Federal State-funded Institution of Higher Education
«The Russian Presidential Academy of National Economy and Public Administration»

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MANAGEMENT OF EDUCATIONAL ACTIVITIES AT AN ENGINEERING UNIVERSITY IN THE CONTEXT OF THE COUNTRY'S MOVEMENT TOWARDS TECHNOLOGICAL LEADERSHIP

Specialty - 5.8.7. Methodology and technology professional education

Abstract of the dissertation for the degree of Candidate of Pedagogical Sciences

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Moscow – 2026

Relevance of the study The early 20s of the 21st century were marked in Russia by decisive actions aimed at achieving not only the country's technological sovereignty, but also its technological leadership in the world. Significant changes have been made to the regulatory framework of the technological policy of the Russian Federation. The Strategy for Scientific and Technological Development of the Russian Federation, approved on February 28, 2024 by Decree of the President of the Russian Federation No. 145, updated the goal of scientific and technological development of the country - ensuring the independence and competitiveness of the state, achieving national development goals and implementing strategic national priorities by creating an effective system for building and making the fullest use of the intellectual potential of the nation. Decree of the President of the Russian Federation dated 05/07/2024 No. 309 "On the National Development Goals of the Russian Federation for the period up to 2030 and for the future up to 2036" directly establishes the technological leadership of one of the national development goals. The draft Decree of the Government of the Russian Federation "On the specifics of the implementation of national projects to ensure technological leadership of the Russian Federation related to the technological policy of the Russian Federation" (prepared by the Ministry of Economic Development of the Russian Federation on 04/08/2025) set the main vectors of national projects designed to ensure that the country achieves leading positions in the field of innovative technologies.

It is quite natural that engineering is becoming one of the fundamental elements that ensure the movement towards technological leadership in Russia. Today, we are talking about a new paradigm of engineering education, about its interdisciplinary nature, based on the integration of various scientific and technological areas. The key professional competencies of an engineer of the future are engineering, design, modeling, research, as well as skills related to industrial design and the use of artificial intelligence. However, modern engineering education cannot be limited to the formation of exclusively professional knowledge and skills. Such qualities as initiative, active citizenship, responsibility for the results of one's work, independence, mobility, readiness for constant self-development, and self-realization in the profession become

critically important. A future engineer should know, understand, love and respect his Homeland, as he will continue to work for its benefit and development. The renewal of ideas about the personality of a graduate of a technical university has led to an increase in the role and importance of educational activities. However, in the practice of universities, quantitative characteristics of the educational process still prevail (the number of events, the coverage of participants, the number of first places, the number of news views on social networks and online communities, etc.). As a rule, an "event-based" approach is used, among the most significant features of which can be named: the passive, "spectator" roles of most participants, formal planning of events without analyzing the results, the lack of connection of extracurricular activities with the educational process, with the qualifications that are formed by students.

It is obvious that the seriousness of the tasks set for higher education today requires a deep reworking of the content, technologies of educational activities and indicators of its effectiveness. Modernization of the educational process at the university is impossible without improving the educational management system and overcoming the remaining problems characterized by a directive management style dominated by administrative resources, the lack of an integrated approach, the isolation of the educational environment of the university from the contexts of future professional activity, the low level of involvement of employers in solving managerial tasks, the lack of objective and reliable criteria for the effectiveness of the educational process, the unwillingness of the teaching staff to use modern educational technologies, the deepening intergenerational gap, the shortage of qualified managerial personnel in the field of educational activities, the lack of high-quality training and retraining programs. Separately, it is worth noting the "vagueness" of goal setting in the education programs of educational institutions of higher education. As a rule, the structure of such programs includes tasks and areas of work, but they lack clearly defined requirements for the results to be diagnosed, which complicates the management process, which is a consequence of the lack of common value bases for educational activities, consistent with the system of national value priorities and capable of consolidating the pedagogical and student community of the university. The need to overcome the current situation

has led to the search for modern technologies for managing educational activities at all levels of functioning and development of an educational organization of higher education. The effectiveness of managed processes in modern conditions is associated with ensuring the flexibility and adaptability of the management system to changes in external and internal environmental factors.The renewal of ideas about the personality of a graduate of a technical university has led to an increase in the role and importance of educational activities. However, in the practice of universities, quantitative characteristics of the educational process still prevail (the number of events, the reach of participants, the number of first places, the number of news views on social networks and online communities, etc.). As a rule, an "event-based" approach is used, among the most revealing features of which can be called: passive, "spectator" roles the majority of participants, the formal planning of events without analyzing the results, the lack of connection of extracurricular activities with the educational process, with the qualifications that students are developing.

In the experience of individual universities, new models of educational management are presented, providing for the rejection of rigid patterns of interaction between participants in the educational process and directive administration, however, experiments and innovations require further development and scaling of scientific and methodological support for the educational work management system in an educational organization of higher education. The development of a system for managing educational work in engineering universities that meets the requirements of the time is an urgent scientific problem, since practical solutions should be based on theoretical approaches that correspond to the achievements of psychological and pedagogical science and management theory.

Key concepts. In the framework of the study, along with the term "educational activity", the term "educational work" is used. We accept them as synonymous. This is due to the regulatory framework that uses both concepts. Thus, the Federal Law "On Education in the Russian Federation" defines education as an activity, at the same time it contains a norm on the implementation of education based on a calendar plan of educational work. The methodological recommendations of the Ministry of Science and

Higher Education in 2023 on the development of a work program for education and a calendar plan for educational work at the university use the concept of educational work to a greater extent. Thus, we have defined the concepts of "educational activity" and "educational work" as identical. As for the term "educational activity", in the context of the conducted research, we have defined "educational activity" as one of the means (tools) of educational activity/work, it is on this, as an element of the management of the educational activity system, that we focus.

The concept of "technological leadership" introduced in the title of the research topic is understood by us as the ability of a country to stay ahead of competitors in the creation, development and commercialization of advanced technologies. It involves not only the development of our own critical technologies and the formation of sustainable production chains, but also the creation of an ecosystem of knowledge, competencies and infrastructure that can quickly adapt to global challenges and changes in technological patterns.

The elaboration of the problem. The study of the theory of the issue indicates that the Russian scientific and pedagogical literature has accumulated considerable experience in studying various aspects of the problem of organizing the educational process at the university.

Thus, the management, structure, content and technologies of modeling the educational space of the university are presented in the works of A.P. Zhigadlo, M.G. Reznichenko, N.L. Sergeev, D.Y. Trushnikov, E.G. Ogoltsova, V.P. Mogutnov.

Methods of education, as ways of interaction between a teacher and a student in order to solve educational tasks of self-realization of a personality, are revealed in the works of V.A. Slastenin, P.I. Pidkasisty, N.I. Boldyrev, N.K. Goncharov, F.F. Korolev, T.A. Ilyina, I.T. Ogorodnikov, G.I. Shchukina.

The issues of professionalization and the formation of professionally significant personality qualities have been sufficiently studied by Russian scientists G.M. Romantsev, V.V. Serikov, A.M. Novikov and others. In the research of T.G. Miroshnikova, N.A. Kulakovskaya, V.G. Martynov, N.V. Maslenko, S.V. Sergeev,

attention is paid to the implementation of a comprehensive educational approach that integrates the moral and professional development of students of technical universities.

Solutions to a number of prognostic issues were proposed in the studies of A.I. Borovkov, A.V. Gagarin, F.R. Grigoryan, N.V. Solovieva, R.R. Zakieva, M.V. Polyakova, A.V. Ivanova, and others. Such aspects as trends in the development of engineering education, approaches to education in the academic environment, concepts of modern theory of education, trends in personality development in engineering education were considered.

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The works of V. I. Andreev, V. A. Anisimov, P. I. Babochkin, V. I. Baydenko, S. Y. Gatsuk, A.V. Ponomarev, A. I. Subetgo, N. A. Shaidenko substantiate approaches to understanding and evaluating the quality of higher education in the unity of education and training.

The specific features of educational activity management were studied in the works of Yu. n. K. Babansky, O. N. According to S. N. Gazman, S. N. M. N. Godnik, F. N. N. Gonobolin, V. N. Prizewinner. Zagvyazinsky, V. N. A. N. Kankalik, A. N. E. Kondratenkov, N. V. N. Kuzmina, A. N. K. Markova, N. D. Nikandrov, Ya. N. A. n. Ponomarev, G. N. According to S. N. Sukhobskaya, L. N. M. N. Friedman, A. N. Winner of the award named after Shcherbakova et al. From the point of view of systemic and process approaches, various models of educational process management have been developed by such authors as I. According to G. N. Bagautdinov, Y. N. According to S. N. Vasiliev, B. N. V. N. Glukhov, Named after D. Guskov, T. N. Y. N. Ivanov, E. N. M. N. Korotkov, E. N. A. N. Neretina, C. N. D. Reznik, V. N. V. N. Repin, T. N. A. N. Sapimova, M. N. In accordance with P. Fedorov and mn. and others .

In the dissertation research of the last two decades, the problems of education at the university are considered in the context of the implementation of certain areas of educational activity (Bogatskaya, E. N., Y. N. M. Biryukova, A. N. M., Goreltsev, A. N. According to G. N. M., Ivanov, A. N. B. N. M., Miroshnikova, T. N. According to G. N., etc.); formation of personal qualities and general competencies of students (Parskaya N.V., D. Trushnikov, Yu. n., Shchebelskaya, E. N. In the opinion of G. N., etc.), organization of the educational space of the university (Reznichenko N. In the opinion of G. N. M. Yakushkin. According to S.N. And others), pedagogical conditions for the management of the educational process (Viksnins, O. N. V. N., Sergeev N.L. N. Y. Khrulkova.V. N.).

Despite the solid scientific foundation laid on the table, it should be noted that by now the management of educational activities at the university has not been considered as an adaptive system based on feedback between the processes of planning, organizing and qualitatively evaluating the results of student education, providing a timely managerial response to permanent and rapid changes in the external and internal environment. In addition, there is not enough work in pedagogical science related to the substantiation of socially and professionally significant qualities of an engineer corresponding to the current stage of society's development, as well as effective technologies for the formation of these qualities.

The analysis of scientific papers revealed a number of **contradictions** that determined the main direction of this research.:

– between the need of the economy and society for a highly qualified engineer who is ready to meet the challenge of technological leadership, and the lack of development of theoretical approaches to the definition, formation, and assessment of socially and professionally significant qualities necessary for him;

– between the understanding of the need to update the content, forms and methods of managing educational activities at the university and the orientation of existing management systems towards a directive management style and formal quantitative indicators;

– between the demand for a constant dialogue with employees, the need to involve them in the process of managing the educational activities of the university and the "closeness" of the educational system of educational organizations, the lack of sound tools for organizing sustainable interaction with external partners;

– between the pace of improvement of educational and management technologies and the willingness of the administration and teaching staff to implement them in the management, educational and extracurricular process of the university;

between the increasing role of educational activities in the structure of the university's educational process and the lack of scientifically sound management models focused on qualitative assessment and consistent improvement of educational outcomes.

The identified contradictions allowed us to formulate the **research problem**, which consists in the need to determine a model for managing educational activities that meets modern requirements, based on establishing feedback between planning, organizing and evaluating the quality results of educational activities.

The need to solve this problem determined the **research topic**:"Management of educational activities at an engineering university in the context of the country's movement towards technological leadership."

The purpose of the study is to scientifically substantiate the organizational and methodological model of educational management in an engineering university based on feedback between the processes of planning, organization and qualitative assessment of the results of student education.

The object of research: educational activities in the higher education system.

The subject of the research is the educational activity management system of an engineering university, focused on facilitating the solution of technological leadership tasks.

Based on the problem, purpose, object, and subject, the **research hypothesis** is formulated: the feedback between the processes of planning, organizing, and qualitatively evaluating the results of student education is a key element in modernizing the education management system in a modern engineering university when solving the

tasks of forming socially and professionally significant personal qualities of future engineers.

To achieve the purpose of the study, the following **tasks** are formulated:

1. based on the analysis of scientific approaches, regulatory legal documents, research results, and employee requirements, summarize the list of socially and professionally significant qualities of an engineering graduate;

2. to develop a system of criteria and indicators for evaluating the effectiveness of educational activities at an engineering university;

3. to determine the stages of formation and development of socially and professionally significant personal qualities of engineering university students;

to develop and test an organizational and methodological model for managing the educational activities of an engineering university.

The theoretical and methodological basis of the study was:

– *a personality-oriented approach* to the organization of the educational process (N.A. Alekseev, E. N. Bondarevskaya, V. N. Serikov, etc.); theory of socialization (M. Kagan, V. N. Karakovsky, Im. According to S.N. Cohn, A. N. V. N. Mudrik, and others), psychological theories of personality development (L. N.According to S. N. Vygotsky, A. N.N. Leontiev, S. N.L.N. Rubinstein, and others), concepts of pedagogical stimulation (L. N.Y. N. Gordin, V. N. According to G. N. Pryanikov, Z. N. Prize winner. Ravkin et al.),

– *systems approach:* theory of management (Kn. Ishikawa, M. N. Mescon, R.N. Schonberger), theory of systems (A. N. Averyanov, V. N. According to G. N. Afanasyev, I. N.V. N. Blauberg, V. N. Prize winner. Slobodchikov et al.), theory of pedagogical systems (V. N.In accordance with P. Bespalko, Yu. N. A. Konarzhevsky, A. N. M. N. Novikov, G. N.N. Serikov, N. F.N. Talyzina, and others); theories of educational system management (Yu. n. V. N. Vasiliev, Yu. N. A. Konarzhevsky, V. N.According to S. N. Lazarev, A. N. M. N. Moiseev, M. N.M. N. Potashnik, E. N.A. N. Yamburg, and others); theory of modeling and design (V. N.According to G. N. Afanasyev, V. N. According to P. Bespalko, V. N. V. N. Davydov, E. N. According to S. N. Zair-Bek, V. N.A. N. Slastenin, N.O. Yakovleva, etc.); theory of educational

systems, including professional education systems (L. N. Prize winner named after Novikova, V. N. A. N. Karakovsky, N. L. N. Selivanova, V. N. In accordance with P. Sozonov, A. N. In accordance with P. S. Zhigadlo, Ya. Batyshev, V. N. Prize winner. Belov, N. F. N. Geizhan, N. N. Dyachenko, B. N. According to S. N. Patralov).

Stages of research.

The study was conducted from 2018 to 2025 in three stages:

At the first stage (2018-2021), pedagogical, professional–pedagogical and scientific-methodological literature was analyzed, regulatory legal documents of educational activity and the practice of educational work at the Gubkin Russian State University of Oil and Gas (National Research University) were studied, and the main research vectors were identified. At the same stage, a research hypothesis was put forward.

At the second stage (2021-2024), the stages of formation and development of personal qualities of engineering university students were developed; based on a monitoring study of the formation of personal qualities, general competencies and flexible skills of students, an organizational and methodological model for managing educational activities of an engineering university was developed; the model was tested

At the third stage (2024-2025), the data obtained during the approbation of the research results were systematized, analyzed and summarized; the manuscript of the dissertation text and the abstract were prepared.

The scientific novelty of the research is as follows:

– a list of educational results of a modern engineering university has been developed. These are universal socially and professionally significant personal qualities of students that are in demand in the professional community, and their key role in the implementation of engineering activities makes it possible to identify them as predictors of successful professional development;

– a system of criteria and indicators for assessing the quality of the results and process of educational activities of an engineering university has been formed;

– the sequence of stages of formation and development of socially and professionally significant personal qualities of engineering university students is

defined, tasks, results and methods of student support at each stage of training are described;

– an organizational and methodological model for managing the educational activities of an engineering university has been developed.

The theoretical significance of the study:

– the organizational and methodological model of management of educational activities at the university, which has the property of adaptability, is based on the application of feedback between the processes of planning, organization and qualitative assessment of the results and process of education, providing a timely managerial response to changes in the external and internal environment and continuous improvement of the educational process;

– the stages of student personality development are conceptualized and correlated with the results of education in a modern engineering university;

– the provisions of the theory of pedagogical management are supplemented by theoretically substantiated and experimentally confirmed goals, principles, technologies, criteria and indicators for monitoring the quality of educational activities.

Practical significance of the study. The goals and results of education developed in the study (a list of socially and professionally significant personal qualities of an engineering graduate), the stages of formation and development of students' personal qualities, and the organizational and methodological model for managing educational activities at an engineering university can be applied in the practice of planning, organizing and monitoring educational activities at universities of a similar profile, and with some refinement, universities other fields and specialties.

Provisions to be defended:

1. The results of the education of a graduate of an engineering university at the present stage of the development of Russian society include socially and professionally significant qualities in demand.: striving for self-realization in the profession; engineering thinking; ability to solve problems; responsibility for decisions; independence; leadership; communication skills; adaptability; ability to work in a team; active citizenship; patriotism; respect for law and order, the man of work and the older

generation; respect for the cultural heritage and multinational folk traditions of the Russian Federation, nature and the environment

The complex of professionally and socially significant personal qualities is typological in nature and is applicable to many professional fields, however, the key role in the implementation of engineering activities allows us to identify them as professionally significant and consider them as a complex result of education in a technical university, as predictors of successful professional self-realization. The general list of socially and professionally significant qualities can be considered as a constructor, on the basis of which specific profiles for a certain qualification (group of qualifications, type or field of professional activity, industry and corporate requirements) are formed. The results of education are divided into those that are diagnosed during the university education process and those that are delayed. The first group includes qualities whose level of development is determined based on the analysis of the student's social and professional activity. The delayed results are evaluated through the analysis of employer feedback on the professional and moral qualities of graduates and young professionals.

2. The following groups of criteria and their corresponding indicators are optimal for assessing the quality of the results and process of educational activities at the university:

1) *effectiveness of educational activities:* formation of socially and professionally significant qualities of students;

2) *completeness of the content of educational activity:* all areas of educational activity corresponding to the planned results are presented; the tasks of education are reflected in the programs and the learning process; meaningful interrelation and continuity of classroom and extracurricular activities of students in solving educational tasks is ensured;

3) *the quality of the organization of educational activities*: the infrastructure and organizational system have been formed to support student initiatives; modern forms, methods, and technologies of educational activities have been introduced; the required level of qualification of teaching staff has been provided; the necessary logistical,

informational, and financial resources have been provided; a feedback system and monitoring of student satisfaction with participation in extracurricular activities has been established;

4) *positive motivation of students:* the proportion of students involved in extracurricular activities out of the total number of students; the proportion of students taking the initiative to organize educational activities out of the total number of students involved in extracurricular activities; the proportion of students participating in social projects out of the total number of students; student satisfaction with the organization of educational work;

5) the university's relationship with society, external subjects of the educational process: Key employees are involved in the educational work system; the university's interaction with youth movements, associations and organizations is presented on a regular, systematic basis.

3. The personality development of an engineering student is carried out in a sequence of five stages, each of which is a sensitive period for the formation of a certain group of socially and professionally significant personal qualities:

– the first stage is work with applicants; the task is to support professional choice, psychological acceptance of the requirements of the profession, university, a certain social environment and prospects for their own development; the result is an independent, informed choice of the university, methods of support: professional trials, master classes, open days, individual consultations, conversations with teachers, undergraduates, graduates, trainings;

– the second stage is work with first-year students; the task is to ensure productive adaptation in the university, the student body and the educational space of extracurricular activities, understanding the social significance of the engineering profession, the formation of adaptability, independence; the result is integration into the educational environment of the university, inclusion in extracurricular activities, the ability to solve problems and take responsibility for their solution; support methods: fairs of student associations and studios, mentoring by undergraduates, short-term "multi-age" projects, round tables, thematic excursions;

– the third stage is working with students of 2-3 courses; the task is to form a sense of responsibility, integration into a common cause, create conditions for the development of engineering thinking, creativity; the result is the ability to work in a team, a critical position, developed communicative, research, analytical and design skills; support methods: project activities, expansion of assignments and powers, professional discussion club, business games;

– the fourth stage is work with students of 3-4 courses; the task is to ensure the formation of students' leadership qualities, readiness for self–organization and for organizing group and collective activities, engineering thinking, initiative, professionalism; the result is initiative, the ability to form new technical ideas, an active lifestyle; support methods: project activities, organization of teamwork with shifts roles, involvement in solving managerial tasks, trainings, competitions of student scientific papers;

– the fifth stage is working with graduate students; the task is to develop the ability to offer something new based on the analysis of their own experience; predict changes; the result is the achievement of established educational results for graduates of engineering universities; support methods: coworking, involvement as mentors for first–year students, internships at employee sites

4. The organizational and methodological management model of educational activities at an engineering university (hereinafter referred to as the model) includes conceptual, program–oriented, organizational-functional and monitoring blocks and is a set of cyclically recurring management activities based on periodic monitoring generalization of the results and process of educational activities, which allows analyzing, predicting and taking into account the influence of changing management decisions. the influence of external and internal conditions on the educational process.

The prerequisites for the successful implementation of the model are: 1) a clear organizational structure that includes the university as a whole, institutes, departments, centers, services, student government bodies, and "seamless" communications between all participants in the educational process; 2) trained, trained, and motivated teachers, additional education educators, and supervisors, including graduate students; 3) variable

approaches and technologies based on active forms and methods of education; 4) continuous diagnosis of the inflammatory process, ensuring timely correction.

The reliability and validity of the research results is ensured by the choice of methodologically consistent theoretical and methodological approaches that correspond to the stated goals and objectives; the use of methods adequate to research goals and objectives for data processing and interpretation of the results of a monitoring study on the formation of personal qualities, general competencies and flexible skills of students; the author's work experience as vice-rector for youth policy and educational work.

The author's personal contribution consists in developing a list of socially and professionally significant personal qualities of a student of an engineering university, the stages of formation and development of personal qualities, an organizational and methodological model for managing the educational activities of an engineering university, criteria and indicators of the quality of the results and the process of education.

The results of the study were tested and implemented at all stages of the study. The research materials were reported and discussed at meetings of the Scientific Council of the Department of Professional Education of the RAO "Engineering Education and Professional Self-Determination" and meetings of the Gubkin Russian State University of Oil and Gas (NIU) departments engaged in educational work and activities in the field of youth policy. The theoretical provisions and practical results of the research were reported and discussed at scientific and practical conferences: at the All-Russian Conference of Young Scientists, Specialists and Students (Moscow, 2015 and 2022); at the III regional scientific and technical conference "Gubkin University in solving issues of the Russian oil and gas industry", dedicated to the 110th anniversary of the Founding of the Russian Academy of Sciences.Winner of the award named after Skoblo and the 105th anniversary of G.N.K. Schreiber (Moscow, 2019); at the VI Regional Scientific and Technical Conference dedicated to the 100th anniversary of M.N.M. N. Ivanova (Moscow, 2022); at the III Scientific and Practical Conference with international participation "Modern career guidance: synthesis of education and self-determination" (Moscow, 2023); at the International Scientific and Methodological

Conference "Engineering Education in a Digital Society" (Minsk, 2024); as well as in the process of publishing research materials in scientific and methodological publications (a total of 22 works were published, of which 8 scientific articles are in publications included in the List of peer-reviewed scientific publications recommended by the Higher Attestation Commission of the Ministry of Education and Science of the Russian Federation).

The structure of the dissertation. The dissertation consists of an introduction, two chapters, conclusions for each chapter, a conclusion, and a list of references from 178 sources. The total volume of the work is 192 pages and includes 10 tables, 13 figures, and two appendices.