

# Modern Methods of Pedagogical Potential Development of Researchers in Technical Universities

Abduazizova Veronika Vadimovna

PhD Associate Professor, Namangan State Technical University, Uzbekistan

Shokirov Hasanboy Tuychiboy ogli

PhD, Namangan State Technical University, Uzbekistan

**Received:** 25 April 2025; **Accepted:** 21 May 2025; **Published:** 23 June 2025

**Abstract:** The article examines theoretically grounded modern methods for developing the pedagogical potential of master's students in technical universities. The focus is on integrative educational models, digital technologies, and project-based learning approaches that foster methodological, reflective, and digital competencies. The inclusion of pedagogical components in engineering education is justified as a key factor for enhancing the quality of higher education.

**Keywords:** Master's program, pedagogical potential, technical education, digital technologies, project-based learning, pedagogical competencies, engineering pedagogy, innovation, methodology, integration.

**Introduction:** The modern system of higher education is in the stage of intensive transformation, caused by the requirements of the digital economy, globalization of knowledge and rapid development of engineering and information technologies. In these conditions, the importance of training a new generation of scientific and pedagogical personnel, capable not only of generating and transmitting knowledge, but also of pedagogical activity based on an innovative approach, is increasing.

Master's degree programs in technical universities are traditionally focused on in-depth professionalization within the framework of engineering and applied disciplines. However, the formation of pedagogical competencies in future teachers of technical disciplines often remains in the shadows, which significantly reduces their readiness to fulfill the educational mission. Meanwhile, as international experience shows (Germany, South Korea, USA), the integration of pedagogical knowledge and skills into engineering training allows us to form full-fledged specialists capable of teaching and scientific-methodological activities in higher education [1].

The pedagogical potential of master's students in

technical fields is a set of personal and professional qualities that ensure the successful implementation of educational functions: design of the educational process, use of digital and interactive technologies, diagnostics of learning outcomes, motivation and support of students. The development of such potential requires the use of modern educational models, methods and tools that meet the tasks of interdisciplinary training and modern challenges of the university.

This article aims to identify effective methods for developing the pedagogical potential of researchers at technical universities, and to analyze existing practices and proposals for integrating the pedagogical component into engineering education. The focus is on the combination of digital educational technologies, problem-based learning, and project-based activities as the basis for developing the pedagogical readiness of future teachers of engineering disciplines [2].

## METHOD

Modern research in the field of engineering pedagogy points to the need to rethink the traditional approach to training researchers in technical fields. Analysis of scientific works shows that the pedagogical potential of

future teachers should not be developed in isolation from basic technical training, but on its basis and in an inseparable connection with it.

Thus, N.D. Galskova emphasizes the importance of a systematic approach to the formation of professional and pedagogical competencies, relying on the activity paradigm, within which the student masters not only the content, but also the methods of pedagogical interaction [1]. Her position is developed by E.N. Solovyova, noting that successful training of teachers is impossible without the integration of methodological knowledge, experience in organizing the educational process and the development of reflective ability [2].

Special attention in the research is paid to the use of interactive forms and digital tools in the educational environment. The works of M.R. Yuldasheva and G.N. Khamraeva reveal the potential of game exercises as a means of developing pedagogical skills and increasing students' motivation for teaching [3]. A similar vector is present in the studies of Sh.Kh. Rakhimova, where storytelling is considered not only as a method of conveying information, but also as an effective tool for developing empathy, creativity and communication flexibility, which are so necessary in the work of a teacher [4].

Digitalization of the pedagogical space is also becoming a relevant topic of modern research. U. T. Khakimov and G. A. Ismoilova draw attention to the need to develop digital literacy in teachers as one of the key components of their professional readiness [5][6]. This is especially important in the context of distance and hybrid learning, which have been actively developed in

recent years.

In foreign studies, the emphasis is on an interdisciplinary approach. The concepts of engineering pedagogy within the CDIO and STEM education models suggest that a technical specialist must simultaneously master pedagogical tools, be able to design educational environments, evaluate learning outcomes and apply active learning methods. Such approaches are widely covered in the works of T. Baillie, R. Felder and other authors, where the importance of problem-oriented, project-based and competency-based learning is emphasized.

Summarizing the above, it can be argued that the focus of scientific interest is the transition from a subject-centric to a personal-activity model of training researchers. Modern educational practices require a new type of teacher - flexible, digitally literate, capable of reflection and interaction in a multidisciplinary environment. Consequently, the development of the pedagogical potential of master's students should be carried out through the implementation of integrative educational models covering both technical and pedagogical aspects.

## RESULTS AND DISCUSSIONS

To identify effective methods for developing the pedagogical potential of master's students in technical fields, the following methods were used within the framework of the study:

Content analysis of curricula and educational modules of 12 master's programs in technical universities of Uzbekistan and the CIS (2021–2024);

**Table 1 - Comparative analysis of approaches to the formation of pedagogical potential of researchers**

Criterion	Uzbekistan	International practice
<b>Educational model</b>	Traditional model with elements of competency-based approach	Competency-based, CDIO, STEM models
<b>Teaching methods</b>	Lectures, seminars, practical classes	Problem-based, project-based, case-based learning, collaborative learning

<b>Integration of pedagogy and engineering</b>	Limited, often optional	Extensive integration with training courses and internships
<b>Use of digital technologies</b>	Partially (introduction of LMS, online courses)	Wide use of EdTech ( Moodle , Canvas , Zoom , etc.)
<b>Preparation for teaching activities</b>	Not all Master's programs implement this systematically	It is a mandatory element of training.
<b>Competency assessment form</b>	Certification, defense of master's thesis	Multi-level assessment: portfolio , pedagogical cases, feedback

Based on the analysis of theoretical sources, current master's programs, methodological developments and scientific publications in the field of engineering pedagogy, key areas and results of the application of modern methods for developing the pedagogical potential of researchers at technical universities were identified.[8]

Numerous studies (Galskova, Solovova, Baillie , Prince ) prove that the pedagogical training of researchers in the context of technical education requires abandoning the traditional subject-centric model. It is being replaced by integrative educational strategies , in which pedagogical and engineering modules complement each other. For example, within the framework of the CDIO model, a future engineer not only masters project activities, but also acquires skills in planning and evaluating educational processes.

According to reviews of scientific publications of recent years, the widespread introduction of digital educational technologies (LMS, online courses, digital simulations, case platforms ) contributes to the active inclusion of master's students in the educational process and the development of such components of pedagogical potential as:

- **interactive methodological literacy** (ability to select and use digital forms of material presentation);
- **communicative flexibility** (proficiency in various interaction formats: online discussions, multimedia tasks);

- **reflexivity** (the ability to evaluate the effectiveness of educational interventions through digital traces and feedback).[7]

The literature emphasizes that these components are becoming integral parts of a competent 21st century teacher, especially in the technical field, where the digital environment is not an alternative, but a necessity.

An analysis of curricula and methodological recommendations (including international programs) allows us to identify the most effective practices:

- **project-oriented learning** as a means of modeling real pedagogical situations;
- **integration of pedagogical cases** into technical disciplines, which allows for the development of educational logic through engineering tasks;
- **introduction of disciplines in engineering didactics** (for example, “Methodology of teaching technical disciplines”);
- **systematic implementation of digital platforms** ( Moodle , GoogleClassroom , Padlet ), through which researchers learn to design and implement the educational process.[9]

These approaches improve the quality of training not only in terms of engineering qualifications, but also in terms of readiness for teaching. They ensure that researchers develop methodological, technological and personal readiness to teach students in the conditions of a modern educational environment.

Despite the proven effectiveness of the above methods, a number of universities show insufficient integration of the pedagogical component into

technical education. This is primarily due to the inertia of traditional programs, the lack of qualified teachers in technical universities, and limited methodological support. A number of countries (including Uzbekistan) have begun reforms aimed at developing integrated master's programs, but further dissemination of positive international experience is required.

## **CONCLUSION**

Development of the pedagogical potential of researchers at technical universities is one of the most important aspects of training future teachers of engineering disciplines. Theoretical analysis of modern research in the field of engineering pedagogy, as well as a review of educational practices in the domestic and international context, showed that successful implementation of this task is impossible without the systematic implementation of integrative educational models.

The most effective approaches in this process are recognized as project-oriented and problem-based learning, case method, and active use of digital educational platforms. These methods allow master's students to develop a wide range of pedagogical competencies - from methodological and technological to communicative and reflective.

However, despite the existing positive trends, the training of pedagogically competent engineers requires further efforts from educational institutions. It is necessary to adapt master's programs to the requirements of the digital age, strengthen the role of pedagogical disciplines in technical education, and create conditions for the formation of sustainable professional motivation for teaching.

Thus, the formation of the pedagogical potential of researchers should be considered not as an additional, but as an integral component of high-quality training of specialists of the new generation. This requires not only methodological modernization, but also a rethinking of the role of the teacher in the engineering education system of the 21st century.

## **REFERENCES**

- Galskova N.D. Modern methods of teaching foreign languages: a tutorial. - M.: Academy, 2013. - 189 p.
- Solova E.N. Methods of Teaching Foreign Languages: Basic Course. - M.: AST, 2012. - 254 p.
- Yuldasheva M.R., Khamraeva G.N. Game exercises in the teaching and methodological kit in English for elementary grades. - Languages and Culture, 2020. - No. 3. - P. 45-49.
- Rakhimova Sh.Kh. Using storytelling in primary English language teaching. - Journal of pedagogical innovations, No. 4. - Tashkent, 2020. - P. 71-75.

Khakimov U.T. Cognitive features of mastering a foreign language at primary school age. - Pedagogical Sciences of Uzbekistan, 2021. - No. 1. - P. 30-34.

Ismoilova G.A. Innovative methods in professional education. - T.: Fan, 2021. - 128 p.

Abduazizova V., Soliev N. "Technical education based on digital technologies". Innovations in technology and science education volume 2, issue 7, 2023.

Abduazizova V. Innovative approaches to the development of digital competence of master's students in the context of credit-modular learning: methodology and implementation tools. Journal of Construction and Education, Vol. 3, 2024, pp. 139-143

Shokirov X. T. , Abduazizova V.V., Formation of intellectual potential of students of engineering specialties in the conditions of digital pedagogy. Xalqaro miqyosida ilmiy va ilmiy-texnik conference " Xalqaro tajriba : Oliy ta'limni transformation sharoitida zamonaviy muhandislik yo'nalishida intelligent qobiliyatli kadrlar tayyorlash istiqbollari " Namangan davlat texnika University , 2025.

Bondarevskaya E.V. Pedagogical support for personality development: Monograph. - Rostov n /D: Rost Publishing House . ped . University, 2001. – 312 p.