CONDIÇÕES PEDAGÓGICAS PARA A FORMAÇÃO DE COMPETÊNCIA PROFISSIONAL DE ESTUDANTES DE UMA UNIVERSIDADE TÉCNICA**PEDAGOGICAL CONDITIONS OF FORMATION OF PROFESSIONAL COMPETENCE OF STUDENTS OF A TECHNICAL UNIVERSITY****ПЕДАГОГИЧЕСКИЕ УСЛОВИЯ ФОРМИРОВАНИЯ ПРОФЕССИОНАЛЬНОЙ КОМПЕТЕНТНОСТИ СТУДЕНТОВ ТЕХНИЧЕСКОГО ВУЗА**

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RESUMO

Documentos fundamentais do governo estabelecem a prioridade do sistema educacional em políticas públicas, declarando a necessidade de treinamento científico e profissional bem-sucedido e atividades educacionais inovadoras de futuros especialistas. O artigo tem como objetivo propor uma solução para a formação de competência profissional de futuros especialistas de universidades técnicas na fase de modernização da educação na sociedade russa moderna. O trabalho revela a essência das principais abordagens metodológicas para resolver o problema em estudo como abordagens por competência, criativa, orientada para a personalidade, atividade do sistema, tecnológica e baseada em tarefas. Uma análise retrospectiva possibilitou revelar as condições pedagógicas, simulando a real atividade profissional de estudantes de uma faculdade técnica. São descritas as formas de desenvolvimento bem-sucedido da competência profissional de futuros especialistas (estabelecimento de ambiente criativo inovador, desenvolvimento da posição de sujeito de uma personalidade, fortalecimento de atividades orientadas para a prática, organização de reflexão e autorreflexão, uso de tecnologias e sistemas de computação, informação e telecomunicações, gestão eficaz das atividades acadêmicas, científicas e profissionais dos alunos). Com base nos princípios importantes, nas abordagens metodológicas, nos requisitos do Padrão Educacional Federal do Ensino Superior para a preparação de futuros especialistas na Federação Russa, o artigo apresenta a experiência inovadora da organização do processo educacional que visa formar uma competência profissional entre estudantes de graduação do Instituto Ryazan da Universidade Politécnica de Moscou, bem como da Universidade Agrotecológica do Estado de Ryazan, em homenagem a PA Kostychev. Este estudo possibilitou o desenvolvimento e a implementação de uma estrutura modular em bloco e do conteúdo de treinamento em engenharia e construção de estudantes, que inclui competências criativas de design, organizacionais e gerenciais, aplicadas à informação e criativas, correspondentes aos tipos de atividade profissional.

Palavras-chave: *metodologia de pesquisa, competência, abordagem baseada em competências, ambiente inovador-criativo, atividade profissional.*

ABSTRACT

Fundamental government documents set the priority of the educational system in public policy, declaring the need for successful scientific and professional training and innovative educational activities of future specialists. The article is aimed to propose a solution to the formation of professional competence of future specialists of technical universities at the stage of modernization of education in modern Russian society. The

work reveals the essence of the leading methodological approaches to solving the problem under study: competency, creative, personality-oriented, system-activity, technological, task-based approaches. A retrospective analysis made it possible to reveal the pedagogical conditions, simulating the real professional activity of students of a technical college. The ways of successful development of professional competence of future specialists are described (establishing innovative-creative environment; developing the subject position of a personality; strengthening practice-oriented activities; organizing reflection and self-reflection; using computing, information and telecommunication technologies, and systems; effective management of students' academic, scientific, and professional activities). Based on the leading principles, the methodological approaches, the requirements of the Federal State Educational Standard of Higher Education for the preparation of future specialists in the Russian Federation, the article presents the innovative experience of the organization of educational process, which is aimed to form a professional competence among graduate students of Ryazan Institute of Moscow Polytechnic University, as well as Ryazan State Agrotechnological University named after P.A. Kostychev. This study made it possible to develop and implement a block-modular structure and content of engineering and construction training of students, which includes design, organizational and managerial, information-applied, creative competencies corresponding to the types of professional activity.

Keywords: *research methodology, competence, competence-based approach, innovative-creative environment, professional activity.*

АННОТАЦИЯ

Основополагающие государственные документы устанавливают приоритет системы образования в государственной политике, заявляют о необходимости успешной научно-профессиональной подготовки и инновационной образовательной деятельности будущих специалистов. Статья посвящена решению актуальной проблемы, а именно формированию профессиональной компетентности будущих специалистов технических вузов на этапе модернизации образования современного российского общества. В ней раскрывается сущность ведущих методологических подходов к решению исследуемой проблемы: компетентностный, креативный, личностно ориентированный, системно-деятельностный, технологический, задачный. Методом ретроспективного анализа литературы выявлены педагогические условия, которые моделируют реальную профессиональную деятельность будущих специалистов технических вузов. Раскрыты пути успешного формирования профессиональной компетентности будущих инженеров-строителей (создание инновационно-креативной среды; становление субъектной позиции личности; усиление практико-ориентированной направленности деятельности; организация рефлексии и саморефлексии; использование вычислительных, информационных и телекоммуникационных технологий и систем; эффективное целенаправленное руководство учебной, научной и профессиональной деятельностью студентов). На основе ведущих принципов, методологических подходов и требований Федерального государственного образовательного стандарта высшего образования (ФГОС ВО) по подготовке будущих специалистов-инженеров представлен инновационный опыт организации учебного процесса в технических вузах г. Рязани, направленный на формирование профессиональной компетентности у студентов-выпускников Рязанского института Московского политехнического университета, а также Рязанского государственного агротехнологического университета имени П.А. Костычева. На основе проведенного исследования была разработана и реализована блочно-модульная структура и содержание инженерно-строительной подготовки студентов, которая включает проектно-конструкторскую, организационно-управленческую, информационно-прикладную, творческую компетентности, соответствующие видам профессиональной деятельности.

Keywords: *методология исследования, компетентность, компетентностный подход, инновационно-креативная среда, профессиональная деятельность.*

1. INTRODUCTION:

Fundamental government documents set the priority of the educational system in public policy, declaring the need for successful scientific and professional training and innovative educational activities of future specialists. In the Law of the Russian Federation "About Education in the Russian Federation" (2012), it is emphasized that the Russian educational system is given a decisive role in the formation of

professional personnel. The Concept of the Federal target program of the development of education for 2006–2010 states that to ensure the quality of teaching and its equal availability for all citizens, the institutional restructuring of the educational system is needed based on effective interaction with the labor market. In the Federal Targeted Program "Scientific and Scientific-Pedagogical Personnel of Innovative Russia (2014–2020)" and the "National Doctrine of Education in the Russian Federation" for the

period up to 2025, the focus is on the need for high-quality scientific, innovative educational activities and personnel training.

Engineering education in the 21st century is associated with dynamic changes in science and industry, based on the integrative role of training a competent specialist, including understanding of engineering activity as an integrative process, analytical thinking; set of abilities; critical assessment of facilities and production problems; contextual knowledge of the educational sphere and situation; the ability to supplement their expertise throughout their work and to adapt to changes in the technical and technological environment, the requirements of the world market; the ability to synthesize innovations at the stages of their design and production (Novikov, Zuev, 2000).

Professional competence of graduates of a technical university is a level-integrative personal education, including a set of system knowledge, practical skills that are used in the process of solving professional problems using computational, information and telecommunication technologies and systems. It is determined by the Federal State Standard of Higher Professional Education, which sets forth specific requirements for the training of technical specialists, including the formation of a set of universal, general and specific professional competencies (The federal state educational standard of higher professional education in the specialty 270800 "Construction" dated January 18, 2010, No. 54).

Formation of professional competence of the future specialist as an integrated system of in-depth expert knowledge, abilities, and skills consists in mastering specialized knowledge and skills, universal actions, social relations, intellectual skills, readiness to show personal qualities and is solved by implementing a set of tasks of a scientific, methodological and practical nature.

At present, the organization of the pedagogical process at a higher educational institution is a complex, multifactorial, constantly changing holistic phenomenon that combines the methods of preparing a future specialist and the means of educating, training, upbringing, and personal development. These processes are all based on the complex of necessary pedagogical conditions for the formation of professional competence of students of a technical university that meet the requirements of the Federal educational standards (Abulkhanova-Slavskaya,

1980).

Consequently, the relevance and significance of the research are due to the new requirements for the professional training of competitive specialists (bachelors and masters) of a technical university in higher education, formulated in the language of the competence-based approach, the formation of competencies and competence (Greibenkina, Suvorova, 2012).

In pedagogical science in current conditions, the problems of the competence-based approach, the formation of professional technical competence of a technical university, and its components are studied in Russia by such scientists as K.A. Abulkhanova-Slavskaya, E.I. Artamonova, V.I. Baidenko, A.A. Verbitsky, M.A. Galaguzova, L.K. Grebenkina, E.F. Zeer, I.A. Zimnyaya, N.V. Kuzmina, V.A. Slastenin, A.V. Khutorskoy, and others. They studied a wide range of problems, in particular, improving the quality and effectiveness of training future specialists, including a technical university.

The set of the components of professional competence reflects not only various aspects of professional activity, but also valuable personal qualities: the ability to self-change and self-development based on self-reflective organization; communication skills (initiative, collaboration, teamwork); ability to criticism and self-criticism; the ability to receive, consume, update informational knowledge, etc.

The continuous complication of activities based on reflexive self-organization creates new problems of a cognitive nature, as objective activity is always aimed at creation (Abulkhanova-Slavskaya, 2008; Baidenko, 2004; Verbitsky, 1991; Galaguzova., 2011; Grebenkina, Suvorova, 2012; Zeer, 1988, Zimnyaya, 2006; Kuzmina, 1990; Khutorskoy, 2003).

The creation and spread of innovations is a purposeful process of exploring the new, suggesting its creative understanding and improving practical results. In the works of scientists (G.S. Altshuller, I.M. Vertkin, V.P. Delia), it is emphasized that in the process of training and educating in a university, when preparing professionals, it is essential to create an innovative and creative environment as a high need for innovations and students' creativity. The researchers consider pedagogical conditions to be external and internal circumstances contributing to the action of personality development factors, for example, readiness for activity, stimulating environment, logistical and resource support, etc. In a broad sense, conditions

are interpreted as causes, development factors, technologies, methods, means training and education, management support, pedagogical support, interaction of the subjects, their joint activities (Altshuller, Vertkin, 1994; Delia, 2007).

The diversity of approaches and the complexity of the new stage of the formation of professional competence oblige a higher technical school to make adjustments to the training of competent specialists to acquire innovative business experience and the ability to make rational decisions. In our study, it was essential to determine the nature, structural components and features of the pedagogical conditions of a technical college. They simulate the real professional creative activity of bachelors and masters, going beyond the limits of learning situations and allowing future engineers to be included in it, developing their personal qualities, and ultimately forming their professional competence based on state educational standards in the training direction - "Construction."

So, the aim of the study was the introduce a competency-based approach and to implement the requirements of the Federal State Educational Standard of higher professional education of the third generation in the professional training of specialists in higher education. In the language of competencies, it is updated content, generalized methods of action when integrating different types of professional activity and solving technical problems of the all-Russian intersectoral association of employers "Russian Union of Builders," the requirements of the Employment Centers, the State Educational Establishment of Higher Education for the level of professional knowledge and skills of a modern specialist and prescriptive requirements of a competency-based approach.

2. MATERIALS AND METHODS:

The process of integrating Russian higher education into the world education system actualizes the problem of the formation of professional competence of future specialists of technical universities. Its solution involves the development and successful implementation of the new pedagogical conditions of training and educating in the integrated pedagogical process of a technical university. The application of these pedagogical conditions in practice ensures the active formation of the main components (competencies) of the professional competence of bachelors and masters, synchronization of methodological approaches and principles.

In modern conditions, scientists-methodologists and teachers (V.I. Zagvyazinsky, V.V. Kraevsky, A.I. Kochetov, G.K. Selevko, V.A. Slastenin) suggest using various methodological approaches and an integrated methodology set, aimed to achieve and solve theoretical and practical problems of modern education, in particular, to solve the problem of forming the professional competence of future specialists of technical universities (Zagvyazinsky, 2008; Kraevsky, 2006; Kochetov, 1996; Selevko, 2006; Slastenin, 2000).

The analysis of the use of the possibilities of various methodological approaches in the process of the formation of professional competence among students of a technical university showed that activities aimed at solving professional problems could not be built based on only one of them.

The following methodological approaches were leading in our study: a competency-based approach (based on the requirements of modern educational standards, as well as on innovative experience in solving professional problems); a creative approach (necessary for the organization of a creative approach in the educational process of the university); an axiological approach (value approach including orientation of the teacher to universal, national and professional values, value orientation in pedagogical activity); a personality-oriented approach (associated with the development of creative abilities, personal qualities and professional mobility of each of the subjects of the educational process); a system-activity approach (characterizing the theoretical and practical experience, scientific and useful results, the criteria development process, the formation of competencies); a technological approach (providing for the possibility of generalization of pedagogical modern technologies in the educational process); a task-oriented approach (to analyze and successfully solve technical problems of production activities). It can be concluded that these approaches are closely interrelated, interdependent and are necessary for the formation of students' professional competence in a technical university.

To solve the aims of the study and obtain reliable results, the sophisticated methodology of scientific research was used (theoretical and empirical methods): a retrospective analysis and review of the literature, observation, questioning, testing, interviews, designing, modeling, monitoring, experiment.

The requirements of the all-Russian

intersectoral association of employers "Russian Union of Builders," employment centers, Federal State Educational Standards of Higher Education for the level of professional knowledge of a modern specialist and directive requirements for the implementation of a competency-based approach were taken into consideration.

The educational environment of technical universities, new scientific, theoretical, and practical areas of the educational process (leading professional activities) of the Ryazan Institute (branch) of the Moscow Polytechnic University, as well as the Ryazan State Agrotechnological University, were chosen the research base of the study.

The teachers of the Department of Industrial and Civil Engineering of Ryazan Institute (branch) of the Moscow State Open University and Surgut State University took part in the experiment. In total, 256 people took part in the study, including 85 students in control groups and 87 students in experimental groups.

The Scientific Department and the Head of the Department of the University have approved this research, and all participants have agreed to participate and consented about the research.

3. RESULTS AND DISCUSSION:

The research was conducted within the educational system of technical universities, recent scientific, theoretical, and practical activities of the educational process (leading professional activities) of the Ryazan Institute (branch) of the Moscow Polytechnic University, as well as the Ryazan State Agrotechnical University.

The research program included the analysis and identification of the requirements and pedagogical conditions developed by scientists for the formation of professional competence of bachelors and undergraduates of Higher technical school, taking into consideration the Federal State Educational Standard of Higher Education 3+, 3++.

In the standards of bachelor's degree in the training program «Construction» it is stated that "when developing a bachelor's plan, the university formulates the requirements for the results of its development in the form of universal competences (systemic and critical thinking; project development and implementation; teamwork and leadership; communication; intercultural interaction; self-organization and self-development; life safety); general

professional and professional competencies of graduates. "As part of mastering the program, graduates can prepare to solve professional activity problems of the following types: survey; project; technological; organization and management; service and operation; expert-analytical.»

In the Federal State Educational Standards of Higher Education in master's training program "Construction," it is noted: a magister should be prepared to solve professional tasks of a higher level also following the types of professional activity: innovation and research, design and settlement; industrial and technological research and teaching; project management; professional expertise and regulatory-methodological."

These standards set forth requirements for the conditions of the implementation of undergraduate and graduate programs, which include the system-wide needs, the requirements for material and technical and educational and methodological support, the requirements for personnel and financial conditions for the implementation of programs, as well as the requirements for the mechanisms used to assess the quality of educational activities and the preparation of students by programs.

"The uniqueness of the master's program lies in the use of the CDIO ("planning - design - implementation - operation") approach in the learning process. The preparation process is formed as follows: the planning stage is for thinking over the technology, the project design strategy, regulatory requirements, developing concepts, technical and business plans; the second stage of the design is devoted to the development of the project, including ideas, drawings, and algorithms, structural materials; at the scene of implementation and operation, the project is being transformed into a housing and utilities facility (residential building, environmental protection enterprise, infrastructure facility, etc.)" (Annotation of the leading educational program for master's training 08.04.01 "Construction." Program name 08.04.01_16 "Design and construction of facilities."

During the analysis, we realized the need to create some interrelated conditions that simulate real professional activities that go beyond learning situations and allow students to be included in it, to develop their personal qualities, to form skills and abilities, to improve the professional experience. As a result, a set of pedagogical conditions was determined that contribute to the successful formation of professional competence

of future specialists (civil engineers: the example of the training of civil engineers:

- creation of an innovative and creative environment, which forms the high need of students for cognition and creative activity;

- formation of the subjective position of the student's personality capable of self-improvement and self-realization by involving him/her in the decision-making process, taking into account the characteristics of the contingent and the specifics of the educational process of a technical university;

- strengthening the practice-oriented direction of the activities carried out in the course of solving professional problems in construction, for example in designing and calculating bases and foundations using data of Ryazan region;

- use of computing, information and telecommunication technologies and systems, which allows combining traditional and innovative ways of mastering specialized knowledge, the development of professional skills as the basis of professional competence;

- organization of students' reflection and self-reflection, manifested in the ability to analyze, regulate their behavior and independent professional activities consciously;

- effective targeted management of educational, research, and professional activities of students.

Let us dwell upon the characteristics of the most significant pedagogical conditions. In our opinion, the creation of an innovative and creative environment at the university has an integrative nature, since this environment is, above all, socio-educational. It solves the tasks of professional training (and self-study), education (and self-education), and development (and self-development) of the future specialist. The innovative and creative environment in the context of the modernization of education is based on a particular social and mental readiness of the teacher's personality for such a change in the situation when both the teacher and the learner can effectively interact in joint activities, reach mutual understanding, eliminate conflicts. Pedagogical creativity assumes that the teacher has a high level of competence, as a result of which creative pedagogical activity becomes more efficient and successful. "The most important indicators of teacher's pedagogical creativity are creative well-being and pedagogical creativity" (Altshuller, 1987; Altshuller, Vertkin, 1994; Morozov, 2004; Delia,

2007).

Attention should be paid to the fact that future specialists need to be taught and developed comprehensively, taking into account their level of talent so that they display latent abilities. Teaching creative activity in a technical university is regarded as an activity that contributes to the improvement of personal qualities: mental activity; ingenuity; the desire to obtain new knowledge necessary for specific practical work; independence in the choice and solution of technical problems; diligence and responsibility; competitiveness, etc. It follows that it is essential to consider the development of the creativity of the individual as a continuous creative process and rely on the previously formed creative abilities.

Considering that the creation of an innovative and creative environment in mentioned technical universities is facilitated by the potential of training, general professional and unique disciplines, as well as the whole range of professional problem solving, we have implemented the necessary conditions for the successful formation of universal and professional competencies responsible for the success of mastering new knowledge and skills. In the educational process being organized, the experience of innovation activity was formed among the students who became its subjects. At the same time, the development of subject-subject relations, the subjective position of the personality of the future engineer, capable of self-realization and self-improvement, took place.

The formation of the subjective position of the individual was realized in the course of dialogic communication through the student's ability to perform all types and forms of learning activities (listen and outline lectures, speak to an audience, solve technical problems, lead discussions, defend their position), plan and organize their work, thoroughly learn and to communicate.

No less critical condition for the formation of professional competence of future civil engineers is the incentive to reflect, which is manifested in the ability to regulate their professional behavior and activities consciously. Teaching and educational activities of the teacher and student's cognitive and creative activities changed with the creation and improvement of an innovative, creative environment, encouraging the student to self-reflection and improve creative abilities. In the course of research, we considered reflection as an essential mechanism of productive thinking; as an exclusive organization of the processes of

understanding what is happening in a broad system context, including an assessment of the situation and actions, finding methods and operations for solving problems; as a process of introspection and active reflection on the state and activities of the individual and other people involved in solving problems (Greibenkina et al., 2004). Reflection characterizes the constant comprehension, transformation, and change of consciousness of the student based on the analysis of their actions. The reflexive activity makes it possible to most effectively and adequately carry out reflexive processes ensuring the development and self-development of an individual, contributes to the realization of a creative approach to professional activity, the achievement of its maximum efficiency and effectiveness (Stepanov, 2006).

Another essential condition for the successful formation of professional competence of future specialists of a technical university is the effective management of students' educational, scientific and practical activities. As a rule, when organizing professional events of students, the teacher provides and implements several levels: teaching and informative (experimental and theoretical), creative, practical, technological, and functional (Suvorova, 2011).

It is known that one of the critical provisions of the system-activity approach to teaching at a technical university is the clearly defined focus of the educational process on shaping students' logical thinking when making decisions related to the nature of their work. The basis of students' professional competence should be considered the ability to acquire knowledge and apply skills in various life situations, establish links between dynamically updated culture in theoretical and practical activities, and find an algorithm for solving professional problems. Consequently, the formation of professional competence of the future modern construction engineer is impossible without new information technologies and computer-aided design (CAD) systems based on the use of computer technology, information, particular, methodological support, which is one of the features of the pedagogical conditions of a technical university. The difference in the modern process of forming professional competencies in the field of telecommunications is that this young progressive field of pedagogical knowledge does not contain "ready-made knowledge" (Glubokova et al., 2008). For example, in our experience, organizing education through the active introduction of computer equipment and network communications into the educational process has become an indispensable element of pedagogical

activity, which determines the construction of interactive forms and teaching methods that meet the needs of the information society, the labor market, the pace of modernization of higher education. The use of computing, information, telecommunication technologies, and systems effectively influences the solution of professional tasks and the graphic design of project solutions, expands communication capabilities, actualizes the needs of the functional interaction of educational subjects.

When forming the professional competence of students, the role of modeling and solving technical problems is enormous, which strengthens the practical orientation as one of the conditions for the success of training in specialized disciplines and serves as a criterion of the level of knowledge and competence measurement. At the same time, the used teaching aids contribute to the development of not only knowledge but also personal qualities and abilities. In the process of practical work, solving technical problems, the student gains the experience of the work that he chose, and tries to determine whether the nature of this work corresponds to his abilities and skills.

The federal standard of higher education records the results of education, the requirements for solving the professional tasks of the future engineer at the level of his/her theoretical and practical experience. The undergraduate training program determines the content of higher education in the "Construction" area of study. In developing the undergraduate training program, the requirements for the results of its development in the form of universal, general and specific professional competencies of graduates were taken into consideration. The graduates should be ready to meet the challenges of professional activity: survey work; project; technological; organization and management; service and operation; expert-analytical.

For the successful formation of professional competence, the traditional list of the curriculum "Industrial and civil construction" was revised and modified, a particular course on "Computer-aided design of computer systems" was introduced.

In the curriculum "Urban construction and economy," "Roads," the discipline "Information technology for the calculation of building structures" was introduced.

As an integral element of the new information technologies, these courses offer to explore the extensive scientific system of civil

settlements, «Base,» which allows getting an innovative professional experience.

The purpose of these courses is to combine traditional and informational techniques of knowledge acquiring; identify the information needs for solving specific professional tasks; train the educational material interpretation and the analysis of situations, the application of further calculation results; develop the skills of applying the previously studied material, the ability to combine, apply theoretical knowledge to obtain a result that has a novelty, "the subject potential of the individual" in the new interdisciplinary conditions.

The specificity of the disciplines is in providing practical solutions to solving professional problems using the "Base" software package. In this regard, the effectiveness of the pedagogical influence becomes higher, since the computer acts as a component of the system of pedagogical management; as a means of increasing the efficiency of scientific and pedagogical research. The ability to find the necessary information and apply it in professional activities is a mandatory requirement of the employer for a modern specialist since the transition from knowledge to action is much faster. Therefore, information technologies and computer-aided design systems are a necessary tool and a specific condition that provides practical orientation using new information technologies and systems (Suvorova, 2011).

It is considered the ability and desire to communicate, interact in a networked electronic environment as competence and means of realizing professional reflection. It opens up vast opportunities for professional self-development and requires systematically organized, intellectual, communicative, reflexive, moral qualities from a future specialist, allowing to successfully set up activity in broad social, economic and cultural contexts.

As a result, the subject-subject interaction is changing, the role of the teacher is increasing not only as a carrier of social experience but also as an active subject which studies the newest adventure, conducts scientific research, interprets current trends, carries out professional approbation of the latest achievements, etc.

The comparison of the pedagogical and construction professional activities of an engineer and a bachelor engineer makes it possible to show the similarities and differences in the types of

events that are determined by the content of educational programs (Table 1).

As already noted, depending on the types of professional activity, a university graduate should be prepared to solve specific occupational tasks. Therefore, modern requirements for professional activity are the conceptual basis for structuring professional competence.

For example, implementing major methodological approaches and modern scientific-theoretical and practical activities in the educational process at the Ryazan Institute of the Moscow Polytechnic University, we realized the need to create conditions simulating real professional activity, extending beyond learning situations outside and allowing to include students in it, to develop their personal qualities, to form skills and to improve professional experience.

The professional activities of technical universities, according to their specificity, are associated with the state policy in education, regional characteristics, fundamental and industry science. Among the practical results of the implementation of the federal target program, the interaction with the real sector of the economy (in our study, the construction sector) can be admitted. For example, the All-Russian Intersectoral Association of Employers "Russian Union of Builders" includes several organizations in the Ryazan Region, aimed at the innovative way of professional and personal development of each employee, his/her skills to direct and organize his activities; use software to improve competitiveness. As a result, the requirements of Russian employers and All-Russian inter-sectoral association "Russian Union of Builders" to the level of professional competence of graduates of a technical university have been formulated:

to know:

- the theoretical foundations of general and specific professional disciplines;
- the trends and the main tendencies of science and technology development;

to be able to:

- transform acquired knowledge into innovative technologies,
- independently find, perceive and analyze new information, taking into account existing legislative and socio-legal norms;
- work with global information sources based on computer and information-communication tools;

- make decisions in uncertain, suddenly complicated professional conditions;

- determine the information needs, use and give them a professional assessment for solving specific problems.

to master:

- the CAD systems;

- the methods of system analysis;

- the means of conducting scientific research;

- the software packages for technical solutions;

- the adequate ways of professional communication and behavior, the ability to cooperate and work in a group for a typical result.

The analysis of the requirements has shown that employers consider the ability of a university graduate to solve non-standard professional tasks, use computer tools, information and communication technologies and have such personal qualities as initiative, communication, reflexivity, creativity as the main requirements in raising the level of employees' competence. The disadvantage of higher professional education in Russia was indicated as the closeness of the education system, obsession with the internal university criteria for training specialists without regard to the requirements of employers and the labor market, which cannot be ignored when forming the professional competence of future specialists.

The study has shown that improving the system of the stated pedagogical conditions contributes to a targeted, systemic formation of a competitive personality. The absence of any of the components reduces the level of motivational readiness to solve the problem of forming students' professional competence. All this was subsequently taken as the basis for the concept and model of the successful formation of the professional ability of bachelor students and undergraduates of a technical university.

4. CONCLUSIONS:

Modernization of higher technical education actualizes the problem of developing and implementing new pedagogical educational conditions into the university's educational process, which ensure the synchronization of principles, methodological approaches, the formation of personal qualities and professional competencies of future specialists (in our research, future civil engineers).

In current conditions, the professional competence of graduates of higher educational institutions of a professional profile is determined by the Federal State Standards of the new generation, which formulate specific requirements for graduates, in particular, the formation of universal, general, and professional competencies. At the same time, the methodology of the implemented transformations represents a competence-based approach that provides for innovative changes, both in the content of education and in the technology of management of the educational process.

When organizing and conducting a holistic pedagogical process, research and professional-practical activity, the following conditions for the successful formation of professional competence among students on an innovative basis proved their effectiveness: the current trends in the structure of professional expertise; the educational character of pedagogical process; the subject-subject interaction of teachers and trainees; the creation of innovative and creative environment, creative relationships; practice-oriented activities; the ability to reflection and self-reflection.

It is proved that the creation of an innovative and creative environment is an essential integrated condition for the organization of the educational process, in which the statement of the problem is a stage of activity, and the solution of a problem is the result of the stage. The use of non-standard creative technical tasks of an open type (absence of a single correct answer), problem analysis, modeling of professional situations and stimulation of self-confidence among students supposes that they have a specific knowledge, skills, abilities, and experience, that is, not only the application of subject-practical content of such tasks but also examples of the search for creative solutions and creative behavior, in other words, professional competence. Learning becomes the creativity of students when the teacher's influence is aimed at attracting them in acquiring the necessary integrated professional experience and is of a targeted nature. A student can gain professional competence when solving problems independently, which requires him to be ready to apply the necessary knowledge and skills in practical activities. Psychologists note that only by entering into useful contact with the outside world, purposefully and creatively transforming it, a student in the process of this complex interaction can change not only the surrounding world but also himself" (Sonin *et al.*, 2002).

Thus, the formation of universal and

professional competencies in technical university students is the degree of students' involvement into complex types of educational, cognitive and practical professional activities, where the development of goals, tasks, content, and technology of independent study of particular disciplines with the support and assistance of a teacher is fundamental; mastering the types of independent work, self-control and self-esteem as a result of the pedagogical interaction of the teacher and the student, implying continuity. The teacher is of great importance to the content and methods of organizing such activities; it is his qualification competency that contributes to the modernization processes in the education system.

The study showed that the establishment and improvement of the system of the stated pedagogical conditions contribute to the targeted, systemic formation of a competitive personality, the absence of any of the components reduces the level of motivational readiness to solve the problem of forming students' professional competence. All this was subsequently taken as the basis for the concept and model of the successful formation of professional ability of bachelor students and undergraduates of a technical university.

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Table 1. *Types of professional activity*

Types of professional activity	
Pedagogical activity	<ul style="list-style-type: none">• educational and methodical• managerial• research• project
Engineer activity	<ul style="list-style-type: none">• engineering design• organizational and managerial• production and technological• research
Bachelor - engineer activity	<ul style="list-style-type: none">• survey and design• production technology and production management• experimental research• installation-commissioning and service-operational