disciplines, aimed to attract gifted children and talented young people to scientific activities, has taken place. The prize-winners and winners of the competition are invited to Novosibirsk Physics and Mathematics School (currently, Specialized Teaching and Research Center of NSU) where they continue education under original programs and are given wide opportunities to begin their scientific and research activities. Apart from that, there are correspondence school of physics and mathematics, correspondence school of humanities, and summer school of physics and mathematics, which teaches school children from 30 regions of Russia and from the neighboring countries and beyond. For many years now NSU has regularly held international scientific student conferences, which also have sections for school children, where they can present their first scientific works.

Below we will provide more detailed information on Novosibirsk Physics and Mathematics School (PMS).

Specialized schools of physics and mathematics were established in Moscow, Leningrad, Novosibirsk, and Kiev by Resolution of the Council of Ministers of the Soviet Union on August 23, 1963, in accordance with the academicians M.A. Lavrent'ev and A.N. Kolmogorov's proposal.

Novosibirsk Physics and Mathematics School became the initial link of the triune system of training personnel for science: "School – University – Academy of Sciences." This structure for training of highly qualified personnel has brought novelty and doubtless value to the system of Russian higher education and world fame – to Novosibirsk Akademgorodok.

It is flexibility and a focus on abilities, talents, and interests of students that distinguished Lavrent'ev's approach to education. And that is exactly why he considered it "necessary to introduce specialization as early as in the seventh or eighth school grade and to form schools and technical schools according to

children's inclinations. There is no point in trying to give everybody a standard amount of knowledge, to teach everybody according to the same curriculum. We should let young people with a strong calling upgrade their skills in the selected area and assist them to reach the apex of their craft and to reveal their talents more fully. <…> Strictly speaking, the idea to select and teach young people with abilities in a certain area is not new; there are art, ballet, and music schools. We are doing exactly the same, admitting children with distinct abilities for exact and natural sciences to PMS. We select young people not by their parents' funds or connections, but by their own abilities. As practice has shown, PMS is an efficient way to enter the university and big science. Today the task is not simply to open a way for talented people, but to look for these talents and to guide them from their school days."

This approach is still relevant today; it implies the necessity of early individual development of students taking into account their aptitudes and interests, the importance not simply to "hammer" knowledge into students but to prepare them for real activities, and, finally, the necessity to look for talents in the most remote parts of our country. People think, talk, and argue about it, they try to implement it. M.A. Lavrent'ev made it a reality half a century ago.

In 1988 Novosibirsk PMS was used as a basis for establishment of the Specialized Educational Scientific Center (SESC) with physical-mathematical and chemical-biological areas of specialization of Novosibirsk State University.

At the beginning of the 1990s an idea of multilevel continuing education was actively developing in Russia. At that time Novosibirsk State University made a proposal to organize an educational and scientific center of informatics. During the same period Higher College of Informatics (HCI) was established on the basis of Novosibirsk Polytechnic School and became a part of the NSU structure. The objective of the college is to conduct early professional training of talented young people in informatics and programming.

The "SESC/HCI – University" educational complex implements the main principle of continuing education, according to which every new level is a kind of foundation for students, relying on which they can consciously choose their professional careers depending on their intentions and capabilities and decide whether to continue education or start working.

The educational process in NSU always included original programs developed by well-known scientists and elective courses allowing students to look at a problem or a phenomenon from different angles; the educational technologies of the university always suggested the presence of a creative component. There is a traditionally large block of elective disciplines, which are funded from extra-budgetary means, in NSU. Due to this the ratio of teachers and students is actually kept at a level of 1:7 [instead of 1:10 (10 students per each teacher), which is funded from the budget].

Everything that was founded 50 years ago also requires modernization, serious development, and improvement. However, it has to be done carefully, following the principle of "doing no harm."

As for the interaction between NSU and the Siberian Branch of the Russian Academy of Sciences, undoubtedly, NSU has to develop even deeper integration. The university also has to integrate with state structures, the Russian Academy of Medical Sciences, and the Academy of Agricultural Sciences.

It is necessary to increase the university's interaction with business structures (large enterprises and small innovative companies). The model of NSU integration with research institutes is actively carried over into the sphere of the university's partnership with business; joint research laboratories, educational and scientific centers, and centers for development of competencies have been created by NSU in cooperation with such companies as Intel, Hewlett-Packard, and Parallels and with such associations of small companies as SibAkademInnovatsiya and SibAkademSoft. Upon requests and with the participation of potential employers the university develops master programs, programs of continuing professional education, and practice-oriented bachelor programs, special courses and workshops corresponding to the current level of science development.

There is active development in integration of the university education and high-tech companies and innovative enterprises. The leading employees from high-tech companies teach NSU students. About 90% of them are NSU graduates and they understand perfectly well how important it is for business to take part in training of specialists. The graduates of NSU have passed through the system of feedback with academic institutes themselves, then they have established their own companies, and have come back

to university to teach students. It is the second round of feedback.

Implementation of the "science – personnel – production" system based on the feedback principle contributes to generation of new knowledge, new subjects, and new courses of lectures. The NSU – SD RAS system created a certain model for further development of the university and NSU integration with high-tech innovative production companies. And this system is indissoluble because it relies not simply on official documents but on relationships between people.

As for the technopark structures and innovative clusters, which are planned to organize in Akademgorodok and which will surround the university, their establishment, undoubtedly, requires engineers and innovative business managers. However, training of engineers for the innovative sphere should not be mass-scale. Such specialists are piece goods. At present, NSU together with the administration of Novosibirsk region are solving a problem of training highly qualified engineers; there has been the first enrollment into the NSU Center of Engineering Training (master programs for innovators).

The university gives serious business education; there is a Presidential program for training innovative business managers; there is a faculty of economics. Students from different faculties can choose to attend business education and innovative business programs as optional subjects.

Novosibirsk State University is looking for a balance between sensible conservatism and innovations in educational programs and technologies, in scientific and research activities, and in human capital development.

Below is how we see the functioning of a higher educational institution. It is necessary to pay attention to the Western model, which has proved its efficiency. There universities themselves do not deal with implementation and innovative development problems. First of all, universities are educational institutions, the task of which is to generate, preserve, and transfer knowledge, whereas innovative activities have to be taken outside the university boundaries. It is small enterprises in the structure of universities that bring ideas up to samples or normal technologies, the transfer of which takes place later. In the West once again they create a belt of implementation; however, all brands, as a rule, were born in universities. The same scheme was used by M.A. Lavrent'ev in the creation of Akademgorodok. It is a very progressive step to create small enterprises in the structure of higher educational institutions; however, everything should be done in an absolutely legal, well thought out, and careful manner, from the very beginning achieving agreement of the parties (who orders the project, who will implement the project etc.). These first steps have to be absolutely positive.

In the Program of NRU NSU Development the mission of the university is stated as follows: "NSU is a research university; we teach researchers, conduct research works, and assist to the implementation of the research results." The university trains broadly educated, creative-minded professionals. It is even usual to talk about a special "university type of thinking."

The main characteristics of the university have been described above. Firstly, NSU teachers are represented by researchers and scientists, one of the best in their area. Secondly, NSU students are necessarily involved in scientific work. University students not only have to pass state examinations, but they also to develop a thesis with a research component. Thirdly, education and science is only one side of the coin. The university cannot do without business and innovations. It is necessary to involve business in educational and scientific activities, in participation in academic councils, and in teaching. Of course, it is a difficult task, especially under conditions of the Russian legislation in force. Fourthly, the system of continuing education in NSU and Novosibirsk Scientific Center is a system of school subject competitions, summer schools etc., which makes it possible to inspire young people with serious science. Our university would never be the university it is now if there were no PMS and HCI. Fifthly, the well-developed system of interfaculty cooperation in NSU contributes to the creation of new interdisciplinary master programs and the formation of an innovative worldview among the students. Classical university education implies the presence of a wide range of specialties. The university should have an environment formed, inter alia, by people of creative humanities-related professions. And, sixthly, in strong universities it is possible to observe training of specialists according to individual trajectories, i.e. several years of general fundamental education are followed by individual training and special courses in senior years of study. Thus, the university trains specialists possessing not only competencies but also expert knowledge.

All this has allowed NSU to "keep the brand" for as long as fifty years.

Problems and Prospects

One of the problems hindering the development of education is low salaries of university teachers. Higher educational institutions train future scientists; however, at present the teachers' salaries are much lower as compared to employees of scientific organizations.

In recent years higher education has faced two main problems, which are a reduction in the number of students resulting from a demographic decline and a decrease in the quality of the school graduates' training level. The school graduates' level of knowledge is especially low with regard to exact sciences. For example, NSU has to introduce "leveling subjects" for first-year students, providing them with the basics of the school curriculum. The university entrants come from different cities of our country (60% of students are nonresidents) and all of them have different level of training. However, at university they study together as one course. Therefore, it is necessary to level their knowledge. It is not easy to study in NSU; in the first year the dropout rate reaches 5–10%.

A question of adjusting the university admission system has been raised. For example, in Western higher educational institutions the admission rules for 80% of students are determined by educational institutions themselves.

An important way for further development of the educational sphere is its close integration with science and business. Mutual steps and interest of all the parties are necessary on this path, whereas the state has to create legislative conditions and incentives for such integration.

Barriers for the development of cooperation are related to the fact that educational institutions, as a rule, try to maintain their academic independence and are not always ready to the interference of business into their activities. Business representatives, in turn, do not always clearly understand or can formulate the competencies that should be possesses by the specialists they need. To solve such problems it is necessary to introduce institutional and infrastructural changes. Thus, an important form of NSU integration with academic science is joint use of the material and technical base. However, the adopted legislative acts, regulating such cooperation, are in contradiction with the Tax Code of the Russian Federation. There is a need to introduce tax benefits for business structures making investments in the sphere of education. It will make it possible to increase extra-budgetary funding of higher educational institutions and will attract medium-scale business companies, which have no possibility to create their own corporate universities and educational centers, to development of the educational system. Naturally, in this context, it is necessary to develop a system of public monitoring of education and to introduce a transparent system controlling the distribution of funds allocated to higher educational institutions.

At the same time, we should note the specific character of NSU as a classical university, which is largely focused on anticipatory training of highly qualified personnel in priority areas of science and technology. For example, by training specialists in nanotechnologies the university anticipates the needs of business, which has no demand for such specialists yet. Anticipatory training of specialists suggests a necessity to develop the graduates' adaptability to current and future changes. It should be taken into account in the development of the university curricula, suggesting their flexibility, which is difficult to formalize and to fit into the existing educational standards. The failed attempts to bring the educational standards of all higher educational institutions of the country to a common denominator, the failed attempts of general systematization are well-known. It is also impossible to avoid a problem of the formation of indicators for licensing and accreditation, as this problem applies to the entire system of higher education in Russia. Partly it is solved by providing national research universities with a right for independent development of educational programs and standards.

For a long time the scientific community has been justifiably concerned with the universal introduction of the "bachelor-master" system, which has an adverse effect on the Russian system of higher education. For many areas of specialization this scheme alone is not sufficient. Undoubtedly, this system develops mobility; however, very often it is a one-way movement to the West. And if we are switching to this scheme, it is necessary to address the problem of developing master programs in Russia quite seriously.

In this connection special attention should be paid to international cooperation issues. As stated above, NSU is actively developing such cooperation, which is a right thing to do. However, it is necessary to make

certain efforts to prevent the students' mobility from turning into an only one-way process, i.e. only in our students' movement into other countries. Russian education should become attractive and prospective for students from all over the world.

It should not go unspoken that there is a problem of age composition of the academic and teaching staff. This problem requires urgent solution.

Returning to the issue of NSU development, first of all, it should be noted as most important that the traditions and settings, determined at the time of the university foundation, have not been lost; they are still important. There would be no academic institutes without the university, whereas NSU itself would never exist without the institutes. It is a foundation, a basis for our education and scientific work.

The measures undertaken by the government of the country aimed to support higher education have contributed to almost complete renewal of both instructional and research laboratories and to creation of common use centers together with the basic departments.

Now NSU faces a problem of the infrastructure renewal. The strategic task is to make Novosibirsk Scientific Center and our university even more attractive for young people, for those who are willing to do science and business in the field of high technologies. The solution of this complex problem requires the development of infrastructure, construction of affordable housing, students' dormitories, the university academic building, and entertainment centers. It is necessary to establish structures interesting for the business community, including innovative and start-up companies. All this ensures comfortable conditions for training, working, and living. The university, the Siberian Branch of the Russian Academy of Sciences, and the local authorities, working together, have to do everything possible to achieve this goal.

Akademgorodok have all the necessary elements to create an innovative system; it has a very serious potential. However, it is not as much in demand as we would like it to be and, first of all, it is not demanded by innovators. Probably, the reason for that is that there are very few of them yet. There seems to be a lot of developments and there are tools, but there are not yet enough people who can implement all this. This problem applies not only to our Akademgorodok but to the entire country; everything depends on the people.

At present, we are trying to adjust the system, signing agreements with the institutes of the SD RAS, state corporations, and business structures. We are actively developing master programs and working in the above-mentioned directions. However, everything is moving slowly. The government of the country has clearly specified a general vector for development; however, changes take time. This situation will change and we will move to a knowledge-based economy. However, this work should be performed in a consistent manner without undue haste, but, at the same time, without delay in certain aspects.

The right thing to do is not to "reinvent the wheel" but to take the best from what has been previously developed, at the same time, preserving our own best. In education, like in science, it is necessary to act without haste to do no harm. There is no doubt that the educational system needs reformation. We are ready for changes and openness; we are actively working in this direction. Russia is not so rich to immediately make heavy investments; therefore, we should move forward step by step.

As for Novosibirsk State University, we would very much like NSU to welcome a lot of young people, who are happy to communicate with teaching scientists and teaching business people, in another fifty years. We would like the university to have even stronger interaction with all Academies of Sciences, to have its own serious research base and an even better developed system of work with school children. We would like the university to be reasonably integrated in the international scientific, educational, and innovative space. We would like the state and business to support education and science on mutually beneficial terms. We would like the university to always hold different intellectual, cultural, and sport events and we would like the university students and staff members to be their active participants. In any case, we would like it to sound always in a justified and impressive way when we say, "Vivat, Russia, NSU, professors, and students!"

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