PEDAGOGICAL SCIENCES

TRANSFORMATION OF "INDUSTRIE 4.0" CHALLENGES INTO THE POSSIBILITY OF PROFESSIONAL DEVELOPMENT OF A MEDICAL REPRESENTATIVE

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ТРАНСФОРМАЦІЯ ВИКЛИКІВ INDUSTRIE 4.0 У МОЖЛИВОСТІ ПРОФЕСІЙНОГО РОЗВИТКУ МЕДИЧНОГО ПРЕДСТАВНИКА

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Abstract

The concept of "Industrie 4.0" was analyzed from the standpoint of the professional education development. The influence of "Industrie 4.0" on the sociocultural space through the introduction of digital technologies, which determines the development of human potential, was highlighted. The necessity of transformation of the content of professional training of medical representatives into pharmaceutical companies on the basis of the principle of human-centeredness, professional mobility and continuous development was substantiated as well.

Анотація

Проаналізовано концепцію «Industrie 4.0» з позицій розвитку професійної освіти. Висвітлено вплив Industrie 4.0 на соціокультурний простір через запровадження цифрових технологій, що зумовлюючи розвиток людського потенціалу. Обґрунтована необхідність трансформації змісту професійного навчання медичних представників у фармацевтичних компаніях на основі принципу людиноцентризму, професійної мобільності та неперервного розвитку.

Keywords: professional development, medical representative, lifelong learning, training in pharmaceutical companies, Industrie 4.0.

Ключові слова: *професійний розвиток, медичний представник, неперервне навчання, навчання в фармацевтичних компаніях, Industrie 4.0.*

The movement of Ukraine towards the implementation of the global initiative "Industrie 4.0" is becoming more active day by day, which, according to scientists, is characterized by a merger of technologies that blurs the lines between the physical, digital and biological spheres [1]. The major statement during the World Economic Forum was: "There are three reasons why today's transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope, and systems impact. The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance" [1].

Thus, modern changes in various sectors of economy are characterized by speed, scale and exponentiality, which, of course, are reflected in social processes and cause the transformation of hard skills and soft skills in the professional activities of many specialists. Accordingly, the professional education system faces two main challenges. Among them:

- automation, robotics and using of artificial intelligence in all spheres of human activity, like business, government and private life;

- elimination of spatial and temporal barriers in communication: between people, between people and machines, between machines and machines due to the use of various mobile devices and applications with unprecedented processing power, storage capacity and unlimited access to knowledge [2].

The impact of the global initiative's implementation "Industrie 4.0" on the development of the lifelong learning is being studied by scientists from around the world in different contexts and during the long period of time. Thus, in the works of D. Bell, U. Beck, J. Galbraith, R. Nureyev, A.J. Toynbee, A. Toffler, R. Trenton. M. Friedman, Yo.F. Fukuyama, O.A.G. Spengler the impact of post-industrial economy on society is widely covered. The scientists: Yu. Bazhal, H.R. Varian, V. Hassler, V. Heyets, S. Dyatlov, S. Ilyashenko, V. Inozemtsev are still studying theoretical and applied aspects of network information society, network economy and knowledge economy. The problem of the "Industrie 4.0" influence on postgraduate education was raised in the scientific works of V. Babaev, O. Brusentsova, K. Korpela, N. Kliasen, O. Ryabova, L. Syhyda and others. However, the question of the transformational processes impact, that is constantly occurring in modern society in the context of "Industrie 4.0", on the development of professional competence of medical representatives, remains out of the attention of researchers.

The aim of the study is to analyze the concept of "Industrie 4.0" and to determine its impact on the professional development of medical professionals.

Currently, a number of elements that make up a holistic system and allow to develop the concept of "Industrie 4.0" are identified in the scientific literature: Internet of things, artificial intelligence, machine learning and robotics, cloud computing, Big Data, additive manufacturing, cybersecurity, integration system, modeling, augmented reality. In our opinion, it is worth paying attention to the conclusions of researchers of rapidly changing processes associated with these innovations of the 21st century and to highlight the main postulates:

"Industrie 4.0" should be considered as an extremely complex and systemic phenomenon;

the dissection of "Industrie 4.0" into the separate components, omitting the dialectical connection between them, which, in fact, creates an explosive synergetic revolutionary effect, is a mistake [2];

the development of each element leads to the development of new hard skills and soft skills within the specialists, as well as non-existent professions in various sectors of the economy.

To understand the role and place of the professionals' training, we turned to the production model, developed according to the German concept of "Industrie 4.0". This model is based on the Cyber-Physical System (CPS), which consists of various natural objects, artificial subsystems and operating controllers. From a technical point of view, CPSs are formed from three types of networks: the Internet of people, the Internet of things, and the Internet of services. It should be borne in mind that the CPS performs the functions of ensuring the close communication and coordination between computing and physical resources. In terms of the "Industrie 4.0" concept, it is a question of purpose for the Cyber-Physical System implementation at the state level. Although, the possibility of its using at the separate enterprise level is not excluded as well. For "Industrie 4.0", the key point is to create an infrastructure based on three types of integration: horizontal integration of the structural business model - value networks; end-to-end digital integration of production processes; vertical digital integration of engineering throughout the whole structure of the business model [2]. It should be also noted that scholars consider "Industrie 4.0" in a broad sociocultural aspect, not just technical and economic. This approach is based on the fact that the fourth technological revolution provides a new level of production efficiency and additional income based on the introduced digital technologies, the formation of network interaction between suppliers and partners, as well as the implementation of innovative business models. At the same time it facilitates the development of human potential and transformation of various types of professional activity.

Returning to the topic of our study, one should note that the profession of medical representative in European countries is not new, but at this stage it acquires new meanings as being a part of the logistics' business philosophy of a pharmaceutical company in the implementation of information logistics for coordinated interaction, organization and integration of information flows for management decisions. Modern productions create a powerful information infrastructure, use advanced information technologies, cloud services, etc. At the same time, the intensification of information technology implementation in various sectors of the economy (e.g., medicine and pharmacy) as well as in education is observed during the quarantine period for COVID-19, which "affects society not only directly - through the spread of computers, but, first of all, indirectly – through the forced high pace of life, which sometimes leads to dramatic changes in all spheres of human activity" [3, p.5]. These two factors (transition to "Industrie 4.0" and quarantine period for COVID-19) in common problematize the further development of "traditional professional education within the understanding of its adequacy to sociocultural reality and changing world, including innovations in labor and educational services" [4, p.167]. A new order for innovation in education has become evident; especially it concerns the lifelong learning. It should be noted that among the 6 key factors that contribute to the sustainable development of Europe-2030, the first place is occupied by the factor "education, training, science, technology, research, innovation and digitalization" [5]. It is planned to continue the work on ensuring fair quality education and providing opportunities for all types of education - formal, non-formal, informal. It is expected that by 2030 the current trends will consist in increasing the level of education among the young people and there will be a structural transformation of labor markets, demographic change and reform of educational policy in European countries. Labor markets are projected to provoke more active participation in adult education and training. People will be able to get validation of the skills they develop outside of formal education and training. The connection between learning and work will grow, cooperation with business and civil society will become closer, the development of educational programs at all levels of education will be actualized in the context of sustainable development [6, p.77]. Thus, the main emphasis in the social and economic policy of European countries will be on human development and its talents, social and economic policy will be in solidarity, and the sustainable development of the EU will be accompanied by the integration of various sciences.

According to the results of the analysis of a number of domestic scientific works, provided by (V. Andrushchenko, M. Artiushyna, V. Bykov, V. Kremen, L. Lukyanova, V. Oliynyk, G. Romanova, L. Sergeeva, T. Sorochan, etc.) and foreign ones provided by (P.G. Altbach, L. Reisberg, L.E. Rumbley, P. Maassen, N. Cloete, P. Uetela, etc.) scientists, we identified the main factors in the development of education in a globalized world. These primarily include information, communication and digital technologies, the introduction of which leads to further modernization of logistical and scientific-methodological support of professional training. Thus, in the field of medical education it is represented by: the transformation of methodological provisions (concepts, principles and scientific approaches) of teaching, requirements for the quality of education; encourages the search for certification and integration mechanisms in line with the European Qualifications

Framework, coordination of regional needs and setting priorities based on standards, best practices and expectations at the national and international levels. In this context, I. Yushchik-Rygalo emphasizes that openness to "mastering of the ideas of modern education is carried out through the development of network technologies, which can be represented in the form of the following schemes: Web 1.0 – one-way transmission: search and read information; Web 2.0 is an interactive communication: cooperation and knowledge creation; Web 3.0 - digital technologies (in the field of information exchange): coexistence in a network of professionals and amateurs" [3, p.5]. This information infrastructure has a significant impact on the educational process both in educational institutions of any type and in production.

It should be noted that it is not possible to build and maintain communication with consumers of pharmaceutical products without the use of various devices (computers, tablets, smartphones, etc.). Business software, various gadgets with the access to Internet and telecommunications, in particular in medicine, need constant updating. Thus, the accumulation of information, the creation of an analytical database, their processing are carried out using software, which in pharmaceutical companies are being updated constantly. Thus, the formation and further development throughout life of such "soft" competencies as informational, communicational and intercultural is a requirement of time in professional training. Proficiency in this field should be considered as an important key performance indicator (KPI) of the professional activity of the medical representative that ensures the achievement of success.

Regarding the state policy in the field of pharmaceuticals, it is necessary to emphasize the expediency of taking into account global trends and encouraging the development and implementation of innovative technologies. Experts predict that changes in the pharmaceutical market will occur as a result of the influence of so-called "drivers" and "limiters". At the same time, drivers include: population growth, which will be accompanied by an increase of life expectancy; rising living standards in developed countries and the development of medicine there; increasing the role of human capital (respectively, increasing health care costs), the development of new technologies. Analysts suggest that the limiting factors will be: slowing the growth of the world economy, strengthening state control of drugs, increasing competition in the pharmaceutical market, the active development of preventive medicine [7, p.313] and the quarantine measures those are currently applied around the world.

Obviously, these trends have an impact on the development of the domestic pharmaceutical market, and, accordingly, affect the promotion of medicines. Today, among the activities of medical representatives we can observe the trends that correlate with the main "drivers" and "limiters" in the pharmaceutical market: reducing the effectiveness of visits to the doctor and the development of measures in order to increase this efficiency; restrictions on the activities of medical representatives concerning the time and place (outside working hours and outside the workplace); encouragement of doctors (gifts and other forms of material encouragement), etc.; restrictions on advertising of medicines; use of computer (tablet) during the visit; growth of the interactive part of the information and analysis of visits; increase of out-of-visit means of promotion of medicines among the doctors, first of all via the Internet; reducing the influence of doctors on the decision-making process and increasing the role of other participants in the process - distributors and pharmacies, "payers", patients; orientation, focused in promotion not only on doctors, but also on patients: patient oriented approach; growing popularity of electronic forms of medical representatives training [8, p.37].

The organization of medical representatives during the quarantine period for COVID-19 has become a kind of test for readiness to work remotely: increased the number of "telephone visits" to doctors and pharmacists. The content and technology of such visits are slightly different from those, conducted in normal mode; remote meetings; organization of remote conferences, round tables, consultations for doctors, pharmacists and patients (for example, those, who suffers from diabetes). Accordingly, it requires a change of emphasis in the content of training of medical representatives, and hence, the development of new trainings (the art of negotiation using mobile phones/smartphones; consulting by using cloud services; search, processing and analysis of information, preparation of presentations, lectures, videos, promotional products, monitoring of medicine sales, etc.).

In the context of this narrative, let us turn to the characteristics of virtual reality in which the modern medical representative works. According to V. Demchenko, it is characterized by the "feature of the five I": intensity, interactivity, immersiveness, illustrativeness, intuitiveness [9, p.109]. According to O. Dzioban, it is worth paying attention to such features as nonlinearity and synergy: the disappearance of spatial and temporal boundaries, interstate borders, the promotion of new values, patterns of behavior, worldview stereotypes. Undoubtedly, this affects the type of human thinking - all subjects of the pharmaceutical market. It "becomes mythological, acquires great imagery, including ambiguity, metaphor. The phenomenon of virtualization of the living space of man and society characterizes a fundamentally new type of symbolic existence of man, society, culture" [10, p.168]. The behavior of an individual is determined by his understanding of the situation and contexts with which he faces "wandering the vast space of the network of the virtual world" [11, p. 168]. Admittedly, today these features of the sociocultural space simulacrization and forced immersion into the virtual world due to the widespread use of the Internet today are not yet realized by the managers or by the medical representatives of pharmaceutical companies, which affects business planning and training.

The reflection of these world transformations is taken into account in the educational policy of European countries. The Fifth Bologna Forum in Paris (2018) initiated a global political dialogue on two common issues - social integration and the broader civic role of higher education. It is also emphasized that

higher education increases the prospects of employment and stimulates the activity of citizens in democratic societies and provides all learners with opportunities for lifelong learning [12, p.2]. The Ministers of Education of all European countries have recognized and declared that the lifelong learning "is becoming increasingly important for societies and economies, as well as for the well-being of our citizens", and now "it's time to add cooperation to innovative teaching and learning methods" [12, p.5]. The development of the practice of human-centered learning and open education, educational programs with the provision of various teaching methods and flexible learning, which can promote social mobility and continuing professional development. Particular attention is paid to the supporting of interdisciplinary programs that combine academic and in-service training aimed at actions related to research and innovation at all levels of higher education, which will promote critical and creative approaches in finding new solutions to emerging problems. Thus, improving the synergy between education, research and innovation is one of the most important principles in training for different sectors of the economy. One of the most pronounced trends is digitalization, which plays its important role in all spheres of society. "Its potential to transform higher education and training people at different stages of their lives" is difficult to overestimate. It is widely acknowledged that sectors of the economy that "use digital technologies are growing faster, cheaper and better. Areas of life, including education, medicine, transport, which are modernized through digital technologies, are becoming much more efficient and create new value and quality" [13].

The contextual approach to the prospects of active digitalization of professional activities of medical representatives in the pharmaceutical market in the nearest future indicates the relevance of the development of skills in the use of medical information and analytical data posted on a full-fledged digital medical platform. After all, the digitalization of medical and related services, as well as the interaction of operators in this field is a reality today. The digital medical platform, which is considered as a "dynamic set of systematized electronic data on the health status of an individual patient", carries out "information exchange between participants in the process of production and consumption of medical services" [13].

Conclusions. The results of the concept of "Industrie 4.0" analysis from the standpoint of the development of professional education indicate its spread among the different countries, which is characterized by the different rates. This global initiative aims to merge technologies that blur the boundaries between the physical, digital and biological spheres. This is an extremely complex and systemic phenomenon, dissected into the separate components that have a dialectical connection and at the same time creates an explosive synergetic revolutionary effect, causes the development of new hard skills and soft skills in specialists, as well as the emergence of non-existent professions in various sectors. In "Industrie 4.0", the infrastructure is created on the basis of three types of integration: horizontal integration of the structural business model - value networks; end-to-end digital integration of engineering and the vertical integration of the internal production chain of the enterprise throughout the structure of the business model. Each of these types of integration combined with elements of "Industrie 4.0" (Internet of Things, Artificial Intelligence, Machine Learning and Robotics, Cloud Computing, Big Data, Additive Manufacturing, Cybersecurity, Integration System, Simulation, Augmented Reality) as a holistic system can serve as a theoretical basis for transformation and further development of both hard skills and soft skills of the professionals.

It was found out, that "Industrie 4.0" influences the sociocultural space through the introduction of digital technologies, formation of networking of suppliers and partners, the implementation of innovative business models, providing a new level of production efficiency and additional income, while determining human development. It was also found out that the further development of vocational education should be adequate to the sociocultural reality, the speed of processes in the socioeconomic and technical spheres, the scale and exponentiality of the changing world, including changes in labor and educational services caused by two main factors - transition to "Industrie 4.0" and the quarantine period for COVID-19. In this regard, the profession of medical representative acquires new meanings: its logistical function in the business philosophy of the pharmaceutical company is changing. There are growing requirements for information and analytical competence, the ability of the specialist to carry out information logistics for the coordinated interaction of structural units of the enterprise/organization, medicine promotion entities and the integration of information flows for managerial decisions. Relevant changes should take place in the content of training of medical representatives directly in pharmaceutical companies, the selection of which should be carried out on the basis of the principle of human-centeredness, professional mobility and continuous development. Systemic, interdisciplinary, innovative, informational, synergetic, and contextual approaches should be used to develop the curricula. Among the most appropriate forms of professional development of specialists are open and distance education with using digital and interactive learning technologies.

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CONTROL OF STUDENTS KNOWLEDGE USING TEST TECHNOLOGIES

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КОНТРОЛЬ ЗНАНИЙ СТУДЕНТОВ С ИСПОЛЬЗОВАНИЕМ ТЕСТОВЫХ ТЕХНОЛОГИЙ

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Abstract
The aim of the article is to optimize the educational process of higher education through the use of information technologies in the form of a testing program.

Аннотация
Целью статьи является оптимизация учебного процесса высшей школы с помощью применения информационных технологий в виде программы тестирования.

Keywords: exam, test, testing program, quality of training, educational process, quality of education.
Ключевые слова: экзамен, тест, программа тестирования, качество обучения, учебный процесс, качество образования.

При оценке знаний студентов применяются различные формы контроля знаний [1, 2, 3], письменные и устные экзамены, промежуточный контроль знаний в семестре, а также тестирование.

Сделав анализ различных программ тестирования, используемых на факультете механизации за последние пять лет мы остановились на комплексе тестирования "Тест-экзаменатор".

Функциональные возможности комплекса позволяют:

– одновременное тестирование до 20 студентов;

– передача данных по протоколу TCP/IP;

– хранение всех результатов тестирования в единой базе данных;

– создание списка студентов и групп, редактирование этих данных;

– настройка параметров тестирования, редактирование вопросов и ключей;

– ввод и изменение информации по дисциплинам, учебным периодам, экзаменам, оценкам, критериям оценки знаний;

– возможность детального анализа результатов тестирования с просмотром заданных вопросов и полученных ответов;

– генерирование матриц билетов в формате Word для проведения тестирования без использования вычислительных средств;

– генерирование экзаменационных ведомостей в формате Word для любой выбранной группы.

Комплекс тестирования состоит из "Сервера тест-экзаменатора" (рис. 1) и рабочего места студента (рис. 2).