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## INNOVATIVE APPROACHES TO VOCATIONAL TRAINING OF SKILLED WORKERS IN METAL PROCESSING IN THE VOCATIONAL-TECHNICAL SCHOOLS

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professional  
competence, innovative  
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schools.

### Abstract

The article justified and developed ways to enhance the skills of future workers in metal processing in vocational education during the school industrial and educational process. The content of teaching and production of material in the exposition of discipline should pay more attention to the theory of invention and development of motor coordination, study and review of current monitoring systems for metal contact, to improve the integral development education.

In the current socio-economic conditions have changed requirements for quality teaching and the production process in vocational and technical schools. New requirements for the quality of training of skilled workers made it necessary to seek ways and means to optimize the educational, industrial and educational process. The urgency of this social problem is caused by changes in science and industry, which cause changes in teaching students in their teaching and industrial practice. The growth of intellectual and creative work in modern manufacturing requires a student to enter the high level of general education and special knowledge on the basis of competence-based approach, which provides for the formation of modern professional competencies and socio-commutative personality traits associated with the preparedness of vocational and technical schools for professional work in public production.

During pedagogical experiment, implemented on the basis of professional technical educational institutions of Ukraine from 2005 to 2014 years to introduce new technologies designing content workers seasoned professional training of qualified engineering and metalworking areas, a group of numbers involved in the experiment of teachers and trainers using the ranking method, identified six main indicators of formation of professional competence of skilled workers: motivation for professional growth in the chosen specialty; general professional and professional knowledge and skills; organization; diligence; level of technical skills; possession algorithms metalworking process; self-assessment of professional and personal qualities

The dynamics of professional competence in skilled workers for certain basic indicators as a result of the introduction of pedagogical training system with the introduction of innovative technologies was positive, as evidenced by the data of final assessments of progress, the result of the qualifying test papers, written examination papers (creative, theses, projects), manufacturing specifications, testing the knowledge of persons receiving vocational training.

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The idea of competence-based approach studied D. I. Zyazyun (2007), N. L. Nichkalo

(2008), V. A. Radkevich (2010), G. S. Gurevich (2004), and many others. Many scholars, such as V. A. Ostafyev (1999), V. A. Zakovorotny (1997), V. M. Poduraev (2001), and others, in its author's studies showed that the main problem of poor-quality treatment products lies in the imperfection of the construction of the machine and the appropriate monitoring process its production. Study of optimal movements engaged in the production of E.G. Agapova, V.G. Aseev and many others. It is known that true knowledge can be obtained at the intersection of the various sciences, in finding the relationship between the individual openings and finding the initial cause of the phenomenon. The emergence of new technologies and materials require working more skill and possession of related specialties. Advanced skilled workers at mastering new production technologies should be knowledgeable in various fields of science and technology. That is why the students revealed need to master the interdisciplinary communication. This enables a deeper

understanding of the objects themselves; improve their knowledge, skills and creative thinking in solving today's complex problems. But until now, has not been definitively addressed the problem of improving educational, industrial and educational process in vocational and technical schools in metal by implementation appropriate modern technologies that will improve the training of future skilled workers in metal processing.

Vocational school is a basic circuit for the professional development of future skilled workers, many-sided in its development. One of the trends in educational theory and practice is the integration of the learning process. Of great importance in recent years and pay a commutative quality professional employee, which include possession of core competencies that characterize the acquired psychomotor and cognitive as a worker, as well as his abilities in socio-personal, information and communication fields. It is known that the qualifications of the worker in metal is associated with quality made piece and the minimum elapsed time for its manufacture. A significant increase in precision machining, quality of manufactured parts is achieved by the application of systems, devices, probes for the diagnosis and monitoring of technological process of metal. Such technical means have to ensure control of the cutting tool, process parameters (metal regimes, management of equipment), as well as the workmanship details. Consequently, consideration of ways to improve the skills of future workers handling the materials in vocational and technical education is an important problem in the preparation of these workers the required direction.

More of the production process in metal is used for making and control parts, which is treated. Increasing the number of new materials with simultaneous increase in the accuracy requirements determine the need to develop new means of production and control processes of metal.

Effectiveness of treatment products is increasing significantly, if you reduce the time for filing the instrument and improve the accuracy of process control associated with control of the location and sizes, control of tool wear, protection from emergency situations.

In the content of many engineering disciplines very little attention paid to basic polytechnic knowledge, interdisciplinary

relations, and creative tasks with the integrated content of the various relevant disciplines, classification and comparison sites understanding of nature as an integrated system. In addition, each exploring, my subject has a greater variety of conceptual apparatus.

That is why the current problem is to prove and develop the basic approaches to improving teaching and industrial practice of future skilled workers in metal with the latest technology in mind.

Aim- of the teaching process is to determine ways to improve the skills of future workers in metal processing in vocational education during the school industrial and educational process.

In the process of manufacturing and forming of the new widgets, machine handling increases pressure on small muscles, it also requires more speed and accuracy of movements, and makes a program of actions more complicated. Professional skills are supplemented by planning, calculation, using drawings, sets high requirements for the qualifications of the employee.

Formed labor skills allow workers to perform complex labor operations with the required accuracy, speed and minimal efforts.

In studying the kinematics of movements, it was determined that the rate of movement depends on their direction and trajectory. Differentiation of labor found its expression in a thread-pipeline organization of production in which high performance is achieved through automation of motor skills, minimizing the time to perform the operations specified rhythm and pace of work. Precise movements are most important in optimal zone. Therefore, the motion must be restricted in the space that they run within the optimal physiological mobility of the limbs.

Physiological principles of rationalization of the labor movement are: the correct use of active and passive forces, smooth motion, the continuity of the movements; roundness of the trajectory of motor units, a moderate range of motion, combining work of both hands, to eliminate redundant moves, the economy moves, rhythmic movements, loss of static loads, uniform distribution load analyzers. [1-4]. Thus, the optimal movement implementation and development during training will enable future worker to manufacture any product with better

productivity. This in turn will increase productivity and provide economic benefit from its use.

Automation of manufacturing processes leads to the fact that the basic functions of man are surveillance, monitoring and regulation on the basis of perception and information processing. In contact with the object of labor through distance forms of control between man and machine contains devices that transmit information about the real state of the production process, and devices for appropriate action by the employee (operator). Such work requires the development of memory, will and creative thinking. Since the employee has to regulate and control the complex system of technological processes - increased its level of responsibility with respect to the perception, processing, making and implementing decisions. That is why the introduction of educational content production and educational process of the basic theory of inventive problem solving [5] and modern control systems [6-8], which use to improve the skills of the future of the skilled professional and technical institutions for processing metals. Considering the content of teaching and industrial practice basic theory of inventive problem solving, algorithm inventive solutions, we can teach the future of the skilled worker to formulate questions in a problem situation, to propose and analyze a variety of hypotheses, using different techniques and methods of invention to find the correct ways to solve the problem. The high level of mastery of the basic theory of invention - the assimilation students a creative approach to solving problems related to the integration of content and features of the particular situation. This creative solution involves overcoming the inertia of thinking, a new strategy, which is based on the development of theory and methodology of Invention [5]. The introduction of the theory of invention throughout the academic, industrial and educational process also allows for better understanding of diverse conceptual apparatus of each study discipline, i.e. get a better understanding of interdisciplinary connections. Indeed, in any educational or other special items you can select an object, matter and field, which interact with each other.

The result of scientific and technological progress is the introduction of automated control systems for industrial processes. As we know, a lot of the

manufacturing process for metal parts is to control that process. Increasing the number of new materials with simultaneous increase in the accuracy requirements determine the need to develop new means of monitoring processes of metal. The main problem of all systems status monitoring tool and the product is late to determine the moment of their touch. Singular lack of monitoring devices is the poor performance of the analysis of the working tool. The most important of these is the speed of obtaining information about touching the instrument and the details in terms of increased surface contamination. In such circumstances it is necessary at high speeds to determine the moment of contact the tool and part, to develop Ultrafast positioning system touch screen that will give the opportunity to build a system with high-precision analysis of the characteristics of touch in a large contamination of metalworking equipment. Therefore, an urgent problem for modern training of skilled workers in metal is to study the latest developments of sensors measuring and monitoring systems [6-8], which allow obtaining qualitative indicators of the final product machining recently exacerbated the problem of human exposure to new technologies, related in particular to, with the automation of various functional areas of production. Modern skilled workers needed to work among flexible manufacturing systems operating under the control of computers, among which are automated cargo-transport systems, machining centers, a network for information transfer, and others. Rational division of labor provides a high level of specialization, and increasing productivity as well: the workers are formed and fixed labor skills by exercises, excluded the extra traffic, provides a rational organization of work places in accordance with the sequence of labor operations, it becomes possible to select personnel according to individual abilities provides automatic delivery of parts and pieces on every job, which reduces the time for ancillary work, reduced the period of industrial training in connection with the ease of operations.

Implementation of individual creative abilities, increased motivation to work is becoming increasingly important in the development of production at the present stage.

A characteristic feature of modern industry is the creation of automated control systems through the introduction of computer

technology, resulting in: the number of objects and their parameters that must be managed, developed remote control system of objects, the dynamics of which are judged on the basis of perceived signals of different devices, more complex and increases the rate of production processes are changed conditions; there are changes in the structure and nature of work, which are the main functions of management, configuration and monitoring of various automated systems.

Process of functional improvement of the body worker with a view to adapting it to the increased demands of activities during field studies should be conducted with the help of exercise. The effectiveness of training can be achieved through a gradual increase in load, the use of different physical exercises to develop the common qualities of apparatus, multiple systematic repetition work at regular intervals. As a result, training can be accessed at the student's ability to mobilize their capabilities and to work economically, improve accuracy and speed of action.

Complexity of problems in production demands from the future working relationship not only with technical appliances, devices, systems, and other employees. For the workers, the profession of metal, as experience shows, it is very important traits such as sociability, emotional stability, perseverance, independence, high self-control behavior, hard work, diligence, responsibility, initiative, persistence and tendency to be creative. Therefore, the development of commutative and other key skills associated with the ability to work in a team - one of the important tasks of vocational education. That is why the formation of professional and socio-commutative personality traits - one of the most important educational problems in vocational training institutions in preparing modern skilled worker in metal during the training of industrial and educational process.

As an analysis of scientific papers V.V. Vasil'ev, I. B. Vasil'eva, G. E. Grebenyuk, and others in 80- 90 years in all sectors of production observed trend of combining jobs, and the integration of manufacturing operations. This is an important sign of change in the skill-composition and content of the workers, which is characterized as a process of gradual convergence of basic and auxiliary functions of workers, creation on their basis of working

trades a wide profile. Occupational mobility, willingness and ability of the worker to quickly shift production jobs, jobs and occupations within the same profession or group of professions, the ability to quickly learn new skills or changes that occur under the influence of technical change, is one of the most important professional qualities. This quality is formed largely due to thorough general education and general technical knowledge that enable the employee to go beyond the narrow confines of the specialty. Content and logic of specific disciplines should take into account modern scientific and technical knowledge of various sciences and manufacturing knowledge and skills. Content and logic preparation of educational and technical disciplines has to provide the necessary background material, which leads to a better understanding of their chosen profession.

The system of polytechnic knowledge includes general issues (theoretical and applied), machinery, a description of its components with the inclusion of devices, instruments, machinery, etc. With the technique is closely related material, containing drawings, diagrams, charts, graphs, calculations.

The system of polytechnic knowledge includes general issues (theoretical and applied), machinery, a description of its components with the inclusion of devices, instruments, machinery, etc. With the technique is closely related material, containing drawings, diagrams, charts, graphs, calculations. That is why knowledge of mathematics, technical drawing, physics, chemistry and other disciplines provides the modern worker sufficient level of qualification. Particular attention during training in any specialty in a professional school should be given to perform mathematical calculations, engineering design, and use of heuristic methods of academic work. That is why the introduction of Invention Problem Solving Theory in the educational process with the inclusion of developed various methods, techniques and principles of the modern working displays a high level of qualifications. If general education provides the basic knowledge, i.e. a strong foundation for learning any profession, the special disciplines have a relative volatility of detention, which requires rapid changes in the educational process.

Thus, retraining, to be able to

continuing education throughout life is an essential feature of modern skilled worker.

Pedagogical research and advanced educational experience proves that no single universal method or the reception, which will provide instant success in school. Success is possible only through a comprehensive and combined use of different teaching methods with the calculation of their teaching capabilities and specific learning objectives for the acquisition of the relevant professions. That is why great importance in the implementation of the developed system integrated developmental education should be the organization of educational process and its control, which will enable the timely correction of knowledge [9-10].

It is essential for the assimilation of the combined, integrated professions to consider the classroom training and work experience in studying the content of educational material, the basic terms of combining jobs and job functions to ensure optimal performance.

A shared profession requires a change of the level of congestion in various organs and systems. A shared operation should be easier than the main. More monotonous work must be combined with least monotonic one. Static loads must be compensated by moderate dynamic ones. [1-4].

Future date by a skilled worker in metal should be able to drill in the machine, grind parts to work with modern advanced technologies. Work on the processing of metals should know the principle works, the technical specifications for metals, chips, parts, tools and requirements for quality finishing, physical and mechanical properties of metals and many other questions in this profession. Therefore, developing new ways to improve the skills of future specialists in metalworking are directions for further research.

During pedagogical experiment, implemented on the basis of professional technical educational institutions of Ukraine from 2005 to 2014 years to introduce new technologies designing content workers seasoned professional training of qualified engineering and metalworking areas, a group of

numbers involved in the experiment of teachers and trainers using the ranking method, identified six main indicators of formation of professional competence of skilled workers: motivation for professional growth in the chosen specialty; general professional and professional knowledge and skills; organization; diligence; level of technical skills; possession algorithms metalworking process; self-assessment of professional and personal qualities

The dynamics of professional competence in skilled workers for certain basic indicators as a result of the introduction of pedagogical training system with the introduction of innovative technologies [11] was positive, as evidenced by the data of final assessments of progress, the result of the qualifying test papers, written examination papers (creative, theses, projects), manufacturing specifications, testing the knowledge of persons receiving vocational training.

So, motivated and developed ways to enhance the skills of future workers in metal processing in vocational education during the school industrial and educational process. The content of teaching and production of material for teaching the general technical and special subjects, metalworking and manufacturing practices should be given greater attention: the development of the transport abilities of students, studying and practicing the most optimal and efficient movement, study and review of modern control systems with touch metal, sensors measuring and monitoring systems, which allow to improve processing control components, poor retention tool and parts, critical wear tool and other processing parameters, the fundamentals of the invention and socio-commutative (key) competencies specific to staff for processing metals. Consideration of appropriate educational material in educational, industrial and educational process of students in vocational-technical schools, including the integrated developmental education, will improve the skills of future specialists in metalworking.

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## Реферат

### Інноваційні підходи до професійної підготовки кваліфікованих робітників з металообробки в професійно-технічних навчальних закладах

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#### КЛЮЧОВІ СЛОВА:

професійна компетентність, інноваційні підходи, професійна підготовка, металообробка, професійно-технічні навчальні заклади.

У статті обґрунтовано й розкрито результативність професійної підготовки кваліфікованих робітників з обробки металу. У сучасних соціально-економічних умовах змінилися вимоги до якості викладання і виробничої практики в професійно-технічних навчальних закладах. Нові вимоги до результативності підготовки кваліфікованих робітників зумовили необхідність пошуку шляхів оптимізації освітнього процесу. Актуальність цієї соціальної проблеми спричинена змінами в науці та промисловості, які викликають зміни в підготовці кваліфікованих робітників. Зростання інтелектуальної і творчої праці в сучасному виробництві вимагає від робочих високого рівня загальноосвітніх і спеціальних знань на основі компетентнісного підходу, який передбачає формування сучасних професійних компетенцій і соціально-комунікативних рис особистості, пов'язаних з готовністю до професійної діяльності в суспільстві та житті.

У педагогічному експерименті, проведеному на базі професійно-технічних навчальних закладів України з 2005 по 2014 рр., впроваджено нові технології навчання у зміст професійної підготовки кваліфікованих робітників машинобудівної та металообробної галузей. Група викладачів і майстрів виробничого навчання, яка брала участь в експерименті, за допомогою методу ранжування визначила шість основних показників формування професійної компетентності кваліфікованих робітників: мотивація до професійного зростання в обраній спеціальності; загальнопрофесійні та професійні знання і вміння; організація; працьовитість; рівень технічних навичок; володіння алгоритмами процесу металообробки; самооцінка професійних і особистісних якостей.

Позитивну динаміку сформованих рівнів професійної компетентності кваліфікованих робітників за основними показниками в результаті впровадження описаної педагогічної системи професійної підготовки під час експерименту з включенням інноваційних технологій (на компетентнісному, суб'єктно-діяльнісному, інтегровано розвивальному підходах) підтвердили: дані підсумкових оцінок успішності у вітчизняних професійно-технічних навчальних закладах; результати виконання кваліфікаційних пробних і письмових екзаменаційних робіт (творчих, дипломних робіт, проектів), виробничих характеристик, рівень знань осіб, які отримують професійну освіту.

**Реферат**

**Инновационные подходы к профессиональной подготовке  
квалифицированных рабочих по металлообработке в  
профессионально-технических учебных заведениях**

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**КЛЮЧЕВЫЕ**

**СЛОВА:**

профессиональная компетентность, инновационные подходы, профессиональная подготовка, металлообработка, профессионально-технические учебные заведения.

В статье обоснованы и раскрыты пути результативной профессиональной подготовки квалифицированных рабочих по обработке металла. В нынешних социально-экономических условиях изменились требования к качеству преподавания и производственной практике в профессионально-технических учебных заведениях. Новые требования к качеству подготовки квалифицированных рабочих привели к необходимости искать методы оптимизации образовательного процесса. Актуальность этой социальной проблемы обусловлена изменениями в науке и промышленности, которые вызывают изменения в профессиональной подготовке квалифицированных рабочих. Рост интеллектуального и творческого труда в современном производстве требует от рабочего высокого уровня общеобразовательных и специальных знаний на основе компетентного подхода, предусматривающего формирование современных профессиональных компетенций и социально-коммуникативных черт личности, связанных с готовностью к профессиональной деятельности в обществе и жизни.

В педагогическом эксперименте, проведенном на базе профессионально-технических учебных заведений Украины с 2005 по 2014 гг., апробированы новые технологии обучения в профессиональной подготовке квалифицированных рабочих машиностроительной и металлообрабатывающей отраслей. Группа участвующих в эксперименте преподавателей и мастеров производственного обучения с помощью метода ранжирования определила шесть основных показателей формирования профессиональной компетентности квалифицированных рабочих: мотивация к профессиональному росту в выбранной специальности; общепрофессиональные и профессиональные знания и умения; организация; трудолюбие; уровень технических навыков; владение алгоритмами процесса металлообработки; самооценка профессиональных и личностных качеств.

Положительную динамику уровней сформированности профессиональной компетентности квалифицированных рабочих по их основным показателям в результате внедрения описанной педагогической системы профессиональной подготовки во время эксперимента с включением инновационных технологий (на компетентностном, субъектно-деятельностном, интегрированно развивающем подходах) подтвердили: данные итоговых оценок успешности учащихся в отечественных профессионально-технических учебных заведениях; результаты выполнения квалификационных пробных и письменных экзаменационных работ (творческих, дипломных работ, проектов), производственных характеристик, уровня знаний учащихся.

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