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EDUCATIONAL HUB AS A SPACE FOR THE DEVELOPMENT OF PROFESSIONAL AND PRACTICAL COMPETENCE OF ENVIRONMENTAL SAFETY SPECIALISTS

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The article contains the results of scientific research in the field of application of educational hubs in the process of training specialists in environmental safety. The analysis of the current Ukrainian regulatory documentation on the implementation of Sustainable Development Strategy dominants and provisions of the Law of Ukraine "On Environmental Protection" through environmental education of the society has been made. The problem of formation and development of professional and practical competence of environmental safety specialists in lifelong learning is updated in view of the constantly changing requirements for environmental safety at the enterprise and the territory of its influence. The analysis of professional and practical competence of environmental safety specialists by integral, general and special components has been made. The role of educational hubs for students through the provision of educational and scientific sessions of different duration and intensity using different learning styles (cooperative and competitive, cognitive and emotional, activity and observation, practical and theoretical) has been determined. A methodology of introducing an educational hub into the process of training specialists in environmental safety has been created. It has been established, that the process of the educational hub implementation has four stages: informational and organizational, evaluative and analytical, practical and technological, summarizing. The effectiveness of the implemented educational hub is proved by enabling the customers of educational services to create more complex educational and scientific and professional and practical products through exchange and cooperation, taking into account the collective integrated experience of professional activity. A model for assessing the formation of professional and practical competencies of environmental safety specialists according to indicators that include personal and professional qualities, practical and technological and organizational and managerial skills has been developed

Keywords: educational hub, innovative teaching methodology, professional and practical competencies, environmental safety specialists

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1. Introduction

Sustainable development is identified as a priority for each country. The concept of sustainable development in the current Ukrainian regulations is identified with a set of mutually agreed management, economic, social, environmental measures, aimed at forming a system of public relations based on trust, partnership, solidarity, consensus, ethical values, safe environment, national sources of spirituality. Sustainable development is based on the inalienable human rights to life and full development [1]. The policy, aimed at increasing competitiveness and strengthening regional, national and international cooperation, raises the issue of environmental education as a major factor in this process. The task of environmental education is to ensure environmental safety, which means a state of the environment that prevents the deterioration of the environmental situation and the emergence of danger to human health [2]. There is a set of appropriate measures, processes, states and actions to ensure the ecological balance on the planet at a level,

to which a person can adapt physically, without loss (political, socio-economic). Environmental safety is also identified with any human activity that includes a safe impact on the environment and eliminates the imbalance of natural or human-modified natural components of the environment and processes, which ensures the sustainable existence of an ecosystem. In connection with the above, the problem of formation and development of professional and practical competence of specialists in environmental safety is actualized.

2. Literature review

The formation and development of professional and practical competence of specialists in environmental safety requires the outline of the main trends and directions of professional and personal development of innovative teachers as organizers of student activities in lifelong learning through the use of educational hubs. An analysis of scientific and pedagogical literature shows that Ukrainian scientists have paid considerable attention

to innovation in education and science. Current legislation [3] defines educational innovations as the creation of new and improvement of existing educational, training, psychological and pedagogical, managerial technologies, methods, models, products, educational and technical solutions in the field of education, which significantly improve the quality, efficiency and effectiveness of educational activities. Innovative educational activity is considered to be educational and research practice, aimed at the development and use of the results of scientific research and development in the field of education. Objects of innovative educational activities are associated with new empirical and/or theoretical knowledge, educational process, educational (pedagogical), didactic, management systems, models, methods, innovative educational programs and projects, other intellectual products, teaching aids and equipment, organizational and administrative decisions that improve the quality of education, the effectiveness of educational activities of research and teaching staff, educational institutions.

Thus, the introduction of European living standards in Ukraine and Ukraine's moving up in the world are presented in [1], the legal, economic and social foundations of environmental protection in the interests of present and future generations are determined in [2]. Requirements for training specialists capable of solving complex environmental problems are given in [4, 5]. The procedure for carrying out innovative educational activities in the education system is represented in [6, 7], the conceptual and terminological apparatus of innovations in education and science is described in [8, 9]. The general and individual patterns of teacher-innovator development trends and characteristics in postgraduate pedagogical education are defined in [10]. Theoretical content and positive expectations for functioning of educational innovation hubs [11, 12], in particular for the development of territorial communities have been established in [13, 14]. Peculiarities of training environmental protection specialists for environmental monitoring in the system of postgraduate education are presented in [15]. The importance of forming the ecological competence of higher education institution students is emphasized in [16]. The role of the workshop as a method of training future specialists in technogenic and environmental safety is disclosed in [17]. The importance of forming transversal competencies among specialists of innovative business structures in lifelong learning has been proved in [18], in particular taking into account innovative aspects of modern post-industrial society. The analysis of innovative teaching methods and the results of their implementation during practical and technical training of students are presented in [19, 20]. The professional competence of teachers in the age of globalization in the world is analyzed in [21]. Recommendations for a common set of technological competencies for educators who train teacher candidates to study technology in the United States are given in [22]. The influence of educational leadership and creative teaching on the actualization of students is determined in [23, 24]. The application of situational learning for postgraduate students of the software course is disclosed in [25]. The structure of

competencies for teaching and learning in innovation centers in the 21st century to predict learning in the post-COVID-19 era is presented in [26, 27]. A diagnosis of the first-year teacher training program of the university is disclosed in [28].

Despite such specific attention to the problem of reforming the modern educational paradigm on the basis of sustainable development and modernization of the innovative educational process, the problem of formation and development of professional and practical competence of environmental safety specialists in the context of integration into the globalization space requires analysis.

3. The aim and objectives of the study

The aim of the study is to reveal the importance of formation and development of professional and practical competence of environmental safety professionals in lifelong learning through the use of educational hubs to ensure competitiveness and strengthen regional, national and international cooperation.

To accomplish the aim, the following tasks have been set:

- 1) to analyze the professional and practical competence of specialists in environmental safety;
- 2) to develop a method of implementing an educational hub in the process of training specialists in environmental safety;
- 3) to develop a model for assessing the formation of professional and practical competencies of specialists in environmental safety.

4. Research methods

The following methods were used to conduct the study: comparative and analytical to analyze the professional and practical competence of specialists in environmental safety; system analysis for the development of methods for implementing the educational hub in the process of training specialists in environmental safety; mathematical modeling for the development of an indicator assessing system for professional and practical competencies of specialists in environmental safety.

5. Result

5.1. Analysis of professional and practical competence of environmental safety specialists

Professional and practical competence of modern specialists in environmental safety is an integral psychological, special and subjective formation, which is formed in the process of acquiring professional education through the formation of general and professional competencies, needed to solve environmental problems, the ability to solve complex environmental problems, characterized by uncertainty of conditions and requirements. It is updated, developed and improved in the process of practical professional activity [29]. The effectiveness of the implementation depends on theoretical, practical and psychological preparedness, as well as subjective, professionally important and mental qualities of the specialist, his/her perception of goals, values, content, results and specific features of this activity.

The professional competence of a modern specialist in environmental safety of the second (master's) level of higher education consists of three components:

– *integrated* (ability to solve complex problems and problems in the field of environmental technology in the course of professional activities or training, which contains research and/or innovation and is characterized by complexity and uncertainty of conditions and requirements),

– *general competencies* (ability to apply knowledge in practical situations, communicate in a foreign language, search, process and analyze information from various sources, generate new ideas, make informed decisions, develop projects and manage them, carry out safe activities),

– *special competencies* (ability to control and assess the environmental risks of technogenic objects and economic activities on the environment, to use scientifically sound methods of processing research results in the field of environmental protection technologies; plan, design and control the parameters of certain types of equipment, machinery and technologies for environmental protection; develop new and use known methods of disposal, disinfection and recycling of household and industrial waste; introduce and use renewable energy sources, resource- and energy-saving technologies; monitor and evaluate the effectiveness of environmental measures and applied technologies) [5].

These components are crucial for successful professional activity in a particular specialty.

5.2. Methodology of implementing an educational hub in the process of developing the professional and practical competence of environmental safety specialists

Innovation in the modern world penetrates into all aspects of society, requiring professionals to be competitive and creative. Accordingly, educational processes in higher education institutions are also undergoing dynamic changes, especially in lifelong learning, which is expressed in changing the form of their architectural organization.

It is higher education institutions that, being innovative, variable, adaptive and mobile, develop professional and practical competencies of environmental safety professionals, as well as their personal qualities (creativity and imagination), which are the basis for the formation of innovation processes. They reveal the potential (intellectual, professional, creative) and provide self-realization in a profession as well as further career growth.

The term "educational hub" is used in the meaning of a center with educational, scientific and practical focus for all those, wishing to receive the ordered service. In this study, the educational hub will perform the function of coworking, namely the space, equipped with everything necessary for full operation, that is leased to a group of people for a certain period (from several hours to several months) to provide customers with lifelong

learning. Educational hubs (schools and universities) can become laboratories for the transformation of society on the basis of sustainable development, where the key challenges of the industrial social model are addressed, provided that environmental safety is met.

As the problem of education modernization affects the forms of its spatial organization and determines the content of education, the world's leading educational institutions are actively forming innovation centers, technology parks, creative hubs and mediatheques that fully meet the needs of modern professionals. In Ukraine, various forms of architectural organization of such centers are just beginning to be created, but there is no thorough theoretical and methodological basis for them.

Educational hubs are formed as a result of interaction between the teaching staff and the public, scientists and enterprises with use of qualitative training means, resulting in formulating the quality policy of education. The main features of the hubs are the common purpose of functioning, the division of responsibilities among the participants, the creation of a coordinating body, compliance with agreements and the development of long-term partnerships. This is an educational environment, in which practical skills are acquired, on the basis of which the competencies of professional development of specialists in environmental safety are formed.

The main purpose of the implementation of educational hub in lifelong learning is to create a space, in which specialists will develop professional and practical competencies in the course of training. This is especially true for technogenic and environmental safety engineers, who must constantly improve their own practical competencies, as the requirements for environmental safety at the enterprise and area of its influence are constantly changing.

The created educational hub will allow:

- to study the need for environmental safety specialists and to form directions for the development of the hub in order to ensure the improvement of necessary professional and practical competencies of specialists;

- to form methodological recommendations on the composition of functional elements of the educational hub in order to use it in the process of training effectively;

- to determine the thematic content of training specialists in environmental safety;

- to promote the involvement of experts in various fields, including an environmental impact assessment expert, an expert in environmental policy-making, an expert in environmental technology development, etc.

Taking into account the main aspects of the activities of enterprises in different sectors, an approximate theme of the educational hub for specialists in environmental safety has been developed (Table 1).

Table 1

Content of the educational hub for professional development of environmental safety specialists

No.	Theme	Number of Hours	Format of Classes
<i>Day 1 "Comprehensive environmental assessment of enterprises"</i>			
1	Presentation of enterprises activities, made by the participants of the hub	8	Facilitation
2	Environmental impact assessment: methodological and practical aspects		Training
3	Algorithm for integrated assessment of environmental and production components of the enterprise		Workshop
<i>Day 2 "Modern technological solutions to ensure environmental safety"</i>			
1	Search for modern environmental technologies	8	Discussion
2	Development of universal organizational and technological solutions to ensure environmental safety		Brain storm
3	Economic justification for the implementation of modern technological solutions		Training
<i>Day 3 "Environmental Management Tools"</i>			
1	Environmental policy to ensure the efficiency of enterprises	8	Coworking
2	Development and implementation of environmental initiatives at the enterprise		Workshop

This hub is designed for three days and 24 hours, during which specialists will be able to gain new practical skills and develop professional competencies. Each topic provides an appropriate form of conduct.

The following stages should be used to implement the educational hub:

1) information and organizational – the study of the needs for environmental safety specialists, the identification of necessary but missing professional skills in particular. This also happens during the presentation of enterprise activities, which should be made in the form of facilitation;

2) evaluation and analytical evaluation of the enterprise in terms of its impact on the main components of the environment, the use of treatment facilities and their efficiency, control over sources of pollution;

3) practical and technological – the identification of environmental technologies, effectively implemented at various enterprises, development of organizational and technological solutions to ensure environmental safety and their economic justification for further implementation in production;

4) summarizing – development and implementation of environmental initiatives to improve the environmental policy of the enterprise.

Holding an educational hub will provide experts in ecological safety with professional and practical competences for performing evaluative, analytic and predictive, production and technological, organizational and administrative tasks. On the example of enterprises, participants will be able to learn new approaches to assessing the functioning of enterprises, selection of effective environmental technologies, skills in the methodology of developing environmental initiatives, etc. [17].

The extent, to which an educational hub is effective for the development of practical and professional competence in environmental safety, can be tested using the developed model (1), which contains three groups of indicators: personal and professional qualities (PPq); practical and technological skills (PTs); organizational and managerial skills (OMs).

$$EM_{PPc} = \sum_{i=1}^n I_{PPq} + I_{PTs} + I_{OMs}, \quad (1)$$

where I_{PPq} is an indicator of personal and professional qualities, which is a component of professional and practical competence. This indicator includes social and personal, corporate, communicative, creative competences;

I_{PTs} – an indicator of practical and technological skills that are part of professional and practical competence. This indicator includes system – integrated, information and technological, production and technological, analytic, evaluative and predictive, design and technological competences;

I_{OMs} – is an indicator of organizational and managerial skills, which are a component of professional and practical competence. This indicator includes managerial, organizational and coordinating, organizational and practical, organizational and methodological competences.

Each indicator is calculated separately, taking into account the coefficient of development (C_d), the coefficient of ergonomics and career growth (C_{ecg}) [1].

The development coefficient of professional and practical competence of environmental safety specialists is higher because they have experience in the field. An important component of their development in accordance with the purpose and objectives of the educational hub is analytical and practical one, as well as personal professional qualities, including the desire for self-education, self-development and self-improvement. For personal and professional qualities, the specified coefficient is 2.0; organizational and managerial skills – 1.5; practical and technological – 2.5.

The coefficient of ergonomics and career development of professional and practical competence of environmental safety specialists is determined, taking into account the needs of hub members, the new qualifications necessary for the improvement in terms of career growth. The most important are personal and professional qualities, the criterion of which is – 3.0; for practical and technological skills – 2.5; organizational and managerial – 2.0.

Developed models for assessing the formation of professional and practical competences of environmental safety specialists take into account a set of qualities, knowledge, skills that are different, according to the levels of the National Qualifications Framework. The models contain coefficients of complexity of formation (or development) and coefficients of professional demand (ergonomics and career) in professional activities.

Educational hubs are often used in the training and professional development of professionals; but the main stages of its implementation are not understood. This study is aimed at the formation of professional competencies of specialists in environmental safety, but the main stages of the educational hub can be used in training specialists of other fields. The model of assessing the formation of professional and practical competencies of environmental safety professionals allows to assess the effectiveness of the educational hub as well as to identify the priority components of professional and practical competence, which will be the basis for further research.

7. Conclusions

1. The analysis of professional and practical competence of environmental safety specialists by integral,

general and special components has been made. The problem of formation and development of professional and practical competence of environmental safety specialists in lifelong learning is updated in view of constantly changing requirements for environmental safety at the enterprise and territory of its influence.

2. The methodology of implementing an educational hub in the process of training environmental safety specialists, which is aimed at forming their professional and practical competencies has been created. Four stages of implementation of the educational hub and its content have been determined. The effectiveness of the implemented educational hub is proved by enabling the customers of educational services to create more complex educational and scientific as well as professional and practical products through exchange and cooperation, taking into account the collective integrated experience of professional activity.

3. A model for assessing the formation of professional and practical competencies of environmental safety specialists by indicators that include personal and professional qualities, practical and technological, organizational and managerial skills, that will test the effectiveness of the educational hub implementation, has been created

References

1. Stratehiia staloho rozvytku «Ukraina – 2020» (2015). Ukazo Prezydenta Ukrainy No. 5/2015. 12.01.2015. Available at: <https://zakon.rada.gov.ua/laws/show/5/2015#Text>
2. Pro okhoronu navkolyshnoho pryrodnoho seredovyscha (1991). Zakon Ukrainy No. 1264-XII. 25.06.1991. Available at: <https://zakon.rada.gov.ua/laws/show/1264-12#Text>
3. Pro vnesennia zmin do Polozhennia pro poriadok zdiisnennia innovatsiinoi osvitynoi diialnosti (2017). Nakaz Ministerstva osvity i nauky Ukrainy No. 994. 11.07.2017. Available at: <https://zakon.rada.gov.ua/laws/show/z1171-17#Text> Last accessed: 04.08.2020
4. Standart vyshchoi osvity za spetsialnistiu 183 «Tekhnolohii zakhystu navkolyshnoho seredovyscha» haluzi znan 18 «Vyrobnystvo ta tekhnolohii» dlia pershoho (bakalavrskoho) rivnia vyshchoi osvity No. 1241. 13.11.2018 (2018). Available at: <https://mon.gov.ua/ua/osvita/visha-osvita/naukovo-metodichna-rada-ministerstva-osvity-i-nauki-ukrayini/zatverdzeni-standarti-vishoyi-osvity>
5. Standart vyshchoi osvity za spetsialnistiu 183 «Tekhnolohii zakhystu navkolyshnoho seredovyscha» haluzi znan 18 «Vyrobnystvo ta tekhnolohii» dlia drugoho (mahisterskoho) rivnia vyshchoi osvity No. 378. 04.03.2020 (2020). Available at: <https://mon.gov.ua/storage/app/media/vishcha-osvita/zatverdzeni%20standarty/2020/03/183-technology-zachisty-seredovisa-M.pdf>
6. Artomov, I. V. (Ed.) (2015). Innovatsii u vyshchii osviti: hlosarii terminiv i poniat. Uzhhorod: PP «AUTDOR – ShARK», 160.
7. Ohienko, O. I. (Ed.) (2016). Innovatsiina diialnist vchytelia. Kyiv: NAPN Ukrainy, 120.
8. Natsionalnyi osvityno-naukovyi hlosarii (2018). Kyiv: TOV «KONVI PRINT», 524.
9. Pearce, J. (2019). Teaching Science by Encouraging Innovation in Appropriate Technologies for Sustainable Development. Available at: <https://hal.archives-ouvertes.fr/hal-02120521>
10. Tolochko, S. (2020). Teacher-innovator as an organizer of educational activity in the conditions of student-centered teaching. *Academic Notes Series Pedagogical Science*, 189, 79–84. doi: <http://doi.org/10.36550/2415-7988-2020-1-189-79-84>
11. Kraus, N. M., Kraus, K. M., Kryvoruchko, O. S. (2017). Osvitni innovatsiini khaby: teoretychni kontent ta pozytyvni ochikuvannia yikh funktsionuvannia. *Strategic Systems in Management*. Madrid: EDEX, 78–86.
12. Nait, Dzh. (2015). Obrazovatelnie khabi: kto vkladaivaet sredstva v iikh razvytye? *Mezhdunarodnoe vishee obrazovanye*, 79, 8–10.
13. Goodman, J. (2015). Library, community campus, learning hub: the community educational development challenge. *The Australian Library Journal*, 64 (3), 217–223. doi: <http://doi.org/10.1080/00049670.2015.1041218>
14. Knight, J. (2018). *International Education Hubs. Knowledge and Space*. Springer Nature, 637–655. doi: http://doi.org/10.1007/978-3-319-75593-9_21
15. Bordiug, N. (2017). Role of interdisciplinary integration in the formation of professional competence in future ecologists. *ScienceRise: Pedagogical Education*, 4 (12), 26–30. doi: <http://doi.org/10.15587/2519-4984.2017.100185>
16. Tolochko, S. V., Shkodyn, A. (2017). Formuvannia ekolohichnoi kompetentnosti studentiv ahrotekhnichnykh spetsialnostei VNZ. *Ekolohichni nauky*, 18-19, 165–172.
17. Bordiug, N., Rashchenko, A., Les, T. (2020). Workshop as a method of training future experts in techogenic and environmental safety. *ScienceRise: Pedagogical Education*, 3 (36), 38–41. doi: <http://doi.org/10.15587/2519-4984.2020.200263>
18. Tolochko, S., Lyman, V. (2016). Innovation aspects of the postindustrial society. *Trends in Education*, 9 (1), 253–258. doi: <http://doi.org/10.5507/tvv.2016.037>
19. Sivarajah, R. T., Curci, N. E., Johnson, E. M., Lam, D. L., Lee, J. T., Richardson, M. L. (2019). A Review of Innovative Teaching Methods. *Academic Radiology*, 26 (1), 101–113. doi: <http://doi.org/10.1016/j.acra.2018.03.025>

20. Subramanian, D. V., Kelly, P. (2019). Effects of introducing innovative teaching methods in engineering classes: A case study on classes in an Indian university. *Computer Applications in Engineering Education*, 27 (1), 183–193. doi: <http://doi.org/10.1002/cae.22067>
21. Orazbayeva, K. (2016). Professional Competence of Teachers in the Age of Globalization. *International Journal of Environmental & Science Education*, 11 (9), 2659–2672.
22. Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., Slykhuis, D. A. (2017). Teacher Educator Technology Competencies. *Jl. of Technology and Teacher Education*, 25 (4), 413–448.
23. Suyudi, M., Suyatno, S., Rahmatullah, A. S., Rachmawati, Y., Hariyati, N. (2022). The Effect of Instructional Leadership and Creative Teaching on Student Actualization: Student Satisfaction as a Mediator Variable. *International Journal of Instruction*, 15 (1), 113–134. doi: <http://doi.org/10.29333/iji.2022.1517a>
24. Xhomara, N. (2022). Critical thinking: student-centred teaching approach and personalised learning, as well as previous education achievements, contribute to critical thinking skills of students. *International Journal of Learning and Change*, 14 (1), 101–120. doi: <http://doi.org/10.1504/ijlc.2022.119513>
25. Ouh, E. L., Irawan, Y. (2019). Applying case-based learning for a postgraduate software architecture course. *Annual Conference on Innovation and Technology in Computer Science Education, ITiCSE*, 457–463. doi: <http://doi.org/10.1145/3304221.3319737>
26. Pérez-Sanagustín, M., Kotorov, I., Teixeira, A., Mansilla, F., Broisin, J., Alario-Hoyos, C. et. al. (2022). A Competency Framework for Teaching and Learning Innovation Centers for the 21st Century: Anticipating the Post-COVID-19 Age. *Electronics*, 11 (3), 413. doi: <http://doi.org/10.3390/electronics11030413>
27. Maslov, Y. V., Pypenko, I. S., Melnyk, Y. B. (2021). The Impact of COVID Pandemic Consequences on Public Demand for Competence Formation in Humanitarian Education. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, 13 (4). doi: <http://doi.org/10.21659/rupkatha.v13n4.26>
28. Medina Rivilla, A., Ruiz-Cabezas, A., Pérez Navío, E., Medina Domínguez, M. C. (2019). Diagnóstico de un programa de formación de docentes en competencias para el primer año de universidad. *Aula Abierta*, 48 (2), 239–250. doi: <http://doi.org/10.17811/rifie.48.2.2019.239-250>
29. Bordiug, N. (2019). Criteria and formation levels of professional competences of specialists of the nature protection branch in ecological monitoring. *ScienceRise: Pedagogical Education*, 4 (31), 4–7. doi: <http://doi.org/10.15587/2519-4984.2019.174106>

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