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# Designing a pedagogical model of professional development for young leaders of research teams

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**Abstract- The aggravation in recent years of the demographic crisis of Russian science, expressed in the aging of the faculty of higher education and increased international competition for talented highly qualified workers, leading to the outflow of young scientists from the Russian Federation to the external environment, requires an operational solution to the problem of ensuring the development and replenishment of scientific personnel, including updating the corps of leaders of research teams for Russian science. Goal. To work out a pedagogical model to ensure the professional development of young scientists acting as potential leaders of research teams in a gender-differentiated environment of the university, including the network community. As the methodological foundations for designing the professional development of potential leaders of research teams were identified systematic activity and acmeological approaches. The empirical research was based on the combination of qualitative and quantitative strategies. A qualitative approach (an in-depth semi-structured interview) was organized with 20 young scientists and is aimed at identifing key problems and barriers to the growth of young Russian scientists, as well as mechanisms that contribute to overcoming them. The quantitative part of the study (online questionnaire survey, which involved 105 from 11 subjects of the Russian Federation was intended to confirm / refute the put forward statements. Results of Research (specific copyright research results are given). The results of an empirical study showed that more than half of the participants of the study have a pronounced need for the organization of scientific and methodological support to move to the position of the head of the scientific team to implement the state tasks and grants from scientific foundations. In this connection the worked out pedagogical model offers a variant of scientific and methodological support for the professional development of young scientists through a specially organized system of interconnected actions, pedagogical events focused on understanding professional experience, personal transformation, actualization of self-development, contributing to the achievement of professional success of both the youngest scientist and the research team as a whole. The model can be used in scientific and educational institutions for the formation of a scientific policy in regards to the replenishment of existing and newly organized scientific teams by young scientists.**

**Keywords – System-activity and acmeological approaches, Professional development of young scientists as potential leaders of research teams, Edhocratic teaching style.**

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## I. INTRODUCTION

As noted by V.S. Stepin, "today all attention is paid to human-sized self-developing systems, since the success of socio-economic transformations is primarily associated with the role of a person as a subject, not only being in the movement, but producing this movement and reproducing itself in the process of its movement" [1].

The successful development of Russian science at present largely depends on the following factors:

- the need for urgent transformation of organizational processes in scientific structures;
- consideration of a high level of uncertainty in the development of scientific processes;
- the dominance of behavioral aspects in making managerial decisions;
- progressive increase in the complexity of the tasks;
- control nonlinearity on the whole,

which requires a change in approaches to the preparation of a new generation of scientists capable of quickly making complex decisions. At the same time, in recent years, of particular concern is the aggravation of the demographic crisis in Russian science has caused particular concern, associated primarily with the growing aging of the faculty of higher education institutions and increased international competition for highly qualified workers, which leads to the loss of the most competitive part of scientific personnel due to the departure of some of them abroad for economic reasons. In 2017, the number of researchers under the age of 39 in the Russian Federation was 157,805 people, or almost 44% of the total number of Russian scientists [2]. According to the Federal State Statistics Service [3] "... in 2017, in the Russian Federation postgraduate study was opened in 1284 organizations (of which

599 are universities), a total of 93 thousand students studied there, but only 2320 people completed their studies defending a dissertation." The average age of a researcher in the Russian Federation is 63 years, doctors of science - 51 years, candidate of science - 47 years [4]. According to the Federal State Statistics Service, the number of candidates of sciences under and including the age of 29 at the end of 2017 amounted to 3,153 people (which is 27% lower than the same indicator in 2010), at the age of 30-39 years - 20772 people; the number of doctors of science under the age of 29 is 32; at the age of 39, it is 566 [5, p. 480]. In general, a tendency toward a decrease in the leadership potential of Russian science should be noted. So, in the report of a Corresponding Member of RAS S.M. Rogov to the Presidium of the Russian Academy of Sciences it was noted that for the period of the speech "... 16 thousand doctors of sciences from Russia work in the USA alone", which undoubtedly contributed to the cessation of the existence of a number of Russian scientific schools and a decrease in the scientific level of many of the remaining [6]. An important indicator of the personnel crisis in Russian science is the age structure of scientific personnel that has changed in recent years, with a significant predominance of young and old researchers. Since "the maintenance of a creative atmosphere in research teams, the active transfer of traditions, experience, relationships in scientific schools at universities and scientific organizations, at all times, is mainly provided by representatives of the most active generation of middle-aged researchers, the current situation leads to further complication state of Russian science " [7].

We failed to overcome the problems in the international scientific exchange. Thus, O. Yu. Osipova notes that "at present, the low degree of participation of Russia in the international scientific and technological exchange is caused not only by the crisis socio-economic situation, which is exacerbated by the lack of an adequate scientific and technical policy and effective mechanisms of state regulation of the sphere of science and innovation,

but also by the lack of highly qualified personnel of a new generation, independent in thinking, with high leadership potential, highly motivated by creativity and innovation" [8, p. 143]. In addition, it should be noted that Russia, at present, takes 49th place in the world in terms of the composer indicator of the UN Gender Inequality Index. Among university rectors, about 85% are men, while among teachers, their share is about a third; higher professional education among employed have 58% of women and 42% of men [9]. The discrepancy between the high level of education, labor activity and ambitions of Russian women and their low career achievements in the country is very high, which should also be taken into account when conducting research in this direction. To solve the above problems in recent years, the state has developed a number of tools (awards of the President of the Russian Federation in the field of science and innovations for young scientists, scholarships and grants of the Government of the Russian Federation, RNF and RFBR competitions, government tasks funded at the level of ministries, federal and regional scientific organizations, etc.), but the situation has not yet been completely reversed due to the well-known bureaucratization of these processes and the presence of a legally improvable corruption component. In the medium term, the emerging negative trends can lead to a decrease in the activity of scientific teams, and the situation will be aggravated as a result of the growing process of natural withdrawal of representatives of the older generation from scientific teams, including current executives. It should be noted that in the country as a whole, according to the study "Russia 2025: from staff to talent", it was revealed that the deficit of new specialists in the "knowledge economy" able to deal with the challenges of the future in Russia in the next 8 years will amount to 10 million people [10]. There is an opinion that "scientists with organizational skills, able to lead research teams of small and large areas, can be roughly estimated using the Pareto principle today in 20% of the total number of scientists in this category" [11, p. 57].

Therefore, the preparation of young scientists to work as potential leaders of research teams is clearly becoming an urgent problem in the medium term. In this regard, the aim of the study is to work out a model for the professional development of potential leaders of scientific teams in a gender-differentiated environment of the university, including the network, community, contributing to an increase in the number of young scientists who are ready to eventually lead promising research areas in their own universities.

IJIET paper format font should be 10 in times new roman with single spacing.In recent years, the accessing of multimedia data or digital data has become very easy because of the fast development of the Internet. In other words, this development makes unauthorized distribution of multimedia data. For the protection of multimedia data, a solution known as watermarking is used. After the approximate 20 years' research, different kinds of watermarking algorithm based on different theory concepts were introduced [1-3]. A digital watermark encodes the owner's license information and embeds it into data. Watermarking may be used to identify the image of owners' license information and to track illegal copies.

## II. LITERATURE REVIEW

The main goal of state policy in the field of education, science and technology of both our country and other states, according to numerous researchers [12, 13, 14], is "... the transition to innovative development, the formation of a

knowledge-based economy" [12, p. 23]. In the world, the demand for labor requiring expert analysis (expert thinking) or complex communication is growing rapidly; employers are interested, first of all, in employees who are able to think critically and creatively solve problems, open to new knowledge and innovative approaches, able to communicate effectively and work in a team [15]. It should be noted that the complexity of the development of the innovative sphere of Russia, as is remarked by E.A. Shmeleva, is also "... the inability of the old system of innovation management to new conditions and requirements of socio-economic development, and therefore, in modern conditions, special attention is paid to the formation of innovative potential and innovative activity of the individual" [16, p.13]. Strengthening positions in the innovation sphere is associated, first of all, with the human factor and, in particular, with solving the problem of forming a new generation of managers who are able to accept modern challenges and effectively carry out innovative activities.

Therefore, today it is the head of the research team who is the integrator of group scientific activity. B. Karloff and S. Soderberg note that "those organizations that have succeeded in convincing people to direct their efforts towards reaching a collective goal achieve outstanding results by doubling and tripling them ..." [17, p.181]. Reality-changing leaders in the scientific literature [18, 19, 20, 21] are represented as people "... stimulating their followers to go beyond the limits of self-realization, which have an" influence that inclines to innovation, encourages the creation of new perspectives and modes of action, the emergence of new ideas" [18, p. 67]. Currently, it is leadership that is recognized as a key factor in a number of models of organizational change, for example, Burke-Litvin model [22], which allows us to estimate the scale and complexity of variables within the organization, Weisbord's "six cell model" [23], which is based on "... on the idea of an organization as an open system and the principle of equivalence and interconnection of cells", as well as in integrated models of management quality with the function of the initiator of changes, for example, EFQM (Business Excellence Model of the European Foundation for Quality) [24]. "The lack of leaders" with the overwhelming need for those who could take on this role in the conditions of the transformation of world science, is considered as a key problem in many studies [25, 26]. Therefore, ensuring the professional development of young scientists in order to form a new generation of leaders - leaders of research teams of different levels becomes an urgent task for the country's higher school for the medium term. By professional development of future leaders in the study is understood the process of integrating professional and personal changes aimed at ensuring the self-realization and self-development of a young scientist, career growth and the development of his competitiveness. According to a number of authors [27, 28, 29] it is professional development that is the driving force that creates the conditions for ensuring effective continuous professional education of young scientists, moreover, an important indicator of this process is self-actualization, based on a personal desire to fully identify one's own opportunities and their further development [30].

## III. MATERIALS AND METHODS

Theoretical methods of research include conceptual-terminological and theoretical-ethodological analysis, comparison, interpretation, theoretical modeling and generalization. In relation to the goals of our research, we regard the concept of approach as a certain position, which involves the use of appropriate research principles, appropriate means and methods of practical activity "[31]. As the methodological foundations for designing the professional development of potential leaders of research teams were identified system-activity and acmeological approaches. In this regard, we will further determine the essence of these theoretical and methodological positions and their role in the model design. As applied to our study, the system-activity approach [32] makes it possible to isolate and ensure the completeness of the structural components of the model, to identify the relationships and dependencies between these components, and also to determine the attributes necessary for combining the components into a single system. At the same time, the developed model has a new quality - focus on planning, implementing, monitoring and correcting the professional development of young leaders of scientific teams in the course of active professional activity. The acmeological approach considers the self-development as the main condition for the formation of subjects of professional activity, which ensures the development of an individual way of organizing the professional activity of a young scientist that meets his personal qualities, motivation, and objective characteristics of this type of activity [33, 34],which, under the conditions of the developed model, allows us to discover new opportunities for the professional development of young leaders of scientific teams in the context of a change in the educational paradigm [35]. The criteria and performance indicators of the acmeological approach to the organization of professional development of young leaders in our case are: the ability to independently put forward and formulate professional tasks in the framework of the organization of academic research; to anticipate and evaluate possible solutions; to carry out a comparative assessment of the achieved results with the expected ones; to understand the nature of the influence of specific factors on achieving the desired results. It should ne mentioned that all approaches used in the development of the model complement each other and allow a systematic approach to solving the problem in question. As a result, optimal behavioral strategies are being formed in

conditions of gender imbalance in the system of research activities that combine legal literacy, orientation in scientific methodology and the ability to practically demonstrate managerial competence. When developing a model for professional development of a young leader of a research team in the conditions of additional professional education, we were guided by a number of principles that allow us to implement the methodological approaches outlined above:

- the eclecticism of training aimed at providing students with a certain freedom of choice of goals, content, forms, methods, sources, means, terms, time and place of training, and the student must assume responsibility for the results of the training;
- reliance on the social and professional experience of a young scientist as an important opportunity for a new understanding of accumulated knowledge and skills;
- updating the learning outcomes, involving the rapid use of acquired knowledge, skills, abilities and qualities in the process of scientific activity;
- stimulation not only of professional, but also of personal development of young scientists, which involves help to ensure the demonstration of their own achievements in the academic community as important results of professional development.

The empirical research was based on the combination of qualitative and quantitative strategies. A qualitative approach (an in-depth semi-structured interview) was organized with 20 young scientists (19 candidates of science and 1 doctor of science under the age of 35 years) and is aimed at identifing key problems and barriers to the growth of young Russian scientists, as well as mechanisms that contribute to overcoming them. The quantitative part of the study (online questionnaire survey, which involved 105 scientists (103 candidates of science, 2 doctors of science aged 26 to 39 years) from 11 subjects of the Russian Federation ((Chelyabinsk, Nizhny Novgorod, Lipetsk, Sverdlovsk, Orenburg, Omsk, Tomsk, Kaliningrad regions, the Republic of Udmurtia, the Khanty-Mansiysk Autonomous Okrug - Ugra, Altai Territory) was intended to confirm / refute the put forward statements.

## IV. RESULTS OF RESEARCH

The data obtained during the study in the form of in-depth interviews indicate that more than 50% of respondents to the study consider that Russian science does not currently claim leadership positions; moreover, one of the most serious difficulties respondents see is a weak system of training scientific personnel ("You can come to a magistracy without basic education - this is a disaster. We really lack smart hands"; "The number of budget places in graduate school is constantly decreasing, but for a fee - who will go there? Then it will not pay off in a lifetime"). Although in universities of the Sverdlovsk region, where our respondents who participated in the study work, the average salary of professors and teaching staff according to official data ranges from 47 thousand rubles up to 59 thousand rubles, scientists from 54 thousand rubles up to 66 thousand rubles, which is more than 150% of the average wage in the region's economy [36], results from in-depth interviews suggest the opposite: "We have many young and promising scientists leaving, because the salary is 11,500 rubles.", "The assistant professor's rate is 22,000 rubles, it is, of course, humiliating."

To maintain an average level of well-being, most respondents are forced to combine several types of activities - for example, academic, teaching and administrative: "Academic work and teaching brings me 15% of my total income." For a significant part of young scientists, the main source of income is grants and work on a contractual basis: "The tariff grid is very funny; we just would not survive on this money. If there is no grant, everything is very sad." In general, 61% of survey participants (N = 105) admit that today scientific grants are an important additional measure to stimulate young scientists. It is alarming that, despite measures taken by the Government in recent years to support young scientists, more than half of the online survey participants (51.4%) answered the direct question "Do you consider the possibility of moving to another country to continue scientific activity on more favorable terms for yourself?"answered that theoretically such an option is possible. Another 15% are considering options currently.

At the same time, 27.6% of the survey participants noted that under any conditions they would remain in Russia: "I had the opportunity to leave, I was invited, but I am a patriot, probably ...." 72.6% of the study participants have experience in participating in grant activities, and 52.3% of respondents clearly require scientific and methodological support to advance in this field of activity, as, for example, projects of 33.3% of the study participants who submitted grant applications were not supported (table 1).

Table -1. Do you have experience in participating in grant activities?

| Answer | Frequency | Percentage |
|---|---|---|
| No, I'm not intereste | 4 | 3,8 |
| No, but I plan | 20 | 19,0 |
| Yes, but applications did not support | 35 | 33,3 |

| | | |
|---|---|---|
| Yes, I have experience in implementing supported projects | 45 | 42,9 |
| Other | 1 | 1,0 |
| Total | 105 | 100,0 |

Despite the great explanatory work carried out by the boards of scientific foundations, 17.1% of respondents believe that the distribution of grants is not objective, 12.4% find that it is very difficult for a team led by a young scientist to win a grant without the appropriate "connections".

In order to support young scientists who would like to try themselves as leaders of scientific teams in the implementation of state tasks and grants of scientific foundations, in the process of research, a pedagogical model for the professional development of young leaders of scientific teams in the conditions of additional professional education was worked out. When developing the program, we relied on the proposals of Peter Senge in the preface to the report "Educational ecosystems for social development", who noted that "... we must support and accelerate the processes that are already taking place due to the fact that education is increasingly moving away from traditional models and traditional skills towards education that teaches students to work together and solve complex problems for which there is no single solution, but that invite to research and creativity" [35]. Since the transformation of education in the next 20 years will occur under the influence of digitalization and automation of routine labor (including intellectual), increasing strategic uncertainty and the need for transition to civilization, built on the principles of sustainability, the program is based on the following considerations:

- the main engine of personality development of a young scientist is his motivation, as breakthrough innovations are created only by enthusiastic people;
-it is necessary to ensure awareness among young leaders of the possibility of falling into a state of "strategic uncertainty", which requires the development of readiness to maintain personal vitality, mindfulness of action, focus on metacognition in an ever more complex world;
- to develop the ability of students to form their own worldview in the context of an increasing information flow.

Based on the data obtained during the study and taking into account the basic principles of the systemic-activity and acmeological approaches, the model offers the option of scientific and methodological support for the professional development of young scientists through a specially organized system of interconnected actions, pedagogical events focused on understanding professional experience, personal transformation, actualization of self-development, contributing to the achievement of professional success of both the youngest scientist and the research team as a whole. It should be noted that a number of researchers notice the special role of the development of personal potential as an important specific "internal support", which contributes to the creation of positive conditions, including for the successful implementation of scientific activities of the potential leader of the scientific team [37,38]. In this regard, the model under development takes into account the fact that professional development is a process of internal self-change of a person, integration of meaningfulness of life and time perspective, productive self-realization, that is, such a pedagogical model can be fully considered as a model of professional and personal development of a young leader of the research team.

We should recall that the head of the research team is a specialist who confidently owns the methodology of scientific research and has his own experience in such activities. His professional activity should provide participants with an accurate choice of research areas, ensuring the formation of a research program, determining the composition and distribution of roles between members of the scientific team. In addition, the supervisor is responsible for "... the organization of information and communication exchange both within the team itself and between its members and the scientific community as a whole, countering the threat of the collapse of the existing team in difficult economic conditions, overcoming crisis situations and ensuring the growth of psychological manageability of participants in scientific research" [39].

It should be noted that out of 105 survey participants, 14.3% are already heads of scientific grants, 33.3% of respondents plan to form a research team under their leadership, but almost half of the participants (48.6%) do not plan to conduct such work. When asked about what conditions are most important when forming a research team led by a young scientist, 56.2% put personal authority and the managerial and creative abilities in the first place, 27.6% noted the possibility of financial incentives, an order from the state for the study was allocated by 5.7% of respondents (Table 2).

Table -2. What conditions, in your opinion, are most important when forming a research team under the guidance of a young scientist?

| Answer | Frequency | Percentage |
|---|---|---|
| Personal authority, organizational and creative abilities of the leader | 59 | 56,2 |
| The possibility of financial incentives | 29 | 27,6 |

| | | |
|---|---|---|
| Presence of a connecting idea | 8 | 7,6 |
| Research order from the state | 6 | 5,7 |
| Professional team | 2 | 1,9 |
| University (scientific organization) support | 1 | 1,0 |
| Total | 105 | 100,0 |

Based on the results of the study, as the main structural elements of the pedagogical model of the professional development of a young leader of the research team, the target, content, process and result components were considered. Moreover, based on the principles of the system-activity approach, the main stages were determined, providing professional and personal development of potential leaders of research teams, namely, orientational, substantive and activity-developing, which makes it possible to give the projected model a system-activity character. The target component assumes that the goal is to ensure the professional development of potential leaders of scientific teams in the system of additional professional education, which will increase the effectiveness of the management of the scientific team, and resolve issues related to the specifics of management and decision-making. In accordance with this, the main development tasks were identified at each of the three distinguished stages:

- at the orientation stage, the work is aimed at ensuring the updating of the internal resources of the potential leader of the scientific team and includes the formation of needs for professional self-improvement and the choice of areas of personal development, in other words, the identification of deficiencies in the methods of activity of a young scientist that will be required when organizing the activities of the scientific team;
- at the substantive stage, development of levels of professional self-awareness and professional opportunities and claims of young scientists is ensured, which also ensures the formation of professional subjectivity of the potential leader of the research team; at the developmental stage, activities are underway to intensify the processes of self-realization of potential young leaders by developing confidence in the success of the implementation of selected professional roles.

The main function of the content component is to reflect the subject of activity that underlies the professional development of a potential young leader of the research team. The substantial component of the model is determined by the semantic content of a modular educational program that promotes the professional development of young leaders in the context of further professional education. In our case, when developing an educational program, the following groups of factors were taken into account. First of all, these are factors that take into account progressive trends in the scientific and educational sphere, reflected in the current regulatory documents. The second group of factors is represented by general didactic principles used in the adult education system and related to the awareness of young scientists of the importance of their own continuous development, the involvement of students in the formation of learning goals and motivation for educational and cognitive activities, as well as their inclusion in the selection of the necessary content of scientific knowledge, skills and organization of diagnosis in the learning process. The third group of factors is associated with the developmental characteristics of young leaders themselves as subjects of education, i.e. taking into account the age characteristics of students, the very nature of research activities, inquiries and the level of professional qualifications. The general matrix of professional development of potential young leaders of research teams within the framework of a modular educational program includes the following content sections / modules:

“State policy and modern regulatory framework of scientific activity in the Russian Federation”, which presents the features of scientific and technological policy in the Russian Federation at the present stage, including peculiarities of public policy towards young scientists;

- “International practice in the comprehensive support by the state of young scientists on scientific, organizational, managerial and domestic issues”,

the purpose of which is training in comparative analysis and strategy and tactics determination of creating attractive working conditions for young scientists in scientific and educational organizations of the Russian Federation;

- “Theoretical, methodological and psychological foundations of the professional activities of the head of the research team”, where methodological and psychological approaches to the organization of managerial activities in the scientific field are disclosed;
- “Technologies for managing the development of the potential for self-organization of scientific teams in a position of network interaction”, which include the study of the characteristics of the participants in the interaction, including by gender, which contributes to their transition to self-organization and the creation of the required organizational and substantive conditions.
- “Content and procedural aspects of the professional activity of the head of the research team” devoted to the consideration of individual areas of management of the implementation of scientific projects and grants in scientific and educational organizations;

- "Applied aspects of solving urgent problems of professional activities for the implementation of scientific grants", which represents the experience of successful management activities for the implementation of scientific projects and grants with specific examples.

The modules and individual topics presented in the program content have, on the one hand, a complete semantic load and, in fact, are autonomous, and on the other hand provide a logical relationship between the individual sections.

When developing the program, "... the mechanism of project-resource management, that regulates the movement of the student in the educational space from actions carried out in a specific situation in accordance with existing circumstances to activities determined by the local goal, was taken into account; then - to the reflection of their own activities in order to give it the status of a new norm; and, finally, to the reflection of changes in one's position" [40].

The substantive basis of the procedural component of the model is made up of the forms, methods and means of professional and personal development of a potential young leader of the research team, implemented in the system of additional professional education. Our model uses a number of approaches that provide continuous learning to solve specific problems of scientific activity in increasing competition. In this case, further training is closely related to strategic goals regarding the organization of grant support for scientific activities in scientific structures and to individual goals of young scientists themselves as possible leaders of research teams. Training can be carried out as part of the implementation of a modular educational program, tailored to the specific needs of young scientists, taking into account the edhocratic style of organization of training, in our case, in the conditions of the research and educational center for innovative activity of the Ural State Pedagogical University.

The implementation of the edhocratic style in the training of young leaders of research teams is aimed at:

organization and conduct of classes in modes that bring satisfaction to students;

creating situations for the simultaneous implementation of three operations: acquisition, joint development and transfer of knowledge;

change in the structure and role behavior in multilevel groups during practical exercises, trainings, seminars, depending on the specific educational task;

widespread use by a teacher in the process of teaching a mentor position.

In general, among the possible forms of professional development of young leaders of scientific teams, along with targeted coursework in the framework of a modular educational program (thematic lectures, practical classes, discussions, seminars, trainings, business games, etc.), one cannot fail to note the active use of the institute of tutors as part of the work of existing scientific schools and the possibility of coaching and consulting in the framework of continuing education to complete the development of the educational program. The problem-search and imitation-role methods proposed for use as part of a modular educational program include the method of specific situations for the development of applications for scientific foundations and the organization of work of research teams to implement supported scientific projects (case studies), action learning method that allows to analyze, plan, and adjust the actions of young scientists in solving work tasks in developing applications, role-playing and simulation games, video analysis, brainstorming, etc. The process of formation of young leaders within the framework of the worked out model is significantly activated by the participation of students in crowdsourcing processes, as an important means of involving the intellectual potential of a significant number of people in solving the problems of a particular scientific project in a network environment.

The specific means and methods of professional development of young leaders of research teams included the inclusion of teachers, tutors and students in the study of issues aimed at:

development of self-knowledge, self-actualization, personal and intellectual potentials;

opening up the possibilities of self-regulation of mental activity, training to transfer knowledge and methods of action in new professional situations;

stimulation of individual self-development;

building individual trajectories of professional development for young scientists as possible leaders of research teams to complete the educational program in the continuing education system.

The resultant component of the model reflects the intermediate and final results of the activities of all subjects for the professional development of young leaders of research teams.

Among the expected results of the professional development of young leaders of scientific teams at each of the three stages of the implementation of the model, it is worth highlighting:

- at the orientation stage - the presence of a steadily expressed need for a young scientist in professional self-improvement, the development of scientific and creative thinking, the ability to work with information and use different media, the formation of social and emotional skills related to interacting with other people and interacting with oneself (self-management and independence of actions, self-regulation, etc.);

- at the substantive-defining stage - adequate correlation of existing professional opportunities and expressed claims of the young leader;
- at the developmental stage - the willingness of a young leader to perform various professional roles in a developing scientific team.

It should be noted that the system cannot function and develop without essential and necessary conditions, the totality of which is called the environment of the system [41]. In determining the conditions for the effective functioning of the model, an important role is played by taking into account the multifunctional nature of the professional and personal development of young leaders, including the interaction of individual personal qualities, professional and managerial knowledge and abilities in the field of managerial activity. It should be mentioned that the personal qualities of young leaders (value attitudes, level of self-esteem and claims) are largely determined by the influence of both genetic and social factors, professional and managerial knowledge that are developed as a result of the inclusion of additional professional education in the continuing education system, and abilities in the field of managerial activity are perfected in the course of direct professional activity within the framework of the scientific team.

To the important pedagogical conditions for the effective functioning of the model are referred:

timely pedagogical support of young scientists in mastering the content of the educational program, taking into account their professional experience in a friendly educational environment, which is able to create and maintain collective goals that are meaningful for students, special identities and activities that promote cooperation, co-creation and joint learning;

ensuring the further professional development of young leaders of scientific teams through participation in the work of self-regulatory professional associations of young scientists and network structures, in a stimulating competitive environment. Since at present metacognitive abilities are especially demanded, including personality control over the state of their intellectual resources and self-regulation of information processing processes [42], then special attention is paid to the development of the ability of young managers to organize their own activities in conditions of lack or inconsistency of information, to identify limitations of their own competence and the aptitude to access the abilities and knowledge of other researchers in a network environment [43].

## V. CONCLUSION

The research showed that more than half of the young scientists who participated in questions and interviews, who could potentially appear as leaders of scientific teams in the implementation of state tasks and grants of scientific funds, experience difficulties in professional scientific activities. To support this category of young scientists, in the research process, a pedagogical model for the professional development of young leaders of scientific teams in the conditions of additional professional education was worked out.

It should be mentioned that the worked out approaches to the development of the pedagogical model of professional development of young leaders of research teams are in good agreement with the results presented in the works [15,35,44,45,46,47], where new postgraduate education mechanisms are discussed in the context of a change in educational paradigms, the results of determining the effectiveness of postgraduate programs in different countries are presented and approaches to determining the success of graduates of such programs in a complex world of the 21st century are explored.

In general, to ensure the goals of professional development of young leaders of scientific teams in the conditions of additional professional education, in the gender differentiated environment of the university community, including the network, it is important to regard the following considerations:

- the need for direct interest of young scientists themselves in the realization of their creative scientific potential as potential leaders of research teams based on the aspiration of the developing personality to self-realization;
- organization of research of starting indicators of the professional potential of young scientists, identification of existing problems and professional achievements;
- definition and wording of individual strategic and tactical goals of professional development of young scientists as potential leaders of research teams;
- design, organization, implementation and correction of educational programs for the professional and personal development of young scientists, depending on the existing professional experience and personal qualities of young scientists, on the basis of the edhocratic principle in training in the conditions of additional professional education and reflection of the results of professional development of young scientists.

In general, an analysis of the nature, structure and content of scientific and methodological support for the professional development of young leaders of research teams outlined the multidimensionality and versatility of this process, which requires further research of ways of becoming young scientists as effective leaders of research teams.

## VI. REFERENCE

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