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CURRENT STATE OF EDUCATIONAL AND METHODOLOGICAL SUPPORT FOR THE TRAINING OF SKILLED WORKERS IN THE ENERGY SECTOR FOR ENTREPRENEURIAL ACTIVITIES

Volodymyr Artyushenko

PhD student of the Institute of Vocational Education of the National Academy of Educational Sciences of Ukraine, https://orcid.org/0009-0003-1897-8701, e-mail: artyushenko.volodymyr@gmail.com

Abstract

Relevance is driven by several factors reflecting the contemporary challenges of Ukraine's education system and the energy sector's operation. The urgent need for a comprehensive analysis of existing educational programs, instructional materials, and pedagogical approaches in terms of their compliance with modern requirements has become critical, especially in the context of the rapid development of renewable energy. Additionally, there is an increased need to assess the readiness of the developed educational and methodological framework to foster not only technical skills in students but also entrepreneurial thinking tailored to industry-specific needs. Identifying the strengths and weaknesses in the system for training skilled workers and determining directions for its improvement and modernization are also essential in alignment with current requirements for the installation and maintenance of renewable energy systems.

Objective: To present the findings of an analysis of the current state of educational and methodological support for preparing skilled workers in the energy sector for entrepreneurial activities, identifying the strengths and weaknesses of existing methodologies for organizing the educational process in institutions of vocational (technical) education.

Methods: A theoretical analysis of official, scientific sources, and internet resources was conducted to ascertain the research problem's state of investigation, create its theoretical basis, and identify key concepts and approaches to educational and methodological support for preparing skilled workers in the energy sector for entrepreneurship. Praximetric methods were applied to study and analyze progressive pedagogical experience in developing educational and methodological support, curricular plans of institutions of vocational (technical) education involved in training specialists in renewable energy, as well as educational programs, textbooks, and instructional materials. A comparative method was used to examine various approaches to planning the educational process for preparing future skilled workers for entrepreneurship and its methodological support. Modeling was used to develop a conceptual model of educational and methodological support, providing a holistic view of the structure and components of an effective educational and methodological complex. Generalization and forecasting were employed to identify successful practices in developing educational and methodological support for training skilled workers for entrepreneurship, recognize existing challenges, and propose possible solutions.

Results: Based on the theoretical analysis of the source base, the current research status of educational and methodological support for the educational process was assessed. An analysis of various approaches to planning the educational process revealed advanced pedagogical experiences in developing educational programs, textbooks, and instructional materials for future skilled workers, while also identifying several significant shortcomings that require comprehensive resolution. By comparing different approaches to preparing future skilled workers for entrepreneurial activities, the primary components for enhancing the effectiveness of educational and methodological support were modeled, and key strategies were developed to address challenges in its development.

Conclusions: The content of Ukraine's regulatory and legal framework, along with the scientific foundation for educational and methodological support for entrepreneurial skill development, especially for future renewable energy specialists, includes legislative acts, scientific publications, and contemporary internet resources. There is a necessity to develop educational resources that not only foster general entrepreneurial skills but also account for the unique aspects and

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challenges of specific professional fields. This would allow students to gain a more comprehensive and practical understanding of entrepreneurship within the context of their future specialization, enhancing their preparedness for real labor market conditions and potential entrepreneurial activities in their chosen fields. The analysis of educational and methodological support for forming entrepreneurial competence in future energy sector specialists identified several significant shortcomings: a gap between theoretical concepts of entrepreneurship and their practical application in renewable energy, insufficient integration of modern digital technologies and simulation models, a lack of emphasis on developing "soft skills," limited implementation of an interdisciplinary approach, and the absence of integrated business incubators and accelerators focused on the energy sector's specifics. Fundamental research in pedagogy and renewable energy should serve as the foundation for creating innovative teaching methods aimed at developing entrepreneurial competence in future renewable energy specialists.

Keywords: *educational and methodological support, vocational (technical) education, educational process, renewable energy, educational programs, entrepreneurial competence, teaching methodology.*

Introduction. In light of modern global trends and the pursuit of sustainable development, establishing a resilient economic model has become a key priority for Ukraine. This model must not only safeguard national security but also strengthen the country's position on the international stage, ensuring a decent standard of living for every Ukrainian. Experts are paying particular attention to the renewable energy sector, viewing it as a promising avenue for economic growth and a means to bolster the nation's energy independence (Ukraine 2030: Doctrine of Balanced Development, 2017).

At the same time, Russian aggression, culminating in the full-scale invasion of 2022, has dealt a severe blow to Ukraine's energy security. Targeted attacks by the occupiers on key energy infrastructure—from generation facilities to distribution networks—not only threaten energy supply stability but also endanger the very functioning of the country's critical infrastructure. This unprecedented situation necessitates a fundamental rethinking of energy security strategy, the development of innovative solutions, and the implementation of flexible mechanisms to ensure energy resilience amid an ongoing armed conflict.

In Ukraine's efforts to create a sustainable economic model and mitigate the impacts of Russian aggression on the energy sector, human capital development emerges as a crucial success factor. Building a strong workforce in renewable energy is essential for achieving the ambitious goals of energy independence and sustainable national development.

The vocational education system must respond flexibly to contemporary challenges by adapting educational programs to the new realities of the energy industry. Training qualified professionals must consider both global trends in alternative energy and the specific needs of Ukraine in post-war recovery. Such an approach will not only facilitate the restoration and modernization of energy infrastructure but will also provide the country with specialists capable of implementing innovative solutions to enhance Ukraine's energy resilience and competitiveness on the global stage.

The integration of modern energy concepts and economic principles must become the cornerstone of educational strategies in renewable energy. This paradigm should permeate educational programs at all levels, especially within the vocational (technical) training system. A key aspect of this approach is the synergy between technical proficiency and economic acumen. Future professionals should not only be well-versed in the specifics of energy systems and equipment but also cultivate a thorough understanding of the economic mechanisms governing the industry. This dual competency will help create a new type of specialist—technically skilled, economically aware, and entrepreneurially oriented. Consequently, high-quality instructional materials for workforce training in renewable energy are crucial, encompassing the latest technological trends while integrating components of entrepreneurship education. This includes the development of interdisciplinary curricula that combine technical knowledge with the fundamentals of business planning, project management, and marketing within the energy sector.

Therefore, quality educational resources focused on developing entrepreneurial skills have become one of the key factors in preparing specialists

capable of effectively contributing to Ukraine's energy independence and economic growth.

Research sources emphasize the importance of developing educational resources, particularly those focused on building entrepreneurial competence in future skilled workers in the energy sector. This need is reflected in several regulatory documents: the Law of Ukraine "On Education" (2017), the Law of Ukraine "On Vocational Education" (1998), the Cabinet of Ministers of Ukraine's resolution "On Approving Licensing Conditions for Educational Activities" (2015), orders from the Ministry of Education and Science of Ukraine "On Approving Regulations for the Organization of Educational-Production Processes in Vocational Institutions" (2006), "On Approving Regulations for General Education Classrooms" (2004), and "On Approving Regulations for Science and Math Classrooms in General Education Institutions" (2012).

Developing effective educational resources to foster entrepreneurial competence among future skilled workers is the subject of intensive research both nationally and internationally. Numerous domestic researchers focus on the theoretical foundations and practical methodologies aimed at preparing future specialists for successful entrepreneurial activities. Their studies cover a broad range of topics, from the conceptual foundations of integrating entrepreneurship education into technical specialties to creating innovative pedagogical technologies and educational materials adapted to the specifics of vocational education. The research of scholars such as V. Radkevych (2022, 2023, 2024), L. Yershova (2023, 2024), L. Bazyl (2020), S. Alekseeva (2021), N. Malaniuk (2020), and O. Lebid (2024) warrants particular attention in the context of this or related subjects.

Researchers underscore the need to transform vocational education, which requires a fundamental rethinking of its paradigm. Entrepreneurial training must cease to be a peripheral component of the educational process and instead integrate as a core element of the entire educational system. This integration calls for a comprehensive approach, where entrepreneurial competencies are cultivated not only through specialized courses but are embedded throughout the full spectrum of educational activities (Radkevych, 2023).

This reconceptualization implies that developing entrepreneurial thinking and skills should become an integral part of every discipline, practical training, internship, and extracurricular activity. This demands the creation of appropriate educational resources that will transform entrepreneurial training from an optional addition into a central element of vocational education, shaping a new generation of professionals capable not only of fulfilling their professional duties but also of creating innovative business solutions, adapting to shifting economic conditions, and actively contributing to the rebuilding and development of the country's economy in the post-war period.

Analyzing the current state of educational resources for fostering entrepreneurial skills in future specialists in the energy sector plays a critical role in improving the educational process and enhancing its effectiveness. This analysis enables the identification of both strengths and weaknesses in current methodological approaches, laying a foundation for their further development. The specificity of training specialists in the energy sector lies in the need to combine deep technical knowledge with an understanding of the economic mechanisms of the energy market. Future entrepreneurs must be able to predict technological trends and assess the investment potential of innovative energy projects. An important aspect is building knowledge and practical skills in energy efficiency and renewable energy sources, which are increasingly significant for entrepreneurial development within the modern energy sector.

Thus, a comprehensive analysis of the current state of educational and methodological support not only reveals its strengths and weaknesses but also establishes a foundation for developing new educational approaches. These approaches must meet the modern demands of the energy sector and foster a new generation of energy entrepreneurs capable of effectively operating amidst continuous change and innovation.

The purpose of this article is to present the results of an analysis of the educational and methodological support system for training qualified workers in the energy sector for entrepreneurial activities, identifying the strengths and weaknesses of existing methodological developments for organizing

the educational process in vocational (vocational-technical) education institutions.

Research methods: theoretical analysis of official, scientific sources, and internet resources – to determine the current understanding of the research problem and establish the theoretical foundation of the study, identifying the main concepts and approaches to educational and methodological support for training qualified workers in the energy sector for entrepreneurship; praxiometric methods – to study and analyze advanced pedagogical experiences in developing educational and methodological support, the working curricula of vocational (vocational-technical) education institutions providing training in renewable energy systems, as well as the educational and training programs for preparing future qualified workers, textbooks, and teaching and methodological manuals; the comparison method – for contrasting various approaches to planning the educational process in terms of preparing future qualified workers for entrepreneurial activity and its methodological support; modeling – to develop a conceptual model of educational and methodological support, creating a comprehensive understanding of the structure and components of an effective educational and methodological complex; generalization and forecasting – to identify positive experiences in creating educational and methodological support for the educational process in preparing qualified workers for entrepreneurial activities, identifying existing challenges in developing such support, and devising potential solutions.

Results and discussion. Ukraine's educational market offers a diversified system for training in entrepreneurial activities. This system integrates formal and non-formal educational approaches aimed at developing entrepreneurial competence. The methodological toolkit includes traditional academic classes, training sessions, personalized consultations, distance learning courses, and interactive discussion platforms. Additionally, practice-oriented formats are employed, such as innovative business idea and startup project competitions, which foster the development of entrepreneurial thinking and practical skills among learners (Bazyli, 2020).

The rapid development of the renewable energy sector, characterized by the implementation of advanced technologies and innovative equipment, generates an increasing demand for highly skilled professionals. This trend underscores the need to modernize approaches to vocational training for specialists in the installation and maintenance of renewable energy systems. To ensure their competitiveness in the labor market and to cultivate their capacity as agents of innovative change, there is an urgent need to develop advanced training models. These models must integrate current industry requirements and focus on developing competencies that align with the dynamic changes within the renewable energy field.

Educational and methodological support is a fundamental element in the vocational training system for learners, playing a crucial role in developing the entrepreneurial competence of future specialists. This comprehensive set of tools and materials covers all stages of the educational process: from the transfer and assimilation of learning information to its practical application and the subsequent evaluation of acquired skills. Structurally, educational and methodological support represents a coordinated set of informational and regulatory resources that are necessary and sufficient to effectively develop entrepreneurial competence within vocational education. By combining the goals, content, and organizational forms of the educational process, this system creates a holistic informational-methodological environment focused on ensuring the quality acquisition of entrepreneurial knowledge and the development of relevant skills.

The components of educational and methodological support include educational and training programs, author course programs, methodological materials for conducting seminars, practical and laboratory classes, resources for organizing independent student work, methods for forming relevant knowledge and their assessment, diagnostic tools, criteria for evaluating the level of entrepreneurial competence, materials for interim and final assessments, a list of essential and supplementary literature, and information sources (Aleksieieva, 2021). Thus, educational and methodological support functions as an integrated system providing a comprehensive approach to developing the entrepreneurial competence of future specialists, particularly qualified workers in renewable energy, laying the foundation for their

effective professional activities in a rapidly changing economic environment.

In the context of developing educational and methodological support, the content of education serves as a foundational basis. Considering the educational system in its complex dimension, it can be argued that it is the mechanism by which the content of education is transformed into learning content through the implementation of educational activities.

The content of vocational (vocational-technical) education has its normative reflection in the state educational standards for specific professions, developed based on professional standards or, in their absence, qualification characteristics that consider labor market demands/needs (Resolution of the Cabinet of Ministers of Ukraine “On Approval of the State Standard of Vocational (Vocational-Technical) Education,” 2021). The learning content materializes within the components of educational and methodological support, such as working curricula, educational programs, course syllabi, textbooks, manuals, methodological guides, and various didactic materials.

State educational standards, which hold the status of regulatory documents in the field of vocational (vocational-technical) education, set the requirements for the training of qualified workers at each qualification level. These standards function as a regulatory tool, ensuring the unity of the educational space and criteria for determining the quality of the educational process. Thus, a hierarchical structure is formed, whereby the content of education, enshrined in state educational standards based on professional standards or qualification characteristics, is transformed through the education system into learning content, which, in turn, is implemented through educational and methodological support. This structure ensures systematization and continuity in developing the professional competencies of future specialists, meeting the current labor market demands and the strategic educational objectives of the state.

The development and implementation of the professional standard for the occupation 8169 “Master of Installation and Maintenance of Renewable Energy Systems” (2022) is a key factor in ensuring the high-quality training of qualified personnel in vocational (vocational-technical) education that meets the modern requirements of the energy sector. The professional standard serves as a multifunctional regulatory document that integrally defines the specification of job functions, qualification requirements, and necessary professional competencies. This document is the fundamental basis for developing the state educational standard aimed at obtaining worker qualifications for the defined profession. Hence, it plays a key role in aligning educational programs with the current labor market demands within the renewable energy sector.

The professional standard for occupation 8169, "Master of Installation and Maintenance of Renewable Energy Systems," encompasses a comprehensive set of competencies, covering both highly specialized professional skills and general competencies. Among the latter, a range of key abilities is highlighted, correlating with the development of entrepreneurial competence in future specialists.

These competencies include the ability to make responsible decisions within professional activities with subsequent personal accountability for their outcomes; adherence to professional and ethical standards within the work environment; effective interpersonal interaction and teamwork skills; the ability to prevent and constructively resolve conflicts; developed adaptability, stress tolerance, and emotional stability; competence in ensuring the protection of clients' personal data in accordance with applicable legislation; professional mobility and the capacity for flexible adaptation in a transforming work environment (Professional Standard "Master of Installation and Maintenance of Renewable Energy Systems," 2022).

This integration of general competencies into the professional standard reflects a holistic approach to training qualified specialists capable not only of performing specific technical tasks but also of functioning effectively in today’s dynamic professional environment.

While the professional standard does not provide an exhaustive description of entrepreneurial competence in its entirety, the aforementioned key competencies form a foundational base for the development of entrepreneurial thinking, leadership qualities, communication skills, and the ability to

solve complex problems. At the same time, a detailed definition of the substantive and structural components of entrepreneurial competence, including its elements, is provided in the state educational standard regulating the preparation of respective professionals.

The state educational standard for occupation 8169, "Master of Installation and Maintenance of Renewable Energy Systems" (2024), regulates various forms of professional training for qualified workers, including initial professional training, retraining, vocational (technical) education, and advanced training. Within this standard, key competencies are defined as a complex of general abilities and skills encompassing psychological, cognitive, social-personal, informational, and communicative aspects. These competencies enable an individual to adequately perceive situations, achieve success in personal and professional dimensions, gain social autonomy, and effectively implement professional and interpersonal interaction.

The development of key competencies is a continuous process that begins with the start of an educational program and continues throughout one's life. This process takes place not only within formal education but also through non-formal and informal learning.

It is noteworthy that the key competencies outlined in the mentioned standard demonstrate a high degree of correlation with the general competencies outlined in the corresponding professional standard, indicating systemic alignment between educational and professional requirements.

In the early stages of training, priority is given to developing digital, personal, social, learning, and civic competencies. Communicative, environmental, energy efficiency, and mathematical competencies are integrated into the educational process according to the specific learning outcomes. Special attention is given to the development of entrepreneurial competence, recommended for formation at the final stages of the educational program.

Entrepreneurial competence, as defined in the state educational standard, encompasses a wide range of knowledge and skills essential for successful performance in a modern business environment. The student is expected to acquire fundamental knowledge of the market economy, legal aspects of entrepreneurship in Ukraine, and the procedures for starting one's own business. An understanding of economic mechanisms, including wage systems and personnel incentives, is crucial. The curriculum includes mastering project management principles and business planning. Practically, the student must learn to apply regulatory acts, analyze innovation processes, make financial decisions, and communicate effectively in a business environment. Special emphasis is placed on developing skills for team motivation and business plan development (State Educational Standard for the Occupation "Master of Installation and Maintenance of Renewable Energy Systems," 2024). This comprehensive training is aimed at developing a well-rounded specialist capable of effectively operating within the modern economy and implementing entrepreneurial initiatives.

State educational standards serve as a regulatory basis for the formation of educational programs that are developed and implemented by vocational (technical) education institutions as well as manufacturing enterprises and organizations engaged in professional workforce training.

The analysis of educational and methodological support for the educational process in occupation 8169, "Master of Installation and Maintenance of Renewable Energy Systems," aimed at developing entrepreneurial skills in vocational (technical) education institutions (State Educational Institution "Kyiv Vocational College with Enhanced Military and Physical Training"; State Vocational-Technical Education Institution "Dnipro Center of Vocational-Technical Education"; State Educational Institution "Ternopil Vocational College with Enhanced Military and Physical Training"; State Educational Institution "Shostka Vocational Training Center") reveals its compliance with basic requirements, while indicating the need for substantial modernization and adaptation considering the dynamic changes in the energy sector.

Based on the state educational standard, vocational (technical) education institutions have developed corresponding educational programs within the context of modernizing the preparation of qualified workers for the energy sector of the economy, ensuring a unified approach to the educational process.

The structure of educational programs envisages the integration of general professional,

theoretical, and practical training, focusing on the development of a complex of professional competencies, including foundational, profile, and general competencies. Educational programs set clear criteria and mechanisms for the awarding of professional qualifications and contain detailed correlation tables that demonstrate the relationship between competencies and educational components. Special attention is paid to the development of entrepreneurial skills through the implementation of a specialized course, "Fundamentals of Sectoral Economics and Entrepreneurship," ranging from 8 to 17 instructional hours, aimed at enhancing the practical orientation of entrepreneurial skill development. These educational programs represent a comprehensive approach to training highly qualified specialists in the field of renewable energy, providing a synergy of technical knowledge, practical skills, and entrepreneurial thinking.

The curriculum of the course "Fundamentals of Sectoral Economics and Entrepreneurship" is focused on forming a comprehensive system of economic knowledge in future specialists, essential for effective entrepreneurial activity in the renewable energy sector. The priority task in the context of developing professional competencies is mastering a fundamental system of economic concepts, categories, patterns, and trends characterizing entrepreneurial activity. The program includes the acquisition of key concepts and categories of economic theory, principles of the market economy, pricing mechanisms, and competitive interaction. Additionally, it covers the study of theoretical foundations and practical aspects of marketing, logistics, human resource management, and the tax system in entrepreneurial activity.

In general, the pedagogical objectives of the course "Fundamentals of Sectoral Economics and Entrepreneurship" are aimed at constructing a modern entrepreneurial paradigm of thinking, forming a professional culture, and developing specific professional competencies necessary for the effective implementation of innovative entrepreneurial activities.

Quantitative and qualitative analysis of educational programs in vocational (vocational-technical) education institutions reveals an insufficient allocation of instructional time dedicated to the study of the course "Fundamentals of Industry Economics and Entrepreneurship" to ensure the proper level of entrepreneurial skill development among future professionals. In light of this, the implementation of an interdisciplinary approach appears advisable, integrating an entrepreneurial component into other educational aspects of the curriculum, particularly those related to the technical aspects of renewable energy. This educational strategy would facilitate the simultaneous development of entrepreneurial thinking and relevant skills alongside students' mastery of field-specific technological knowledge and abilities. Such an approach would contribute to shaping a holistic professional worldview and enhancing the competitiveness of future specialists.

The analysis of curriculum structures indicates that elective courses account for 25 to 45 instructional hours over the complete training cycle, depending on its duration. Vocational (vocational-technical) education programs offer several elective courses aimed at developing entrepreneurial competence, such as "Financial Literacy," "Fundamentals of Innovative Entrepreneurship," "Marketing Technologies," and "Business Planning." The content of these educational components covers key aspects of entrepreneurial activity, including business idea generation, business model development, marketing strategies, financial planning, legal aspects, and other essential elements of effective business operations. Significant emphasis within these courses is placed on the industry-specific context of renewable energy. Additionally, the curricula of these disciplines emphasize the development of "soft" skills essential for effective entrepreneurial activity, including leadership, communication abilities, teamwork skills, creative thinking, problem-solving, and change management. These skills are integral to the professional profile of a successful entrepreneur, as they facilitate effective team management, networking, decision-making under uncertainty, and adaptability to a dynamic business environment.

Currently, vocational (vocational-technical) education institutions face a significant shortage of high-quality educational resources, especially up-to-date textbooks and teaching materials that align with modern trends and challenges in the field of entrepreneurship and effectively foster entrepreneurial competencies. The Ministry of

Education and Science of Ukraine has initiated the process of creating a new generation of instructional materials in entrepreneurship that will meet international standards, integrate the latest advancements and best practices in the field, emphasize practical application, and employ innovative pedagogical methodologies.

Particular attention in the development process will be given to ensuring industry specialization in educational publications, adapting their content and structural organization to various educational levels and target audiences. This initiative aims to improve the quality of vocational training for future specialists and foster a comprehensive set of competencies necessary for successful entrepreneurial activity in a dynamic economic environment (Ministry of Education and Science of Ukraine Letter "On the List of Textbook Titles for Vocational (Vocational-Technical) Education Students," 2022).

Within the context of vocational education, there has been some progress in supplying quality didactic materials in entrepreneurship. Available educational resources reflect current trends in entrepreneurial activity and meet modern requirements for the development of professional competencies. It is noteworthy that these developments are the result of targeted collaboration between the academic and pedagogical community and industry practitioners, focused on enhancing the effectiveness of the entrepreneurial component in vocational education and fostering related skills among students of professional qualifications.

In promoting economic education and entrepreneurial competence, the instructional publication Fundamentals of Economic Literacy and Entrepreneurship (Aleksieieva, Bazyl, Baidulin, Hrytsenok, Yershova, Zakatnov, Orlov, & Sokhatska, 2021) has been published. This textbook is intended for a broad audience in the field of vocational education and entrepreneurship. Its target audience includes vocational (vocational-technical) education students, academic, pedagogical, and scientific-pedagogical staff, methodologists, and practicing entrepreneurs. The textbook aims to impart fundamental economic knowledge and develop entrepreneurial skills, which are critically important in the context of modern economic realities and labor market demands.

The textbook *"Fundamentals of Economic Knowledge"* (Kudinova, Kulaha, & Lopukh, 2023) is a comprehensive educational resource aimed at a broad audience, including students of vocational (technical) education, individuals independently mastering economic activities, instructors of economic disciplines, and professionals across various fields. This publication was developed within the *"EU4Skills: Better Skills for a Modern Ukraine"* program, funded by the European Union and its member states: Germany, Finland, Poland, and Estonia. The content of the textbook covers essential aspects of economic theory and practice, including analyses of economic phenomena, market structures, principles of entrepreneurial activity, and mechanisms for economic development. A distinctive feature of this textbook is its integration of theoretical material with practical cases, statistical data, and applied tasks, which fosters a comprehensive understanding of economic processes. The methodological approach employed in the textbook emphasizes the multifaceted nature of economics and entrepreneurship, highlighting their importance as subjects of scientific inquiry and areas of practical individual activity. This structure promotes the development of critical thinking and practical skills in the field of economics, a particularly relevant aspect in the context of modern labor market demands and economic realities.

The educational textbook *"Fundamentals of Entrepreneurship"* (Karpyuk, 2021), developed within the framework of the United Nations Peacebuilding and Recovery Program with financial support from the European Union and approved for use in vocational (technical) educational institutions, serves as a comprehensive didactic publication adapted to Ukraine's contemporary economic realities. The content of the textbook spans a wide range of theoretical and practical aspects of entrepreneurial activity. It discusses the conceptual foundations of entrepreneurship as a unique form of economic activity, analyzes the regulatory framework for conducting business in Ukraine, and offers practice-oriented guidelines for the establishment and operation of business entities, with a particular emphasis on the activities of individual entrepreneurs. The methodological approach in this textbook focuses not on providing ready-made business models or guaranteed financial success

strategies but on fostering a systemic understanding of the entrepreneurial process. The core concept of the publication lies in a sequential presentation of the stages of entrepreneurial activity, from generating a business idea to its practical implementation and the subsequent development of the enterprise.

In the context of enhancing the quality of the educational process, the issue of methodological support becomes increasingly relevant. Specifically, the methodological guide *"Entrepreneurial Competence of Future Professionals"* (Alekseeva, Bazyl, Baidulin, Hrytsenok, Yershova, Orlov, & Sokhatska, 2021) is a comprehensive resource aimed at a wide range of educational sector professionals, including scientific, pedagogical, and scientific-pedagogical staff, methodologists, psychologists, and social educators. The content of the guide presents a methodological system for developing entrepreneurial competence in future professionals, based on contemporary pedagogical concepts and considering the specifics of vocational education. The publication contains detailed methodological recommendations for implementing innovative pedagogical technologies aimed at developing entrepreneurial competence.

These technologies include stimulating business activity, enhancing financial literacy, integrating self-management elements, and applying project-based learning. Special attention is given to the method of optimizing the synchronous implementation of multiple technologies for developing entrepreneurial competence in the educational process of vocational (technical) educational institutions. The guide incorporates integrated tools aimed at increasing the effectiveness of forming entrepreneurial competence in vocational students by improving pedagogical approaches and methodologies. This publication contributes to advancing the methodological foundation of vocational education and enhancing its alignment with the modern labor market and economic demands.

The practical manual *"Youth Entrepreneurship in Wartime Conditions"* (Bazyl, Baidulin, Hrytsenok, Yershova, Orlov, Savchenko, & Telovata, 2022) provides methodological recommendations for organizing advisory support for students of vocational (technical) education in the field of youth entrepreneurship, adapted to the conditions of wartime and prospects for post-war economic recovery. Based on a comprehensive analysis of the career centers and other structural units within vocational educational institutions, which focus on developing career and entrepreneurial competencies of future professionals, it was found that youth entrepreneurship consulting is generally carried out in four main areas: professional, psychological, business, and legal counseling. Accordingly, the publication presents scientifically substantiated recommendations for organizing each of these types of consulting activities, considering the specifics of starting and conducting business in wartime conditions. A separate section is dedicated to forms and methods for developing entrepreneurial competence among future professionals within the educational process. The target audience of the publication includes managers, educators, coordinators, and staff members of career centers, business centers, and other structural units of vocational (technical) education institutions engaged in developing the career and entrepreneurial competencies of future professionals, preparing them to start and manage their own businesses to ensure dignified employment in the context of post-war economic recovery and sustainable societal development.

The methodological guidelines *"From Business Idea to Entrepreneurial Success"* (Hrytsenok, Baidulin, & Savchenko, 2021) are designed for vocational education students aiming to initiate their own entrepreneurial activities and achieve economic success, thereby contributing to both personal well-being and the economic development of the country. These guidelines are of high practical value to a wide range of professionals, including vocational (technical) education instructors, potential entrepreneurs, and specialists involved in developing entrepreneurial competencies for future skilled workers.

The guidelines outline the conceptual foundations and socio-economic significance of entrepreneurial activity in the context of Ukraine's market economy transformation, as well as the strategic goals and tactical tasks of entrepreneurship in current economic conditions. The publication provides practical instructions for starting a business, including step-by-step guidance for novice entrepreneurs and an explanation of the registration

procedure for business entities in Ukraine. Special attention is paid to the necessity of preparing youth for entrepreneurial activity and fostering financial literacy as a key factor in the long-term stabilization of the financial system, improving quality of life standards, and ensuring the economic security of the population in the long term. The guidelines offer a detailed analysis of the stages of business creation, encompassing the formation of sustainable positive motivation for entrepreneurial activity, the generation and selection of an innovative business idea as the foundation of the future enterprise, the development of a preliminary business plan within the educational process in vocational (technical) educational institutions, as well as the practical implementation of the business idea and the accumulation of initial entrepreneurial experience. This comprehensive approach ensures the systematic formation of entrepreneurial competencies in vocational students.

The reference book *"Preparing Future Skilled Workers for Youth Entrepreneurship"* (Bazyl, Baydulin, Hrytsenok, Yershova, Orlov, Savchenko, Telovata, & Titova, 2022) provides structured information on the operation of structural units within vocational (vocational-technical) education institutions, whose activities focus on preparing young students for entrepreneurial endeavors. This publication offers an overview of essential official sources, whose familiarity is critically important for initiating and managing one's own business, as well as for organizing effective career counseling for vocational education students. The reference book consolidates scientific, educational, practical, and reference materials, along with pedagogical innovations developed by researchers from the Institute of Vocational Education of the National Academy of Pedagogical Sciences of Ukraine in the area of youth entrepreneurship training. The target audience of the publication includes a broad range of professionals in vocational (vocational-technical) education, including administrative staff, educators, organizers, and employees of career centers, business centers, and other specialized units within educational institutions. The materials are particularly valuable for specialists whose work is directly connected to developing students' career and entrepreneurial competencies and preparing them for independent entrepreneurial activities.

The monograph *"Preparing Future Skilled Workers for Entrepreneurial Activities in Small Business: Theory and Practice"* (Aleksieieva, Bazyl, Hrytsenok, Yershova, Zakatnov, Orlov, & Sokhatska, 2020) warrants special attention in the context of educational and methodological support for this area. This monograph is a comprehensive study of the theoretical and applied aspects of preparing future skilled workers for entrepreneurship within the context of small business development. The authors propose and substantiate a pedagogical system model aimed at fostering entrepreneurial competence among future specialists. The methodological foundations for preparing students in vocational (vocational-technical) education for entrepreneurship are thoroughly examined, with detailed clarification of the content and innovative forms of its implementation.

Special attention is given to the analysis of pedagogical conditions and technologies that encourage business initiative among students in vocational education institutions. The necessity of implementing self-management technologies as an effective tool for cultivating entrepreneurial competence among future skilled workers is substantiated. Key directions for developing entrepreneurial skills within project activities are characterized. This publication is directed at a wide range of vocational education professionals, including educators in vocational education institutions, staff of training and methodological centers (cabinets) for vocational and technical education, representatives of the State Employment Service of Ukraine, as well as higher education faculty, students, postgraduate students, and doctoral candidates with research interests in entrepreneurship education.

An analysis of instructional materials, particularly those targeting students and aimed at developing entrepreneurial competence, reveals a significant shortfall in the form of insufficient industry-specific specialization and a lack of consideration for the unique characteristics of specific professional fields. This issue is especially pertinent in industries with highly specific business conditions, regulatory environments, and technological-ecological requirements, such as renewable energy. Renewable energy is characterized by a complex set of unique aspects, including the use

of alternative energy sources, the implementation of innovative technologies, the specificity of investment processes, and risk management practices. Accordingly, specialists aspiring to engage in entrepreneurship within this field require a specialized knowledge base (Benmenni, 2020). Most available educational resources (textbooks, manuals) on entrepreneurship are generalized and do not consider industry-specific details. They overlook the particularities of initiating and developing businesses in renewable energy, omitting issues such as industry-specific regulatory frameworks, financing of "green" projects, marketing of renewable energy sources, and management of environmental risks.

To address this issue, it is necessary to initiate the development of specialized textbooks and manuals dedicated to entrepreneurship within specific sectors of economic activity. These educational resources should cover the full range of relevant topics, including industry trends, technological innovations, legal regulations, financial support, environmental considerations, and risk management specific to the energy sector.

The digital transformation of education requires the integration of new information and communication technologies into the educational process of vocational (technical) education institutions. An important step in this direction was the digital learning platform “Vocational Education Online,” presented by the Ministry of Education and Science of Ukraine in 2022. This platform is an effective tool for developing entrepreneurial skills among learners and offers extensive opportunities for remote learning. It allows students to master vocational professions online, enables educators to enrich the learning process with modern digital content, and provides everyone interested with the chance to obtain vocational education or improve their qualifications remotely.

The implementation of this platform creates significant advantages for fostering entrepreneurial skills among learners: it helps develop critical, creative, systemic, and strategic thinking, enhances communication skills, teamwork abilities, problem-solving, and decision-making skills. A critical aspect is the improvement of digital literacy among all participants in the educational process. These skills are crucial for effective entrepreneurial activities in today’s conditions. Therefore, the online platform becomes an essential tool for building entrepreneurial competence within vocational (technical) education.

Conclusions. Analyzing the regulatory framework and scientific basis for the educational and methodological support in developing entrepreneurial skills, especially for future renewable energy technicians, reveals its comprehensiveness, encompassing legislative acts, scientific publications, and modern internet resources. Domestic researchers focus on advancing theoretical foundations to create practice-oriented methodologies, covering a wide range of issues: from conceptual foundations of integrating entrepreneurial education into vocational education to developing innovative pedagogical technologies and educational materials.

Despite the availability of well-developed educational and methodological resources aimed at fostering entrepreneurial skills, there remains a pressing need for specialized materials that consider the specific professional activities of future graduates. The general approaches to forming entrepreneurial competence do not fully meet the energy sector's requirements, underscoring the necessity of developing a specialized educational and methodological complex. Such a complex should integrate general principles of entrepreneurship with the specific features of renewable energy, including regulatory specifics, technological aspects, financial considerations, and risk management practices. Creating this educational and methodological support would enhance the effectiveness of entrepreneurial skill formation for future specialists, aid their better adaptation to the real labor market, and stimulate the innovative development of the renewable energy sector as a whole.

Based on the conducted analysis of the educational and methodological support for developing entrepreneurial competence in future energy sector specialists, several significant shortcomings requiring comprehensive solutions have been identified.

Firstly, there is a considerable gap between theoretical entrepreneurship concepts and their practical implementation in the context of installation and maintenance of renewable energy systems. This leads to a fragmented understanding of business processes specific to the energy sector, potentially reducing graduates’ competitiveness in the labor market.

Secondly, there is a notable lack of integration of modern digital technologies and simulation models in the educational process across most educational materials. In particular, the absence of interactive platforms for simulating energy markets severely limits the acquisition of practical skills in forecasting and analyzing market trends in the energy sector.

Thirdly, there is insufficient emphasis on developing "soft skills" essential for successful entrepreneurial activities in the energy sector. The development of skills in strategic planning, risk management, and crisis management remains critically underdeveloped, especially in the face of the energy market's high volatility.

Fourthly, there is limited implementation of an interdisciplinary approach within educational programs. This is evident from the insufficient synergy of technical, economic, and environmental knowledge, which is a key factor in forming a comprehensive understanding of modern energy trends, particularly in the context of the global shift to renewable energy sources.

Finally, the absence of integrated business incubators and accelerators in educational programs tailored to the energy sector significantly restricts the development of practical entrepreneurial skills among future specialists.

Identifying the above-mentioned issues establishes a scientific basis for developing and implementing comprehensive strategies to enhance educational and methodological support aimed at increasing the effectiveness of entrepreneurial competence formation in alignment with the specific requirements of the energy sector. These strategies would contribute to improving the quality of vocational training for future energy specialists, enhancing their competitiveness and innovative potential amidst the global transformations in the energy market.

The core aspect of improving educational and methodological support should be the implementation of an approach that synthesizes technical, economic, and environmental aspects of renewable energy with the fundamentals of entrepreneurship. This involves the development of integrated learning modules or courses that combine the study of energy technologies with business planning and innovative management.

A crucial direction involves strengthening practice-oriented training through the introduction of business simulations, case studies, and the creation of training and production laboratories where students can develop entrepreneurial skills in a realistic energy sector context. This is complemented by enhancing the digital component of education, including the use of interactive platforms for modeling energy markets and business processes.

Special attention should be given to developing "soft skills" and strategic thinking, which are critical for successful entrepreneurial activity in the energy sector. This includes incorporating courses on communication skills, leadership, risk management, and decision-making under uncertainty within educational programs.

Considering global trends and strategies, it is necessary to foresee the creation of specialized entrepreneurship modules in the renewable energy sector and the development of projects aimed at creating circular business models in energy supply.

Implementing these interconnected strategies will enable the creation of flexible and adaptive educational and methodological support, facilitating the effective development of entrepreneurial competence in future specialists within the field, preparing them to meet the challenges and opportunities of today's dynamic energy market.

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СТАН НАВЧАЛЬНО-МЕТОДИЧНОГО ЗАБЕЗПЕЧЕННЯ ПІДГОТОВКИ КВАЛІФІКОВАНИХ РОБІТНИКІВ ГАЛУЗІ ЕНЕРГЕТИКИ ДО ПІДПРИЄМНИЦЬКОЇ ДІЯЛЬНОСТІ

Володимир Артюшенко

здобувач ступеня доктора філософії Інституту професійної освіти НАПН України,
https://orcid.org/0009-0003-1897-8701, e-mail: artyushenko.volodymyr@gmail.com

Реферат:

Актуальність дослідження зумовлюється низкою факторів, що відображають сучасні виклики освітньої системи й функціонування галузі енергетики України: критичного значення набуває необхідність всебічного аналізу наявних освітніх програм, навчальних, методичних матеріалів і педагогічних підходів з точки зору їх відповідності сучасним вимогам, особливо в контексті стрімкого розвитку відновлюваної енергетики; посилення необхідності оцінки готовності розробленого навчально-методичного комплексу до формування у здобувачів освіти не лише технічних навичок, але й підприємницького мислення, адаптованого до галузевої специфіки; виокремлення сильних і слабких сторін системи підготовки кваліфікованих робітників, визначення напрямів її вдосконалення й модернізації відповідно до сучасних вимог щодо монтажу й обслуговування систем відновлювальної енергетики.

Мета полягає у висвітленні результатів аналізу стану навчально-методичного забезпечення підготовки кваліфікованих робітників галузі енергетики до підприємницької діяльності, визначенні сильних і слабких сторін наявних методичних напрацювань для організації освітнього процесу в закладах професійної (професійно-технічної) освіти.

Методи: теоретичний аналіз офіційних, наукових джерел та інтернет-ресурсів – задля з'ясування стану вивченості проблеми дослідження й створення його теоретичного підґрунтя, виявлення основних концепцій і підходів до навчально-методичного забезпечення підготовки кваліфікованих робітників в галузі енергетики до підприємництва; *праксиметричні методи* – для вивчення й аналізу прогресивного педагогічного досвіду щодо розробки навчально-методичного забезпечення, робочих навчальних планів закладів професійної (професійно-технічної) освіти, що провадять освітню діяльність з підготовки фахівців з відновлювальної енергетики, освітніх і навчальних програм підготовки майбутніх кваліфікованих робітників, підручників, навчальних і методичних посібників; *метод порівняння* – для зіставлення різних підходів до планування освітнього процесу в частині підготовки майбутніх кваліфікованих робітників до підприємницької діяльності та його методичного забезпечення; *моделювання* – для розробки концептуальної моделі навчально-методичного забезпечення, створення цілісного уявлення про структуру й компоненти ефективного навчально-методичного комплексу; *узагальнення й прогнозування* – для виявлення позитивного досвіду щодо створення навчально-методичного забезпечення освітнього процесу з підготовки кваліфікованих робітників до підприємницької діяльності, наявних проблем у розробці такого забезпечення й вироблення можливих шляхів їх подолання.

Результати: на основі теоретичного аналізу джерельної бази вивчено стан дослідженості проблеми розробки навчально-методичного забезпечення освітнього процесу; на основі аналізу різних підходів до планування освітнього процесу виявлено прогресивний педагогічний досвід щодо розробки освітніх і навчальних програм підготовки майбутніх кваліфікованих робітників, підручників, навчальних і методичних посібників, а також виявлено ряд суттєвих недоліків, які потребують комплексного вирішення; на підставі зіставлення різних підходів до підготовки майбутніх кваліфікованих робітників до підприємницької діяльності змодельовано основні компоненти підвищення ефективності навчально-методичного забезпечення освітнього процесу й вироблено основні шляхи подолання проблем у його розробці.

Висновки: змістовна вітчизняна нормативно-правова база й наукове підґрунтя навчально-методичного забезпечення формування підприємницьких навичок, зокрема у майбутніх майстрів з відновлювальної енергетики, включають в себе законодавчі акти, наукові публікації, сучасні інтернет-ресурси; існує необхідність у розробці таких освітніх ресурсів, які б не лише формували загальні підприємницькі навички, але й враховували унікальні аспекти й виклики, притаманні певним професійним сферам, що дозволить здобувачам освіти отримати більш цілісне й практико-орієнтоване розуміння підприємництва в контексті їхньої майбутньої спеціалізації,

підвищуючи їхню готовність до реальних умов ринку праці й потенційної підприємницької діяльності в обраній галузі; аналіз навчально-методичного забезпечення формування підприємницької компетентності у майбутніх фахівців енергетичного сектору виявив ряд суттєвих недоліків: розрив між теоретичними концепціями підприємництва та їх практичним застосуванням у сфері відновлювальної енергетики, недостатня інтеграція сучасних цифрових технологій і симуляційних моделей, дефіцит уваги до розвитку «м'яких навичок», обмежена імплементація міждисциплінарного підходу, відсутність інтегрованих бізнес-інкубаторів та акселераторів, орієнтованих на специфіку енергетичного сектору; фундаментальні дослідження у сфері педагогіки й відновлювальної енергетики мають стати основою для створення інноваційних методик навчання, орієнтованих на розвиток підприємницької компетентності у майбутніх фахівців з відновлювальної енергетики.

Ключові слова: *навчально-методичне забезпечення, професійна (професійно-технічна) освіта, освітній процес, відновлювальна енергетика, освітні програми, підприємницька компетентність, методика навчання.*

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