



PROFESSIONAL TRAINING OF FUTURE SKILLED WORKERS OF THE MACHINE-BUILDING INDUSTRY BY DUAL FORM OF EDUCATION

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Abstract. The paper focuses on the necessity of substantiating the essence and structure of the professional training of future skilled workers by the dual form of education. In the context of the formulated goal, an analysis of the concepts of "essence", "structure" and "professional competence" is carried out. On the basis of the results of analysis and generalization of scientific researches, it has been established that the professional training of future skilled workers of the machine-building industry by the dual form of education should be assessed by motivational, cognitive, action-related and reflexive criteria. The structure of professional training of future skilled workers of the machine-building industry by the dual form of education is presented in the form of four interrelated components: valuable-motivational, innovational-cognitive, professional-action-related, reflexive-estimated. The model of the dual form of education in Germany is described. It has been determined that the interaction between vocational schools in Germany and employers at the individual and institutional level is considered to be one of the most effective tools for developing a system of vocational education. The author carries out a theoretical analysis of pedagogical sources of philosophical, educational, methodological, psychological, pedagogical literature and scientific works of domestic and foreign researchers, normative and legal documents; modeling (synthesis), comparison, classification, systematization and generalization of theoretical and experimental data. The peculiarities of updating the contents of vocational education, management of the system of vocational education, changes in the system of professional training of specialists of the machine-building industry, adaptation of the structure of vocational education of specialists of machine-building industry in conformity with the demand on the labor market and the requirements of employers are analyzed. The analysis of sources about the preconditions and features of updating the contents of vocational education, issues of management of the system of vocational education, relevant changes in the system of professional training of specialists of the engineering industry, adaptation of the structure of vocational education in line with the demand in the labor market and the requirements of employers are carried out. Attention is paid upon the formation of professionally important qualities of future specialists of the machine-building industry, which are manifested in psychological, theoretical and practical preparation for professional activity. The main reasons and disadvantages of the modern system of professional training are determined, directions of modernization of professional training of specialists of the machine-building industry at the institutions of vocational education (VET) are grounded.

Keywords: *vocational education, dual form of education, professional training, social partnership, skilled working personnel.*

Introduction. The country's industry remains one of the leading industries of management, and the level of development of machine-building is a significant indicator of the estimation of the state's economic growth and its innovative potential. Heavy industry forms more than 80% of the total value of sold products, in particular, machine-building accounts for

12-14% (Shapurov, 2009, p. 59). At the same time, the planned desire for import substitution and the establishment of new foreign economic relations indicates an increase in the demand for products of the machine-building system, increase of its quality, because the significant part of equipment and machines produced at Ukrainian enterprises do not fully meet

the world standards. These problems are solved by introduction of innovative technologies in production and increase of the qualification level of enterprises' personnel. This, in its turn, foresees an increase in the requirements of enterprises for the professional qualification of graduates of vocational (vocational education and training) institutions (hereinafter referred to as VET institutions), and, therefore, actualizes structural and informative changes in the professional training of future specialists of the machine-building industry in accordance with the current technical and technological modernization of production.

The Concept of the implementation of state policy in the field of vocational education "Modern vocational education" (for the period up to 2027) provides for a comprehensive and systematic solution of the tasks (education quality provision), decentralization of management and financing, and the creation of effective models of public-private partnership. The solution of these tasks necessitates the search for new forms of organization of educational activity of students, increase of their activity level in mastering the future speciality. Therefore, the study of the essence and structure of the preparedness of skilled workers of the machine-building industry for professional activities in conditions of high-tech production is relevant and is currently timely.

Materials. The processes of globalization of the country's economy, competitiveness increase, the exit of Ukrainian enterprises into international markets, actualize the need not only for skilled workers, but also for workers with a high intellectual level, creative abilities and creative thinking, with high responsibility and self-discipline. As evidenced by the results of the researches of scientists-economists of the scientific school of the Institute of Industry Economics of the National Academy of Pedagogical Sciences of Ukraine (Amosha et al., 2007, p. 95), it is necessary to have staff capable of innovative activity, which is characterized by high level of education and professional training, the appropriate level of creativity, the initiation of new ideas, culture and outlook, the propensity to innovate, the proper level of discipline and responsibility for the development of innovation and personnel potential at any enterprise. The most important qualities that need to be formed by future skilled workers include: readiness of staff to perceive technological innovations and systematic upgrading of the gained knowledge; the need to improve the level of education and qualification; mastering of modern production technologies; the presence of a creative component in the labor activities and the ability to adapt to technological changes in production (Amosha et al 2007, p. 100-101).

V. Radkevich (2012, p. 6) mentions that employers pay special attention to the ability of skilled workers to use knowledge and skills in non-standard situations, feel the need for constant professional growth, improvement of professionally important qualities. In this context, the main task of modern VET institution in the conditions of rapid changes occurring in the labor market, is the training of skilled workers capable of self-realization, rapid adaptation to the requirements of the workplace, active participation in social-economic and cultural processes of the country. Therefore, nowadays an interest increases greatly in educational technologies, models and innovations that can provide high quality training of skilled workers and the implementation of educational state standards and programs (Drozach, 2009, p. 73-79).

The theoretical basis for the solution of the mentioned problem is the works of domestic and foreign scientists: in the philosophy of modern education (V.Andrushenko, I.Zyazyun, V.Kremen, V.Lutai, V.Ognevyuk, etc.); lifelong vocational education (S. Batushev, O.Borodienko, L.Gerganov, P.Lusan, N.Nichkalo, V.Orlov, L.Pukhovska, V.Radkevich, S.Sisoyev, etc.), the introduction of a competent approach in vocational education (V. Zagvyazinsky, V. Lugovy, V. Yagupov, etc.); the introduction of innovative learning technologies (M.Prigodiy, G.Romanova, V.Slastonin, etc.), didactic and pedagogical aspects of project learning (L.Zazulina, N.Kulalaeva, O.Marinovska, E.Polat, etc.); professional training of specialists of machine-building (A.Lytvyn, O.Markovsky, V.Pardzhnitsky, L.Slipchysyn, M.Fomina, etc.). According to the results of the analysis of the works of German researchers (A.Shelta, K.Stratman, etc.), the dual system ensures a close relationship between vocational training and the production sphere, the timely response to changes of production sphere's needs in the light of development trends (Henning and Petzold, p. 185). At the same time, the problem of the professional training of future skilled workers of the machine-building industry at the VET institutions by the dual form of education is not sufficiently studied.

The main provisions of the organization of the dual form of education as a practice-oriented one, distinguishing it from other forms, are as follows: where: the source of the goal setting is the request of the economic sphere (the core of "social practice") to qualified personnel of a certain level, profile and qualifications; developed mechanisms of public-private and social partnership are based on the involvement of interaction of the teaching staff of the VET institutions with the representatives of the economic sphere – the direct customers of the working personnel); the prevailing of practical forms (in

educational process) enables the formation of specific professional competencies.

In European countries, with the help of dual education, companies provide themselves with skilled staff that meets the specific requirements and demands of the employers. This allows to save money on the selection and adaptation of workers, bring up the young generation of workers in accordance with their requirements, working conditions, corporate culture of the enterprise, train the specialist who is able to join the work from the very first days and perform it at a high professional level.

The dual form promotes a greater integration of education, science and business and is widespread in Germany, Austria, and Switzerland. It focuses on the spatial and temporal combination according to the principle: 40% of studies – at the educational institution and 60% – internships at enterprises (dual education). In Germany, on average, almost 65% of young people study by the dual system of education, others – on a traditional basis (education takes place at the educational institutions). When, as a rule, our young people aspire to enter the institution of higher education after school (hereafter: HEI), more than half of the children in Germany go through vocational education, preferring to have a "real business" in their hands. 60% of young people with secondary education, having chosen a certain direction of vocational education and training, are going to study by the dual form. Currently, there are 450 main specialties (trades) in Germany, of which 344 are trained within the dual education system. Despite the fact, the entrepreneurs who participate in such a program, invest significant amounts and receive significant benefit from it. All funds invested by them for the professional training of the specialist are returned with profits in 9 months, and after maximum 2-3 years.

The results of research on modern models of vocational education and training in the EU countries indicate the existence of various types of financial support for dual education, including through the use of subsidies. In Austria, in particular, financial grants are provided both (during the employment of students, in accordance with the collective agreement in the first year of apprenticeship), and for each subsequent year of their stay in employment relationships within the framework of apprenticeship programs (Radkevich et al., 2018, p. 162).

The peculiarities of the dual education of specialists in Germany include those where colleges prepare specialists, collaborating with production. Curricula are designed so that during one or two days a week the student undergoes theoretical training, and during three or four days he works at the enterprise; the student receives wages, social privileges from the firm or

factory; after finishing education the graduate passes the specific state examinations; the main expenses for vocational training are covered by the enterprise, and also compensates are paid to instructors who are diverted from the main work for mentoring; as a reward for the student (80% of the wage level of a skilled worker, ranging from 300 to 800 Euros a month); the state can stimulate the training of specialists in priority specialties, paying money for different types of state subsidies to enterprises; the final control of knowledge of students is carried out by independent commissions of Chambers of Commerce and Industry in order to prevent manipulations by educational institutions and enterprises; after taking exams the graduate receives three certificates at once: from the vocational school, from the enterprise and a state recognized specialty certificate from the Chamber of Commerce and Industry.

V. Radkevich (2017, p. 8) approves that trainers of production training (coaches) play a leading role in the dual system of vocational education in Germany. They, in accordance with the provision on the organization of professional training, are responsible for its quality. Their main task at the enterprise is to provide students with practical training in a particular specialty (trade).

Based on the approval of the German educator V. Grainert (1995), we distinguish a number of functional criteria of the dual system of vocational education: the need for the number of workers and students is regulated by the labor market; if enterprises offer certain professions and trades, they are guided by legitimate state norms; the carrier of vocational education is an enterprise, but the process of professional training is organized according to state legislative norms and is subject to direct or indirect state control; the quality of professional qualifications is ensured, first and foremost, in accordance with the requirements of the enterprise, as well as taking into account the requirements of the state, trade unions and the Union of specialists; funding for vocational education by the dual system is made mainly by enterprises, as well as by different funds and partial public funding; the level of systematization of professional training is determined by the needs of the state, society and it depends on financing.

Assessment of the International Institute for Labor Quality Monitoring shows that Germany is one of the leaders in terms of personnel qualifications. Such a form of vocational education has acted as a product of social partnership, which is built and supported by the general goal due to training of highly qualified personnel in accordance with the needs of the labor market through established mechanisms of close interaction between the state, educational institutions

and employers (Kozak, 2007). It is represented by three characters: the enterprise (employer), the institution of education and the Chamber of Commerce and Industry (an intermediary between the institution of education and the enterprise). Chamber of Commerce and Industry carries out the formation of an order for the training of skilled personnel.

Hence, the dual form of vocational education can be introduced as an infrastructure regional model that provides interconnection of systems: forecasting of needs in skilled personnel, professional self-determination, vocational education, assessment of professional qualifications, training and skills development of teaching staff, including tutors (instructors) in the workplace. Relations between the parties are characterized by flexible consensus, collegiate management system. Each system influences the development of another one, and one can not exist without the other one. The effectiveness of the dual form of education is provided by the integrity and simultaneous distribution of functions of the participants.

Methods. In order to solve these identified problems, traditional methods of pedagogical research were used, in particular: historical method (study of literary sources, normative-legal and educational-methodical documents, comparative analysis of domestic and foreign experience of training of workers of the machine-building industry); method of theoretical research (analysis and synthesis, modeling, generalization, systematization of theoretical data).

The aim of the paper is to substantiate the essence and structure of the professional training of future skilled workers of the machine-building industry by the dual form of education.

Results and discussions. The radical transformation of the social-cultural and economic spaces of Ukraine affects education inevitably, including vocational one. The new approach to the system of vocational (VET) education enables to provide high-quality training of highly skilled specialists of the future. Currently, VET institutions are in need of modernizing vocational education. The implementation of the system of dual training of working personnel opens up new additional prospects in raising the level of efficiency of vocational education.

Based on the research, we consider it necessary to clarify the meaning of the concept of "essence". The interpretation of this term is defined as the most important, main, a content, a basis. From a philosophical point of view, "essence" is defined as "the main thing that is decisive in an object and which is conditioned with deep links and development tendencies and is recognized at the level of theoretical

thinking" (Busel, p. 14-17). The essence of modern vocational education is to create a qualitative educational environment in which graduates meet the demands of the labor market. Educational environment should be constantly improved taking into account modern technological processes. All this is possible under the condition of effective public-state partnership, one of the forms of which is the dual form of education.

In general, revealing the essence of the dual system of training, it should be noted that it strengthens its practical orientation by integrating a large volume of production practice into the educational process, which enhances the professional mobility of graduates greatly. At the same time, the introduction of the dual system involves a fundamental change in the organization of the educational process, based on a rational combination throughout the academic year of theoretical training with production training and practice at enterprises, organizations. Accordingly, the role of the principle of individualization of practical training and the approximation of its content to the real conditions of the enterprise, which manifests itself in the maximum practical orientation of tasks and diploma works on the demands of enterprises and organizations – future potential employment places for graduates, is actualized.

In the choice of the vector of scientific research of the stated topic of the paper, we proceed from the need to clarify the meaning of the notion of "structure", which is interpreted "as a way of a logical connection between the components of objects and the phenomena of nature and society, thinking and cognition, the set of essential connections between the allocated parts of the whole, which ensure its unity; the internal structure of something" (Shynkaruk, p. 611).

The dual form of education is the maximum practical oriented training, based on a social partnership, aimed at creating a new model of professional training for education researchers (with an innovative format) which have an extended range of competencies. As an invariant basis for the process of person-oriented learning, an ideal model of competence enables one to design a variety of specific learning options at all stages of the system of lifelong education. However, this is a general model, which, in principle, can not be unambiguous, since the competences that are formed by students are their multifaceted, multidisciplinary characteristics, which are influenced by a significant number of external and internal factors. They can not be interpreted as a set of subject knowledge and skills. Whereas the spectrum of properties and functions of this concept is quite broad, it is possible to construct several different models of this concept that form its general (system)

model. Then, each of the given below models, with appropriate interpretation, will reflect only certain aspects of the concept of "competence": cognitive, operational-technological, motivational, ethical, social, behavioral, and others. We restrict ourselves to considering professional competence as an informational-action-related category and present its model in the form of four interrelated components: valuable-motivational, innovation-cognitive, professional-action-related, reflexive-estimated (Khutorsky, pp. 60). Valuable-motivational component involves the ability of future skilled workers to determine goals (operational, tactical, strategic) in their professional activity, awareness of their own benefits from the economic, social, environmental benefits of work. Innovative-cognitive component covers a set of theoretical knowledge about the effective use of natural resources. Innovation is a must for theoretical knowledge, because renewal of its contents with information on modern technological processes (prospected from the point of view of ecological characteristics, resource and economic efficiency, technical methods, methods of preventing and reducing negative environmental impacts) is important for the formation of energy-efficient competence of future skilled workers. The Law of Ukraine "About Innovation Activity" (Ukrainian Legislation, 2002) also proclaims the necessity of reproduction of "scientific and technical potential of the country, production of competitive products" (in the content of theoretical knowledge). The professional-action-related component contains an effective, integrative application of practical skills. N. Nichkalo (2013, p. 87) defines professional competence as the sum of attributes (mobility of knowledge, possession of operational knowledge, flexibility, critical thinking, ability to choose among many solutions the most optimally). It should be noted that the development of professional competence of students takes place under the conditions of comprehension, comparison, comparative analysis of the obtained results and previous practical actions (operations), therefore the reflexive-estimated component is included into the structure of professional competence.

The diverse description of professional competence is based on the principle of unity of consciousness and activity. It contains a set of distinctive features that make up the contents of the named components. Taking into account that the highest level of attributes is taken as a criterion in the scientific literature, the formation of the professional competence of future skilled workers is coordinated with the selected components and determined by the motivational, cognitive, action-related and reflexive criteria (Glushchenko, 2017, p. 5).

Under current conditions, approaches to organizing the educational process in VET are changing. Organization of educational process is based on the peculiarities of the business process of the employer company, which includes all activities necessary for the performance of educational tasks. The business process involves receiving orders, scheduling, delegation of tasks, performance of own volume of work, documenting of the quality and cost of materials, as well as the transfer of finished product to the customer. The running of such a process is the ability to perform (plan, control) a concrete, typical task for a given profession, taking into account the organizational framework conditions. For the researcher of vocational education, a situation is created in which he uses and develops his knowledge and skills in the course of performing professional tasks.

Thus, after analyzing the essence and structure of the professional training of modern workers, the main tasks of the dual form of education include: strengthening and improvement of the practical component of the educational process and the preserved sufficient level of theoretical training that ensures compliance with educational standards; training of personnel that corresponds to the modern requirements of the labor market and employers; increase of the motivation of education researchers to acquire a specialty (trade), qualification and obtain employment opportunities; increase of professional mobility and competitiveness of the graduate in the labor market; provision of interconnection, interpenetration and mutual influence of different systems (science and education, science and production), which enable to change the education qualitatively; the adaptation of education researchers to the conditions of production.

Conclusions. The results of the analysis of domestic and foreign experience about the training of working personnel in the system of vocational education (VET) give us the opportunity to conclude that the introduction of elements of the dual form of education has a strategic significance for the formation of the country's labor potential.

The use of elements of the dual system in the educational process affects the increase of the attractiveness of the professions (specialties, trades) in the machine-building industry; provision of the growth of mobility and competitiveness of graduates of VET institutions at the labor market; security of opportunities for students and teachers to engage in the most up-to-date production technologies, which, in the end, will contribute to improving the quality of vocational and practical training of future skilled workers of the machine-building industry, and the level of interaction between the teaching staff of VET institutions and employers.

Specification of the essence and structure of the concept of "professional training of future skilled workers of the machine-building industry by the dual form of education" allows to actualize the relationship of the main components in the overall system model of the modern graduate. The identified specification

is a prerequisite for the study of the current state of development of professional training of working personnel and the development of the appropriate pedagogical system for the training of working personnel of the machine-building industry.

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Професійна підготовка майбутніх кваліфікованих робітників машинобудівної галузі за дуальною формою здобуття освіти

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Реферат: У статті зосереджено увагу на необхідності обґрунтування суті та структури професійної підготовки майбутніх кваліфікованих робітників за дуальною формою здобуття освіти. У контексті сформульованої мети здійснено аналіз понять "суть", "структура" та "професійна компетентність". На основі результатів аналізу й узагальнення наукових досліджень встановлено, що професійна підготовка майбутніх кваліфікованих робітників машинобудівної галузі за дуальною формою здобуття освіти має оцінюватися за мотиваційним, когнітивним, діяльним і рефлексивним критеріями. Структура професійної підготовки майбутніх кваліфікованих робітників машинобудівної галузі за дуальною формою здобуття освіти представлена у вигляді чотирьох взаємопов'язаних компонентів: ціннісно-мотиваційного, інноваційно-когнітивного, професійно-діяльносного, рефлексивно-оцінного. Охарактеризовано модель дуальної форми здобуття освіти в Німеччині. Визначено, що взаємодія професійних шкіл Німеччини та роботодавців на індивідуальному й інституційному рівні вважається одним з найдієвіших інструментів розбудови системи професійної освіти. Автором здійснено теоретичний аналіз педагогічних джерел філософської, навчально-методичної, психологічної, педагогічної літератури та наукових праць вітчизняних і зарубіжних дослідників, нормативно-правових документів; моделювання (синтез), порівняння, класифікація, сис-

тематизація й узагальнення теоретичних та експериментальних даних. Проаналізовано особливості оновлення змісту професійної освіти, управління системою професійної освіти, зміни в системі професійної підготовки фахівців машинобудівної галузі, приведення структури професійної освіти у відповідність до попиту на ринку праці та вимог роботодавців. Здійснено аналіз джерел щодо передумов та особливостей оновлення змісту професійної освіти, питань управління системою професійної освіти, відповідних змін у системі професійної підготовки фахівців машинобудівної галузі, приведення структури професійної освіти у відповідність до попиту на ринку праці та вимог роботодавців. Акцентовано увагу на формуванні в майбутніх фахівців машинобудівної галузі професійно важливих якостей, що проявляються у психологічній, теоретичній та практичній підготовленості до професійної діяльності. Визначено основні причини й недоліки сучасної системи професійної підготовки, обґрунтовано напрями модернізації професійної підготовки фахівців машинобудівної галузі в закладах професійної (професійно-технічної) освіти.

Ключові слова: професійна освіта, дуальна форма здобуття освіти, професійна підготовка, соціальне партнерство, кваліфіковані робітничі кадри.

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