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Developing the Professional Competence of Technical University Students Through Materials Based on National Values

Qoriyeva Matlubaxon Axmadjonovna

Lecturer at Namangan State Technical University, Uzbekistan

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ABSTRACT

The article examines the pedagogical potential of materials based on national values in developing the professional competence of technical university students. The relevance of the study is determined by the need to modernize technical education in a way that preserves its professional rigor while strengthening students' social responsibility, ethical culture, communication, civic awareness, and value-based decision-making. In contemporary higher education, professional competence is interpreted not only as mastery of specialized knowledge and practical skills, but also as the integration of attitudes, values, and behavioral readiness required for effective professional action. In this context, materials grounded in national values may serve as a meaningful educational resource because they connect professional preparation with cultural continuity, social responsibility, labor ethics, and historically rooted models of technological creativity. The purpose of the article is to substantiate a methodology for developing the professional competence of technical university students through the systematic use of materials based on national values in the educational process. The study is theoretical and methodological in nature and is based on the analysis of scientific literature on competence-based education, technical and vocational education, engineering pedagogy, sociocultural competence, and values-oriented learning. The results show that the integration of nationally grounded educational materials into technical disciplines can improve the motivational, cognitive, operational, communicative, and axiological components of professional competence. The article proposes a pedagogical model that combines contextualization of technical content, value-oriented interpretation of engineering problems, project work, reflective discussion, and interdisciplinary integration. It is argued that national values-based materials become especially effective when they are not used as decorative cultural additions, but as meaningful pedagogical instruments linked to real professional tasks, engineering ethics, sustainable development, and the social mission of technical specialists. The practical significance of the article lies in the possibility of applying the proposed methodology in technical universities, engineering faculties, and vocationally oriented higher education institutions.

Keywords: Professional competence, technical university students, national values, engineering education, competence-based approach, values-based education, technical education, sociocultural competence, pedagogy, higher education.

INTRODUCTION

The modernization of technical higher education increasingly requires universities to educate not only technically prepared graduates, but also socially responsible, ethically aware, communicatively competent, and culturally grounded professionals. The engineering and technological sectors are developing in conditions shaped by digital transformation, sustainability challenges, social complexity, and the need for human-centered innovation. Under these conditions, a narrow understanding of professional training as the transmission of technical knowledge alone becomes insufficient.

International educational discourse increasingly describes competence as an integrated construct that combines knowledge, skills, attitudes, and values applied in professional practice. UNESCO's current approach to technical and vocational education and training explicitly frames TVET as a field that develops abilities, knowledge, values, and attitudes needed for work and life, while the OECD likewise treats competence as inseparable from values and attitudes in curriculum design and global competence frameworks.

In technical universities, however, the value dimension of education is still often treated as auxiliary. Students may be trained to solve engineering problems, use digital tools, perform calculations, and design technical systems, yet remain weakly prepared for the broader human consequences of professional action. They may show insufficient readiness to work in culturally sensitive environments, communicate responsibly, preserve professional integrity, or understand technology as a social and cultural phenomenon. This gap becomes especially visible when employers and accreditation systems emphasize not only technical literacy, but also communication, teamwork, ethical judgment, sustainability awareness, and socially meaningful innovation. Studies in engineering education therefore increasingly highlight professional skills, sociocultural competence, and values-based learning as necessary elements of high-quality preparation.

Within this context, the use of materials based on national values acquires special methodological importance. Such materials may include texts on the historical development of crafts and technologies, biographies of scientists and inventors, proverbs and ethical narratives related to work culture, examples of environmentally responsible local practices, descriptions of traditional technical solutions, materials reflecting collective responsibility, labor discipline, respect for knowledge, intergenerational continuity, and social solidarity. Their pedagogical significance lies not in idealizing the past, but in using culturally meaningful content to deepen professional motivation and situate technical learning within a recognizable moral and social framework. When students perceive engineering and technology as part of their own civilizational and cultural heritage, professional learning becomes more personally meaningful and socially directed.

The problem, however, is methodological. If national values are introduced into technical education superficially, they risk remaining decorative and disconnected from the content of engineering preparation. Their effectiveness depends on whether they are integrated into real educational tasks, interpreted through professional categories, and linked to the development of concrete competencies. Competence-based education literature shows that competence is formed through holistic tasks rather than abstract declarations, and engineering pedagogy research indicates that authentic, project-based, and socially situated learning environments more effectively develop professional competencies than lecture-dominated models alone. This suggests that materials based on national values should not merely supplement technical education ideologically; they should become part of curricular design, problem situations, project themes, case analyses, and reflective practice.

The purpose of this article is to substantiate a methodology for developing the professional competence of technical university students through materials based on national values. The research addresses the following questions: how professional competence should be interpreted in the context of technical higher education; what pedagogical functions national values-based materials can perform; how these materials should be selected, structured, and integrated into the curriculum; and under what pedagogical conditions such integration can influence students' professional development. The novelty of the article lies in the theoretical justification of a value-oriented competence model for technical education in which nationally grounded materials are treated as an active pedagogical resource for forming professional identity, communicative maturity, ethical responsibility, and contextualized technical thinking.

The study is theoretical and methodological in character. Its empirical basis consists of the analysis and synthesis of contemporary scientific publications, policy documents, and pedagogical models related to competence-based education, technical and vocational education, engineering pedagogy, sociocultural competence, and values-oriented instruction. A comparative approach was used to examine how professional competence is conceptualized across competence theory, engineering education research, and international educational policy. A content analysis approach was applied to identify the educational functions of national values-based materials and their possible relationship to the components of professional competence.

Pedagogical modeling was used as the main methodological tool. On this basis, a model was constructed in which professional competence of technical university students is understood as a dynamic unity of motivational-value orientation, professional knowledge, practical-technological readiness, communication and collaboration abilities, reflexive judgment, and socially responsible professional behavior. Materials based on national values were interpreted as educational resources capable of influencing each of these components when embedded into authentic academic tasks.

The study relied on the principles of contextuality, interdisciplinarity, gradual integration, student activity, and practical relevance. Contextuality means that educational material should reflect real or realistic professional situations. Interdisciplinarity means that technical content should be meaningfully linked with cultural, historical, ethical, and social dimensions. Gradual integration means that value-based content should be introduced systematically, from simple comprehension to applied professional interpretation. Student activity means that values are internalized more effectively in discussion, design, project work, and problem solving than in passive reception. Practical relevance means that every value-based element should be connected with technical action, engineering judgment, or professional responsibility.

The analysis made it possible to formulate a methodology in which materials based on national values perform five interconnected pedagogical functions in the development of students' professional competence. First, they strengthen professional motivation by connecting future work with socially meaningful purposes. Second, they deepen conceptual understanding by showing that technical knowledge always develops within historical and cultural contexts. Third, they enrich practical training by providing locally relevant cases and design situations. Fourth, they support communicative and reflective growth by creating opportunities for discussion of ethical and social issues. Fifth, they contribute to the formation of professional identity by helping students perceive themselves not merely as performers of technical operations, but as responsible actors participating in the development of society.

In the proposed model, the motivational component of competence is developed through materials that reveal labor as a value, knowledge as a social good, and technological creativity as a culturally significant achievement. When technical students encounter examples of engineers, inventors, architects, artisans, and scientists whose work served public needs and reflected national ideals of diligence, responsibility, and usefulness, professional learning gains internal meaning. Such content changes the emotional climate of learning because technical disciplines are no longer perceived as isolated systems of formulas and procedures, but as instruments of human contribution. Research in engineering education increasingly supports this broader view, showing that professional competencies grow more effectively in learning environments where technical preparation is linked with social purpose, responsibility, and personal engagement.

The cognitive component is developed through the contextual enrichment of technical knowledge. In practice, this means that engineering concepts, design principles, materials science, energy use, environmental technologies, construction methods, or digital systems are interpreted through examples rooted in local production culture, historical technologies, community needs, and nationally meaningful development priorities. A student studying energy efficiency, for example, may analyze not only universal engineering principles but also regionally grounded housing traditions, climatic adaptation, and inherited practices of rational resource use. In this case, national values-based materials do not replace scientific knowledge; they serve as a context that makes knowledge deeper, more understandable, and more transferable to real professional situations.

The operational component of competence is strengthened when students use national values-based content in project work and problem solving. The most productive tasks are those in which students must design, compare, improve, or justify technical solutions for socially relevant contexts. A mechanical engineering student may be asked to redesign a small-scale device considering affordability, durability, and local production realities. A civil engineering student may analyze traditional settlement practices in relation to modern sustainability standards. An information technology student may create a digital product oriented toward the preservation, systematization, or dissemination of cultural and technical heritage. In each case, the technical task remains central, but the value framework increases its practical and civic significance. Studies of project-based and applied engineering learning indicate that such contexts support not only technical knowledge acquisition but also communication, cooperation,

creativity, and professional self-confidence.

The communicative and collaborative component of competence develops when national values-based materials become the basis for dialogic learning. Technical students often need structured opportunities to explain ideas, justify decisions, listen to alternative viewpoints, negotiate solutions, and reflect on the social implications of technology. Value-based cases stimulate these forms of academic interaction because they rarely permit purely mechanical answers. They require interpretation. For example, students may discuss how principles such as collective responsibility, respect for labor, ecological care, or social justice should influence design decisions, safety standards, or resource management. In such tasks, communication is not external to professional competence; it becomes its mode of manifestation. Research on engineering education shows that professional skills are conceptualized by faculty and institutions as extending beyond technical performance to include behavioral, interpersonal, and ethical dimensions.

A particularly important result of the methodological synthesis is the identification of the axiological component as an internal regulator of technical competence. In value-neutral training, students may acquire operational efficiency without forming criteria for socially responsible action. By contrast, value-integrated training helps students develop stable orientations toward responsibility, honesty, respect for public welfare, and awareness of the human consequences of professional decisions. This is especially important in technical fields, where errors, negligence, or narrow profit-driven logic may lead to serious environmental, economic, or social damage. OECD work on curriculum design emphasizes that values and attitudes are not optional additions but elements that shape responsible agency. Engineering education studies also show growing attention to sustainability values, corporate social responsibility, and socially responsive professional formation.

The methodology proposed in this article therefore includes several sequential stages. At the introductory stage, the teacher selects and presents national values-based materials related to the topic of the discipline. At the interpretive stage, students analyze the cultural, ethical, and professional meaning of these materials. At the applied stage, they solve technical problems or complete design tasks grounded in this context. At the reflective stage, they evaluate the quality of their technical solution and the values embodied in it. This sequence ensures that cultural material is transformed into competence-building experience rather than remaining purely informational. The role of the teacher is crucial here: the teacher must mediate between cultural meaning and technical rigor, ensuring that value-based work deepens rather than dilutes professional preparation.

The proposed methodology corresponds to major tendencies in contemporary professional education. One of them is the movement from knowledge transmission toward competence formation. Another is the transition from fragmented curricular logic toward holistic, contextualized, and socially responsive learning. A third is the recognition that technical professionalism cannot be reduced to technical skill alone. UNESCO materials on TVET, OECD frameworks on competence and curriculum, and current engineering education research all point toward broader models of graduate preparation in which values, attitudes, and responsibility complement disciplinary expertise.

At the same time, the article argues that the cultural and national dimension of competence deserves more explicit pedagogical attention in technical higher education. In many universities, value education is delegated to separate humanities courses and remains weakly connected to professional training. This division reduces educational coherence. The methodology developed here overcomes that separation by embedding national values in technical content itself. This does not mean replacing engineering science with ideology or folklore. It means constructing educational situations in which cultural memory, professional ethics, community orientation, and technological competence mutually reinforce one another. Research on sociocultural competence in engineering education and cultural intelligence among engineering students suggests that culturally aware preparation can broaden students' professional adaptability and strengthen their capacity for responsible action in diverse and changing environments.

The methodology also supports the idea that educational materials should be selected according to pedagogical function, not symbolic prestige. Materials based on national values become effective only when they illuminate the professional meaning of the topic being studied. A historical narrative is pedagogically useful if it helps students understand technological ingenuity, design logic, or engineering responsibility. An ethical maxim is

useful if it helps interpret safety culture, work discipline, or professional honesty. A locally grounded case is useful if it activates technical analysis and solution design. In this sense, the quality of methodological integration is more important than the quantity of cultural content.

The limitations of the study should also be acknowledged. The article is theoretical and does not present the results of a completed experimental intervention. Therefore, its conclusions require empirical verification in specific technical disciplines and institutional settings. Future research may test the proposed model through quasi-experimental design, compare student groups taught with and without national values-based materials, and assess changes in motivation, reflective judgment, project quality, communication, and professional self-concept. Even so, the current study offers a coherent methodological basis for such empirical work and for immediate pedagogical application in technical universities.

Developing the professional competence of technical university students through materials based on national values is a pedagogically justified and socially relevant direction of higher education modernization. Professional competence in technical education should be understood as an integral quality combining knowledge, practical skills, communication, responsibility, reflection, and value orientation. Materials based on national values can contribute to this development when they are systematically integrated into technical disciplines, connected with authentic professional tasks, and interpreted through the logic of competence formation. Their main educational effect lies in strengthening students' motivation, contextualizing technical knowledge, humanizing project work, enriching communicative practice, and forming a socially responsible professional identity. The methodology substantiated in this article may be used as a conceptual and practical basis for improving the content and pedagogy of technical higher education.

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