



FORMATION OF FUTURE SPECIALISTS' PROFESSIONAL COMPETENCE ORIENTED ON SUSTAINABLE DEVELOPMENT: FACTORS AND ALGORITHM OF MODEL DEVELOPMENT

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Abstract.

Relevance. The article substantiates the need to develop a model of future skilled workers' professional competence, oriented towards sustainable development, based on the results of the analysis of the factors of its formation.

The purpose of the article is to structure and analyze the factors of the formation of future specialists' professional competence aimed at sustainable development, and to highlight the stages of development of its model on the example of professions related to the production of food products in Germany to adapt the specified experience to the system of domestic vocational education.

Methods: theoretical (analysis, synthesis, interpretation, abstraction, generalization, analogy and comparison – for structuring and analysis of the factors of formation of future specialists' professional competence aimed at sustainable development); modeling – to represent the stages of developing its model; comparative – to adapt the experience of the Federal Republic of Germany to the conditions of the domestic system of vocational education.

The results. The authors' structuring and analysis of the factors of formation of future specialists' professional competence focused on sustainable development made it possible to determine the levels of their distribution according to the spheres of sustainable development (ecological, social and economic), namely: international, national, regional, industrial and institutional (enterprise-institution of vocational education). The stages of development of a model for the formation of future specialists' professional competence, oriented towards sustainable development, are highlighted, using the example of professions related to the production of food products in Germany, which will contribute to better adaptation of the specified experience to the system of domestic vocational education.

Conclusions. Professional competence focused on sustainable development is defined as an integrative education based on key, general professional and professional competences acquired by future specialists in a professional education institution considering the Sustainable Development Goals in the content of education and ensuring the ability to act in accordance with the principles of sustainable development (socially responsible and subjectively meaningful). The algorithm for developing a model for the formation of future specialists' professional competence, oriented towards sustainable development, consists of four stages: determination of work processes, which are the basis of production in the relevant industry; clarification of aspects of work related to sustainable development; structuring and selection of the content of vocational education to the competence matrix; formulation of goals and content of competences.

Keywords: professional competence focused on sustainable development, sustainable development, education for sustainable development, factors, future professionals, professional competence formation model, food industry.

Introduction. The need for post-war reconstruction of our country, caused by the consequences of the full-scale invasion of the aggressor, requires quick and thoughtful actions, as well as a purposeful reconstruction policy. This is evidenced by data from the Kyiv School of Economics: on September 1, 2022, because of military operations in Ukraine, 5,270 large and medium-sized private enterprises, 78,060 small private enterprises and Individual entrepreneurs, and 1,665 state enterprises were destroyed (KSE Institute, 2022).

In view of this, the question arises of introducing a system of measures for the construction of economic entities and the reconstruction of partially destroyed ones, their re-equipment and the launch of new technological lines (Cabinet of Ministers of Ukraine, 2021). At the same time, it is necessary to consider the development trends of the modern resource-oriented economy, in particular the implementation of the Sustainable Development Goals (President of Ukraine, 2019). This means the introduction of modern, energy-efficient and ecological technologies, the operation and maintenance of which will be provided by highly qualified workers with formed competence the ability to act professionally in accordance with the principles of sustainable development. So, the question arose, which consists in the development of a model of future skilled workers' professional competence associated with sustainable development, for which it is appropriate to analyze the factors of its formation.

Sources. It is worth noting that sustainable development is the central challenge of the 21st century. The scale and necessity of the global transformation of society are declared, first, in the Sustainable Development Goals of the UN (United Nations. Ukraine, 2022). Such changes require complex learning processes in the economy, politics and society at both global and local levels. In this context, education for sustainable development (ESD) aims to empower people to jointly shape a sustainable future. Among the main problems that the Sustainable Development Strategy aims to solve, the following ones are distinguished (Stern S. et al., 2021):

- consumption of limited resources;
- growth limits;
- entry of pollutants into the environment;
- participation in management and decision-making processes;
- global fair distribution of resources between current and future generations.

The need for a comprehensive solution to the identified problems actualized two key directions –

ecological and socio-economic, which were reflected in the ESD. This development was driven, on the one hand, by the so-called Brundtland Report of 1987 "Our Common Future" and on the other hand by Agenda 21, the final document of the 1992 Conference on Environment and Development in Rio - de Janeiro (United Nations Conference on Environment & Development, 1992).

From a global perspective, the intentions of the 1992 Rio Conference to achieve changes towards sustainable development through active public awareness were considered unsuccessful ten years after the conference. Therefore, the United Nations decided to declare the World Decade of Education for Sustainable Development from 2005 to 2014 to give momentum to this topic. Next, the World Program of Action of UNESCO ESD (2015-2019) was developed, which is now being continued by the UNESCO program "ESD 2030" (2020-2030). The latter examines the 2030 Agenda and 17 chapters of the UN Sustainable Development Goals (UNESCO. UNESDOC Digital Library, 2020).

Results and discussion. Since three spheres of sustainable development are distinguished – ecological, social and economic (De Haan G. et al., 2021), we consider it necessary to structure the factors of formation of future specialists' professional competence, oriented towards sustainable development, taking into account the specified spheres at the following levels: international, national, regional, industrial and institutional (enterprise-institution vocational education).

At the international level, the factors of the environmental sphere include the following: an increase in the share of energy from renewable sources in the global energy balance; activation of international cooperation in the field of ecologically clean energy; ensuring preservation, restoration, and rational use of natural ecosystems; rational and efficient use of natural resources. Among the factors of the social sphere, we single out the following: elimination of poverty throughout the world; prevention of mortality; providing all population groups with sufficient food; promotion of accessible and quality education; increasing global macroeconomic stability. Factors of the economic sphere at this level are: full and productive employment and decent work for all; transition to the use of rational models of consumption and production.

At the national level, among the factors of the ecological sphere, the following ones have been identified: ensuring general access to energy supply; response to climate change; financial support for the preservation and rational use of biological diversity

and ecosystems. Factors of the social sphere are: introduction of appropriate systems and measures of social protection for everybody; prevention and treatment of various diseases, support of mental health and well-being of the population; involvement of youth and adults in obtaining professional education for better employment; encouraging effective partnership between state and non-governmental organizations and the private sector. Factors in the economic sphere of this level should include: promotion of productive activity, creation of decent jobs, entrepreneurship, creativity and innovative activity; a significant increase in the level of employment in industry and the share of industrial production in the gross domestic product.

At the regional level, among the factors of the environmental sphere, the following should be singled out: encouragement of investments in energy infrastructure and environmentally clean energy technologies; preservation and rational use of natural resources. Factors of the social sphere are: investing measures to eliminate poverty; sustainable food production; assistance in the development of vaccines and medicines; training on issues of sustainable development, human rights, gender equality and awareness of the value of cultural diversity; reducing the scale of corruption and bribery. The economic sphere is represented by the following factors: development of high-quality, reliable and sustainable infrastructure; reducing the negative environmental impact of cities; qualitative planning of national and regional development.

At the industrial level, environmental factors included: increase in energy efficiency; informing employees of economic entities about the consequences of climate change. The social sphere is represented by the following factors: ensuring the proper functioning of food markets and their processing products; increased financing of health care measures; creation of effective, accountable and transparent institutions. Factors of the economic sphere are: encouraging the development of micro, small and medium-sized enterprises; research and innovation in the field of domestic technologies; prevention of waste generation, their reuse.

We consider the institutional level as the formation of an educational and industrial environment in the conditions of a dual form of education. Conventionally, its components include the business entity – the customer of labor personnel, which provides professional and practical training of future specialists, and the professional education institution, which is responsible for their professional and theoretical training (Kulalaieva N. & Haiduk O.,

2021). Environmental factors at this level include: introduction of energy-efficient technologies; training of specialists knowledgeable in the field of ecological and energy-efficient technologies. Factors of the social sphere are: training of specialists who have modern agricultural technologies; creation and improvement of educational institutions that take into account the interests of children, the special needs of the disabled and gender aspects, and the provision of a favorable educational environment. Among the factors of the economic sphere, the following should be singled out: assistance in ensuring reliable and safe working conditions for all employees; reduction of waste during the life cycle of the product; ensuring that future specialists acquire knowledge about sustainable development and a way of life in harmony with nature.

In this context, the following aspects can be noted: on the one hand, vocational education and training should have a clear program of sustainable development, and on the other hand, during recent years, this program has only slowly turned into means of regulation. The central system lever and a certain impetus in this direction in the leading EU country – Germany was the revision of the standard of the profession profile "Environmental protection" (from 2020 "Environmental protection and sustainable development"). The first effects of this momentum can already be seen in the updated training regulations and framework curricula, in particular the integration of the Regulation on the professional standard of the profession "Environmental protection and sustainable development" into the framework curriculum for the profession of electronics technician (De Haan G. et al., 2021).

Based on the competence model of the German educator Heinrich Roth (Roth H., 1971), the future specialists' professional competence, oriented towards sustainable development, can be understood as an integrative education based on key, general professional and professional competences acquired in a professional education institution taking into account the Sustainable Development Goals in the content of education and provides the ability to act in accordance with the principles of sustainable development, socially responsible and subjectively meaningful (Kastrup J. et al., 2021). In Fig. 1 the prerequisites for the formation of future specialists' professional competence focused on sustainable development are presented.

It is clear that the model of formation of future professionals' professional competence, oriented towards sustainable development, will depend on the

profile of their professional training, i.e., the relevant industry.

Let's consider such a model on the example of competence focused on sustainable development in the production of food products, which was used as part of the scientific monitoring of pilot projects of the Federal Institute of Vocational Education and Training (BIBB).

First, this model, according to German colleagues (Kastrup J. et al., 2021), should be aimed at forming the responsibility of future experts in the food industry and the industry for sustainable nutrition. This is due to the fact that most trade and industrial companies that produce food products are often embedded in global production and sales chains. In view of this, the employees of this industry face an important task – to fully consider sustainable development in their work.

To fulfill their own responsibilities in the field of production and manufacture of ecologically clean food, they need comprehensive professional competences, which also include accepting responsibility outside their company. That is why sustainable development is structurally enshrined as a minimum standard in education in the Regulation on Vocational Education Standards "Environmental Protection and Sustainable Development" (Hauptausschuss des BIBB, 2020).

So, the algorithm for developing a model for the formation of future specialists' professional competence, focused on sustainable development, related to the production of food products, will consist of four stages.

First, it is necessary to determine the work processes that are the basis of the production of the relevant industry. Thus, for professions related to food production in Germany, two stages of processing can be distinguished: processing of agricultural raw materials and refining of raw materials (processing of raw materials and packaging). For some professionals, the field of application can be clearly defined (eg. baker or butcher), while for other professions (eg. food technologist) it is more varied. However, there are workflows common to all professions. They can be grouped into three subgroups: procurement and supply of raw materials; processing, storage and packaging; product development and marketing. However, the actions of food production workers are not determined exclusively by these work processes. In total, three levels of actions are distinguished: direct performance of work, which can be directly influenced by workers; the operational and organizational level of activity covering the entire company, on which the decisions of its management rely (business model); social and political frameworks, which include legal requirements

that must be met in the production of food products, or trends in the food industry that affect the business area.

Secondly, aspects of the work related to sustainable development are clarified. With the help of research based on a thorough analysis of modern scientific literature, educational practices, the latest production technologies and the results of current test models, a collection of content focused on sustainable development is formed, which is relevant for all professions related to the production of food products.

Thirdly, the content of professional education is structured and selected for the competency matrix. As a result, a model is obtained for describing professional competencies focused on sustainable development in the production of food products (Table 1).

Fourth, the competence goals are formulated. Specific goals are formulated for each area of the competency matrix. For example, for the field of the Processing, Storage and Packaging matrix, the specific objectives (Improve raw materials and optimize work processes) are that acquirers use equipment and materials, such as raw materials, auxiliary materials and consumables, in a resource-conserving manner within the framework of processing raw materials, understand the particular importance of packaging loss, waste and pollution for sustainable development, and know strategies to prevent or transform them.

They are able to:

- choose and effectively use processes, machines and production systems;
- effectively and safely use various cleaning and disinfection measures;
- choose and apply food-safe processes for preserving valuable ingredients during production, packaging and storage;
- create maintenance plans for machines and systems to ensure their optimal service life and minimize unplanned downtime;
- classify packaging components, their various functions and critically consider their impact from the point of view of sustainable development;
- differentiate packaging options based on aspects of sustainable development and choose optimal ecological packaging;
- determine data on the energy efficiency of systems and processes in production, packaging and storage;
- develop concepts for improving energy efficiency and implement them.

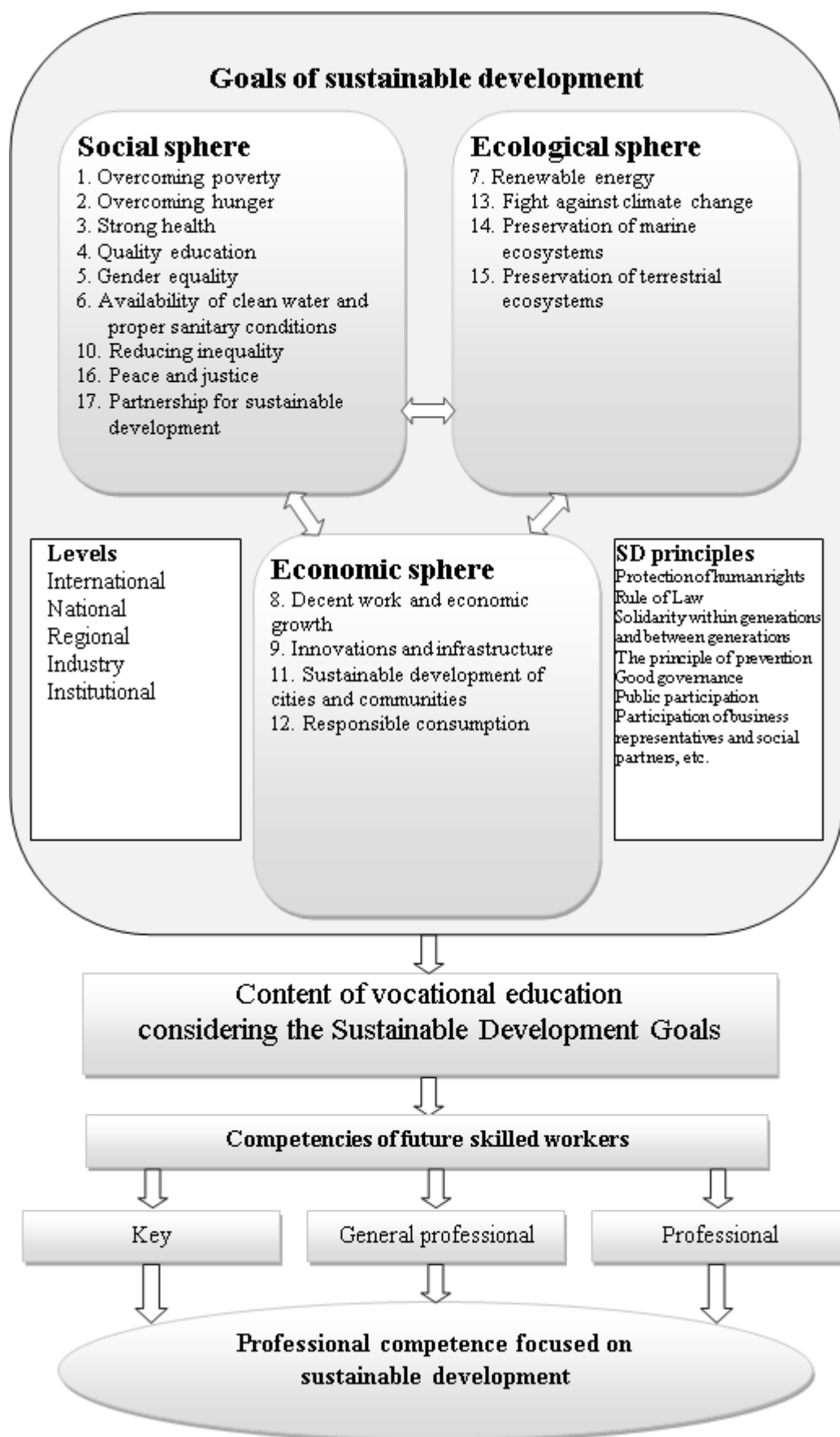


Fig. 1. Prerequisites for the formation of future specialists' professional competence, oriented towards sustainable development

A model for describing professional competence focused on sustainable development in the food industry

Measure of competence		Competence of sustainable development as the ability to		
		relevant sustainable actions (relevant sustainable activities)	socially responsible activity	activities that create sense (meaning) and identity
Level of activity				
Work-related workflows	Procurement and supply of raw materials	Selection and supply of raw materials as needed	Assessment of working conditions, production and supply chains at the initial stage	"From the barn to the table" to think
	Processing, storage and packaging	Processing of raw materials and optimization of own work processes	Production taking into account resources and climate	Promote sustainable development through food production
	Product development and marketing	Enhancement of product characteristics taking into account sustainable development	To support eating habits taking into account sustainable development	To preserve traditions and create trends
Production and organizational		Establish sustainability in the business model	Advocate for social and employee health issues	Use professional freedom of creativity
Socio-political		Understand the role of companies as subjects of sustainable development	Support the normative idea of sustainable development	Healthy life through healthy food

In the specific objectives, which are at the socio-political level of action (Understand the role of companies as subjects of sustainable development), it is noted that students consider their company as a social system in which people work, create products and services for other people and, thus, always operate in a wider social context. They understand the associated social and environmental responsibility, as well as the factual, legal and moral obligations of transparency and reporting (eg. balance sheet and sustainability reporting obligations, corporate social responsibility, etc.). In addition, they are able to:

- critically evaluate entrepreneurial actions in the industry in accordance with economic, social and environmental consequences;
- understand political decisions affecting their work and company and position themselves accordingly;
- to be aware of the company's ability to take on social responsibility;

- recognize the responsibility of companies as multipliers of equal opportunities and freedom from discrimination;
- evaluate external costs and the price of a food product, derive external costs caused by own production in the value chain;
- characterize the shortcomings of monopolistic structures both for sustainable development and for social aspects of the market economy;
- evaluate the potential of corporate forms oriented towards public welfare and managed by employees for the relevant industry;
- identify specific advantages and problems of reporting on sustainable development and corporate social responsibility;
- evaluate the effectiveness of communication measures regarding sustainable development and formulate appropriate proposals;
- draw conclusions about own activities based on the requirements of sustainable development certificates.

Conclusions. Therefore, the need to build new economic entities and rebuild partially destroyed ones, their re-equipment and the launch of modern technological lines, caused by the full-scale invasion of our country by an aggressor, requires taking into account the leading trends in the development of a resource-oriented economy, in particular the implementation of the Sustainable Development Goals. The structuring and analysis of the factors of the formation of future specialists' professional competence focused on sustainable development made it possible to determine the levels of their distribution according to the spheres of sustainable development (ecological, social and economic), namely: international, national, regional, industrial and institutional (enterprise-professional education institution). The presentation of the prerequisites for the formation of future specialists' professional competence, focused on sustainable development, made it possible to understand it as an integrative education based on key, general professional and professional competences

acquired by future specialists in a professional education institution, taking into account the Goals of sustainable development in the content of education and ensuring the ability to act in accordance with the principles of sustainable development (socially responsible and subjectively meaningful). The development of a model for the formation of future specialists' professional competence, focused on sustainable development, consists of four stages: determination of work processes, which are the basis of production in the relevant industry; clarification of aspects of work related to sustainable development; structuring and selection of the content of vocational education to the competence matrix; formulation of goals and content of competences. Highlighting the specified stages on the example of professions related to the production of food products in Germany will contribute to a better adaptation of the specified experience to the system of domestic vocational education.

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МОДЕЛЬ ФОРМУВАННЯ У МАЙБУТНІХ ФАХІВЦІВ ПРОФЕСІЙНОЇ КОМПЕТЕНТНОСТІ, ОРІЄНТОВАНОЇ НА СТАЛИЙ РОЗВИТОК

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Реферат.

Актуальність. У статті обґрунтовано необхідність розроблення моделі професійної компетентності майбутніх кваліфікованих робітників, орієнтованої на сталий розвиток, за результатами аналізу чинників її формування.

Мета статті полягає у структуруванні та аналізі чинників формування у майбутніх фахівців професійної компетентності, орієнтованої на сталий розвиток, і висвітленні етапів розроблення його моделі на прикладі професій, пов'язаних із виробництвом продуктів харчування у ФРН для адаптації означеного досвіду до системи вітчизняної професійної освіти.

Методи: теоретичні (аналіз, синтез, інтерпретація, абстрагування, узагальнення, аналогія та порівняння – для структурування та аналізу чинників формування у майбутніх фахівців професійної компетентності, орієнтованої на сталий розвиток); моделювання – для представлення етапів розроблення його моделі; порівняльні – для адаптації досвіду ФРН до умов вітчизняної системи професійної освіти.

Результати. Здійснені авторами структурування та аналіз чинників формування у майбутніх фахівців професійної компетентності, орієнтованої на сталий розвиток, дали можливість визначити рівні їхнього розподілу відповідно до сфер сталого розвитку (екологічної, соціальної та економічної), а саме: міжнародний, національний, регіональний, галузевий та інституційний (підприємство-заклад професійної освіти). Висвітлено етапи розроблення моделі формування у майбутніх фахівців професійної компетентності, орієнтованої на сталий розвиток, на прикладі професій, пов'язаних із виробництвом продуктів харчування у ФРН, що сприятиме кращої адаптації означеного досвіду до системи вітчизняної професійної освіти.

Висновки. Професійну компетентність, орієнтовану на сталий розвиток, визначено як інтегративне утворення, що ґрунтується на ключових, загальнопрофесійних і професійних компетентностях, набутих майбутніми фахівцями у закладі професійної освіти з урахуванням Цілей сталого розвитку в змісті освіти та забезпечує здатність діяти відповідно до принципів сталого розвитку, соціально відповідально та суб'єктивно осмислено. Алгоритм розроблення моделі формування професійної компетентності, орієнтованої на сталий розвиток, у майбутніх фахівців складається з чотирьох етапів: визначенні робочих процесів, що є основою виробництва відповідної галузі; з'ясуванні аспектів роботи, що стосуються сталого розвитку; структуруванні та відборі змісту професійної освіти до матриці компетентності; формулюванні цілей та змісту компетентностей.

Ключові слова: професійна компетентність, орієнтована на сталий розвиток, сталий розвиток, освіта для сталого розвитку, чинники, майбутні фахівці, модель формування професійної компетентності.

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