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TÍTULO: Implementación de la estrategia de desarrollo de la ciencia: soluciones nuevas y no estándar.

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RESUMEN: El documento discute las principales tareas de las actividades de investigación en las universidades en el contexto de la implementación del proyecto nacional "Ciencia". En el trabajo se especifican indicadores que permiten garantizar la presencia de Rusia entre los principales países del mundo dedicados a la investigación científica. Se dan las características de los instrumentos utilizados en la práctica de la universidad; en particular, para resolver los problemas de la investigación científica, mejorar la calidad y la eficacia de la investigación en curso, y la eficiencia del proceso educativo.

PALABRAS CLAVES: universidad, desarrollo científico y tecnológico, investigación, ciencia, investigación y Desarrollo.

TITLE: Implementation of the Science Development Strategy: New and Non-Standard Solutions.

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ABSTRACT: The paper discusses the main tasks of research activities in universities in the context of the implementation of the national project "Science". In the work, indicators are specified that make it possible to ensure the presence of Russia among the leading countries of the world engaged in scientific research. The characteristics of the instruments used in the practice of the particular university for solving the problems of scientific research, improving the quality and effectiveness of on-going research, and the efficiency of the educational process are given.

KEY WORDS: university, scientific and technological development, research, science, research and development.

INTRODUCTION.

The 21st century is the time of rapid scientific and technological progress when a new stage of social development is being formed: an economy based on knowledge with the leading role of intellectual production, high-speed time change in the development of scientific knowledge.

States with advanced manufacturing technologies and unique knowledge will be included in the group of the world elite and will occupy a leading position in world ratings. One of the factors of scientific and technical progress is the level of scientific development, which causes the need for state support of science as a source of economic growth, a realization of the intellectual potential of citizens, ensuring the use of science and technology to meet the needs of members of society.

In modern conditions of the transformation of society and state, the scientific potential and its ability to produce high-tech technologies are the leading determining factors of development. The world is on the verge of a new, 6th technological order, the basis of the economy of which should be science-driven, high-tech industries, a synthesis of scientific achievements in new scientific directions.

Science, innovation and human capital are the determining factors in the competitiveness of the country's economy. Russia in the coming years should take a leading position among the leading countries. The task set by the President of Russia is “to go to the development of the economy, gain a foothold in the five best economies in the world” determines the importance of the scientific

development and the realization of its achievements, which, in turn, will allow our country to compete with dignity on the world stage.

DEVELOPMENT.

Theoretical and methodological aspect of the studied problem.

The implementation of scientific and innovative policies and the practice of its implementation in our country and abroad were studied in the works of Zh. Komarova, N.I. Ivanova, O.G. Golichenko, I.G. Salimyanova, S.E. Ushakova, L.A. Korshunova, etc. The scientific community maintains a constant interest in the problems on the effective implementation of scientific and technical policies, the instruments that allow the technologies for the productive development of scientific activity both in academic institutions and universities in Russia and abroad to put into practice. The analysis of "successful practices" in the scientific development in universities was revealed in the works of I. G. Dezhina, O. G. Leonova, O. V. Fedorets, A. V. Schepilova, etc.

In connection with the urgent tasks outlined by the Government of the Russian Federation, it is necessary to "take a fresh look" at the prospects for the scientific development, determine the tools for solving the tasks and the role of universities in the implementation of the scientific policy of Russia as a whole.

Because of the foregoing, this work aims to identify effective instruments that can be used in university practice to solve the priority tasks of the scientific policy of our country.

The methodological and theoretical basis of the research consists of work on the issues of scientific, technological and innovative development of various countries, research on the scientific potential of universities, as well as the role of the state in managing scientific and technological development, the role of universities, scientists and specialists from Russia and abroad in scientific and technological development.

The following methods were used in the paper: the comparative-legal method in the process of analysing regulatory legal acts of the state scientific and technical policy; the diachronous

(periodization) method for the study of qualitative and quantitative changes in the formation of state policy in the field of the scientific development in the modern period and with a forecast for the long term; the dialectic method in preparing specific recommendations and determining the authors' own position on the formation and implementation of an effective state scientific and technical policy; the structural method, the method of statistical observations in ascertaining the dynamic characteristics of the scientific development and the indicators characterizing this development; analysis and synthesis; factor analysis to identify specific factors that determine the current state of the national scientific and technological development of the country.

The above methods, in conjunction with general logical methods and techniques (induction, deduction, analogy) made it possible to comprehensively and effectively conduct this study.

Results and their discussion.

One of the strategic priorities of the modern economic policy of Russia is the creation of a competitive scientific sector and the use of new technologies in the real sector of the economy. The main directions of the country's science development are reflected in the Decrees of the President of the Russian Federation [1], and the national project “Science”[1]

These documents set a strategic goal to provide a place for Russia among the leading five countries of the world that carry out research and development in priority areas of scientific and technological development, ensuring the attractiveness of work in the Russian Federation for scientists and young promising researchers, and increasing the internal costs directed to research and development.

An instrument for realizing the ambitious goals of the scientific development is the national project "Science" which consists of three Federal Projects. It identifies the main 5 tasks which are aimed at achieving goals, defined the indicators that allow the implementation of the National Project to track. It is expected that as a result of the implementation of this project, by 2024 the number of publications in international databases and patents bases should double, the share of domestic expenditures in GDP for research should increase from 1% to 1.7%, the number of scientists per

[1][2].

10,000 employees should be at least 111 people, and the number of managers of Scientific laboratories under the age of 39 should be at least 50% (Figure 1).

Place in the world	2017	Indicators for entering the top five leading countries	2024
		Number of publications in international databases	
11	57 909	→	115,818
		Number of patents	
8	29,777	→	59 554
		Share of domestic research costs in GDP (%)	
8	1.11%	→	1.66%
		Number of scientists in research and development per 10,000 employees	
4	111 pax	→	Not lower than in 2017

Fig. 1: Indicators for the entry of Russian science into the number of five leading countries of the world.

During the implementation of the National Project, 15 world level RECs will be opened, 14 centres of competence of STI will be created; it is planned to involve 250 large and medium-sized Russian companies to implement projects by the created centres in the processes which involve the development of technologies, products, services, updating at least 50% of the instrument base of products manufactured by leading organizations. At least 500 Russian academic periodicals should be included in international databases; 5 agricultural and biotechnological parks will operate; 210 sea expeditions on research vessels will be completed; 250 new scientific laboratories will be created, at least 30% of which will be led by young researchers.

According to the plans of the Ministry of Science and Education, Russia should take 5th position among other countries (currently occupying 11th position) in terms of the number of publications in international databases, 5th position in terms of the number of patents (now 8th position), 4th position according to the number of researchers, with the condition that 50.1% of all researchers must be under the age of 39 years.

Achieving these indicators will allow Russia to become one of the leading countries in the world in terms of the scientific development, i.e. such ambitious goals of Russia are nothing more than the challenge, a certain challenge to itself and its abilities. It is worth emphasizing that the main

producers ensuring the fulfilment of the above indicators are research institutes and higher educational institutions [Uporov, 2018]. Today, they are entrusted with the main task in solving the priority areas of state policy within the framework of the National Project.

Science in Russian regional universities has never been their competitive advantage, but the tasks set by the government cannot be solved only by federal and core universities. In our opinion, some indicators indicated in the project cannot be achieved without the participation of regional universities. In particular:

- Training of at least 10,000 students in educational programs of the priority areas of scientific and technological research.
- Implementation of at least 7500 research projects in priority areas of scientific and technological development.
- A 2.1 times increase in the proportion of graduate students who submitted a dissertation for the degree of candidate of sciences by 2024, with 30% of those defending of the total number of successfully defended, the main scientific results to be published in at least 2 journals indexed in international databases data.
- Support of at least 1000 young promising researchers within the framework of stimulating domestic Russian academic mobility.

In order to understand what tools the universities have for implementing the tasks set in the national projects of the Russian Federation, whether there are tools for a breakthrough in scientific research, what and how can be changed in the universities' management in order to achieve the necessary results in their scientific activity, it is necessary to consider possible mechanisms for managing science in a university using the example of one of the regional universities, namely, FSBEI HE "VSUES".

The main goal of scientific research activities (hereinafter referred to as SRA) of the University is to improve the quality and effectiveness of on-going research, increase the efficiency of the educational process as a result of introducing the achievements of the scientific research activities.

The quality and effectiveness of scientific research activities can be measured through the number of publications that are prepared according to the results of research and income from their implementation. The first goal of the National Project, the primacy in science among the leading countries of the world, is just measured by determining the leadership position of the country by specific weight in the total number of papers in areas determined by the priorities of scientific and technological development.

Today, the effectiveness of universities in science is low in comparison with research institutes, especially if to evaluate them by such an indicator as to the number of publications and their citing. One of the tools to improve the quality and effectiveness of research is the collaboration of research teams of research institutes and universities in joint scientific activities, the creation of basic departments and joint laboratories.

The result of combining the efforts of the university and academic scientific powers will manifest itself in a systematic increase in the number of scientific papers, grants, and increased research income from the real sector of the economy. One of the tools to stimulate the work of scientific and pedagogical staff and the heads of educational departments (directors of institutes and department heads) are the introduction of performance assessment through the rating system. Since the main executor of the university’s performance is its scientific and pedagogical staff, it is advisable to cascade these indicators from the upper level to the lower one, stimulating their performance through bonus payments to the salaries of higher-education teaching personnel for achieving high results and additional payments to heads (heads of departments and institutes) for performance indicators by structural educational subdivisions.

The performance indicators of the University's structural educational subdivisions in the context of all areas of activity, in particular, and research activities are monitored once every six months, while the plan values are compared with those achieved. Based on the monitoring results, analytical reports are prepared and deficiencies in the work of structural units are identified, and the relationship between the deviations of indicators from their planned values is also fixed. It must be

emphasized that the list of indicators included in the rating system for evaluating the performance of the University's departments is fully consistent with the list of University performance indicators for monitoring the performance of higher education organizations.

As practice shows, the use of this tool allows us to maintain a positive steady time course of publication activity, both in national and international databases of scientific citation at the university for several years [Shashlo, 2017]. So, in 2018, the number of papers published in the WoS database has almost 2 times increased (Figure 2).

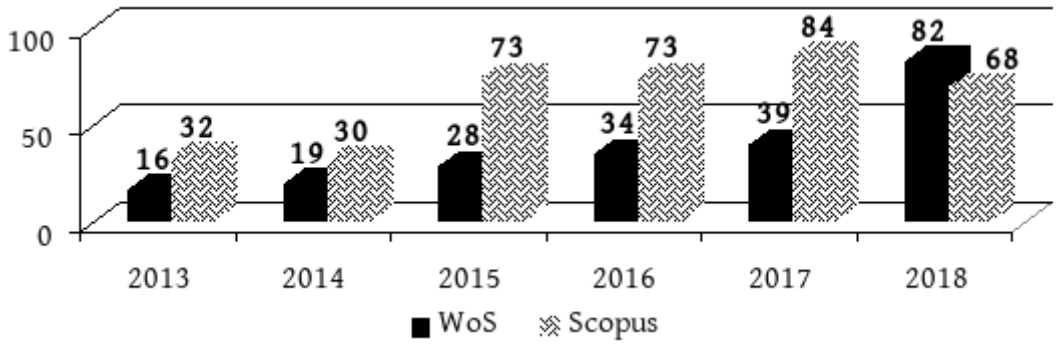

Fig. 2: The number of VSUES publications in the Scopus and Web of Science databases.

The number of citations from publications of VSUES employees is also increasing, which confirms the relevance of the research (Figure 3).

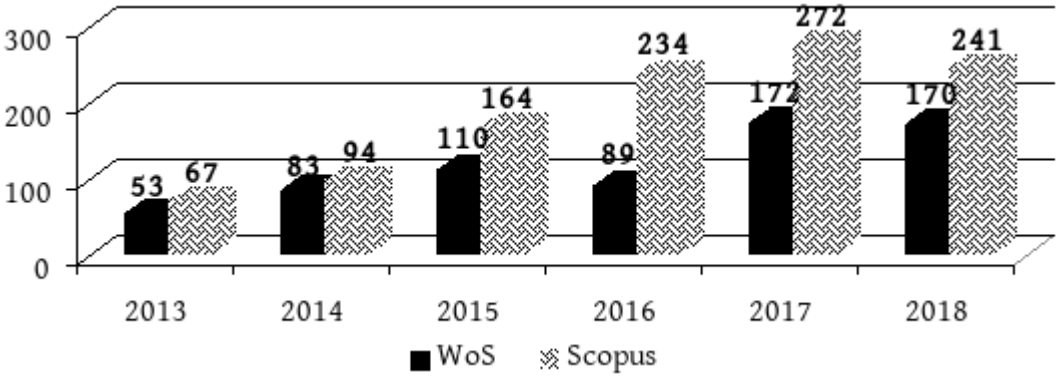

Fig. 3: Citation of VSUES publications in the Scopus and Web of Science databases.

The next goal of the project is to ensure the attractiveness of work in the Russian Federation for Russian and foreign leading scientists and young promising researchers. The indicator is focused on the number of Russian and foreign scientists working in Russian organizations and having papers in

recognized scientific journals. The number of Russian and foreign scientists working in Russian organizations and having papers in scientific publications of the first and second quartiles in international databases should be 31% by 2024.

The university implements projects that integrate the potential of the teams of academic institutes and university teachers, which affects the quality of scientific research demonstrated in scientific publications prepared by them with the participation of students and graduate students, and also affects the number of defences of dissertation research, the growth in the number of grants supported by Russian science foundations. Thus, 14% of the total number of papers were published in periodicals of 1-2 quartiles indexed in Scopus and WoS in 2018 [Petruk, 2019] (Figure 4), with more than half of them performed by teams of scientists.

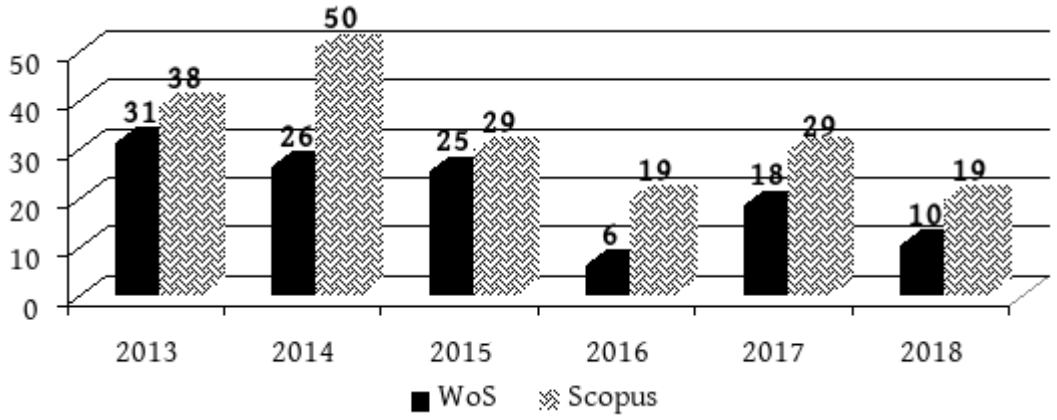

Fig. 4: Publications of VSUES in periodicals of 1-2 quartiles indexed in Scopus and WoS.

The second indicator is an increase in the share of researchers under the age of 39 in the total number of Russian researchers. The actual problem of many universities and academic institutes is the ageing of scientific personnel, and it has also affected VSUES. A tool for changing the current situation is the program for the reproduction of scientific and pedagogical personnel developed and adopted for implementation.

The main goal of the program is the reproduction of the University's personnel potential, the development of new scientific ideas and scientific knowledge, the integration of science, education and production, and the stimulation of the active scientific activity of the University's departments.

The project is aimed at supporting the scientific research of young scientists, attracting, preparing and securing promising scientific and pedagogical staff at the University, including young researchers (under the age of 35).

Within the framework of the program, 8 research areas have been created.

The project provides the following opportunities for young researchers:

- Carry out fundamental and applied for research work in a specific scientific field, providing an increment of scientific knowledge.
- Develop and implement research projects on pressing scientific problems under the rule of an experienced scientist.
- Receive targeted funding from the University, external sources (for example, grants from scientific foundations, research orders from outside organizations, etc.); from the funds of Institutes and departments obtained through the commercialization of the results of their research activities.
- More fully reveal their creative abilities by contributing to the organization of scientific work.
- Interact with the scientific community of leading Russian and international research centres and laboratories.

The support of leading scientists, scientific teams of schools can provide an advanced level of scientific research at the University. The support of young scientists creates an opportunity to consolidate talented youth in universities.

Increase in domestic costs for research and development from all sources is one of the goals of the National Project. An indicator with which we can evaluate the achievement of this goal is the internal costs of research and development from all sources. It is impossible to apply this indicator in its pure form for universities since the financing of science in Russia is measured from all sources. Therefore, it is advisable to analyse the income from the implementation of research and development. In addition to the above scientific collaborations, the tool that increases these incomes is project and practice-integrated training (hereinafter - PIT).

Since 2015, VSUES has been implemented a model of practice-integrated training which provides for the assignment of students in the period of the educational process for enterprises in the region for a period of 6 to 8 months.

The concept of practice-integrated training organization consists of integrating professional practice with the educational program, acquiring hands-on experience in professional activity and performing graduation qualification work on the order of a living enterprise. This approach to training further guarantees graduates their employment, professional growth and makes it possible to realize them in the region. For the University, this is one of the opportunities to receive orders for research and development from the real sector of the economy, solve urgent problems of business entities and receive income from fulfilling orders related to scientific and scientific-technical services and developments. According to monitoring data, 67% of VSUES graduates remain to live and work in the Far East.

Another modern tool for generating income from the research is the use of project training in the implementation of educational programs. Modern society poses the challenge for higher education institutions of training students who can quickly adapt to various situations, independently acquiring the necessary knowledge; think critically on their own; competently work with different information; are capable of self-development; adapt quickly in a team. Students participate in projects initiated by state and municipal authorities, representatives of the real sector of the economy.

Implementation of joint projects allows students to acquire skills and build competencies that are in demand on the labour market, and the university to perform research, including those initiated by external customers.

Thus, the use of the introduction of design and practice-integrated training in the educational process, the collaboration of researchers from among academic institutes and university teachers make it possible to increase the level of income from the implementation of scientific research activities [29].

Based on the study, as well as taking into account the solution of the scientific and technological development problems in the Russian Federation, it is possible to determine the tasks of universities within the framework of the scientific policy implementation by the Russian Federation soon:

- Implementation of scientific projects in priority areas of scientific and technological development;
- An increase in the number of promising young researchers.
- Participation of young and promising researchers in the program of academic mobility.
- An increase in the number of graduate students who defended their thesis at the deadline for graduate school.
- An increase in the number of publications indexed in Scopus and WoS, including in scientific periodicals of 1-2 quartiles.

CONCLUSIONS.

The recognition of science as a complex structured sociocultural phenomenon at the present stage of civilizational development of society and assigning it a significant role in the formation of the sixth socio-humanitarian technological order as an adequate response to technological challenges of the 21st century is one of the key factors in ensuring the competitiveness of the countries of the world.

One of the strategic priorities of the state policy in Russia is the scientific development and innovation, the key goals of which are reflected in the national project "Science". The effective use of scientific achievements will allow the country shortly to achieve leadership among the leading countries of the world. However, domestic science is capable of fulfilling its key and crucial role in modernizing society only under certain conditions, namely, a radical transformation of the attitude of the state, sufficient funding, and improvement of the mechanisms for organizing scientific work of research and the creation of conditions for evaluating its results.

As an analysis of practice has shown, VSUES uses the following tools to solve the tasks set by the Government of the Russian Federation in the National Project "Science": material incentives through rating support of teachers and scientists, targeted training for graduate and postgraduate

programs, practice-integrated and project-based training of students, the formation of scientific collaborations which will solve the tasks set by the state in such areas as:

- Development of scientific research of universities in priority areas of scientific and technological development of Russia;

- The use of new approaches and practical solutions in organizing the scientific activities of universities that ensures the implementation of the development strategy of university science.

The solution to these problems correlates with the tasks reflected in the strategy of VSUES until 2023.

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