

Modernization of Natural Science Education in the Context of Teacher Training

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Abstract: The article states about the personal readiness of future psychologists to use the latest interactive and information technologies in order to improve natural science training in the framework of the integrative acquisition of professional competencies. For this purpose, the expediency of post-non-classical integration of the humanitarian and natural components in the field of psychology was investigated, the relevance of Coworking, BarCamp, and Workshop technologies was reasoned. The readiness of future psychologists to use these technologies after passing advanced training of scientific and scientific pedagogical personnel abroad has been studied using sociological methods. The purpose of the article is to clarify the presence of personal motivation for innovative, integrative, interactive and informational improvement of professional natural science competencies aiming to improve the transformational processes of higher education in Ukraine. A theoretical analysis of the modern natural-scientific training of future psychologists with the identification of promising aspects and a sociological analysis (survey) were chosen as research methods. The analysis showed the need for personal awareness and interactive and information-oriented education. The result of sociological research is the manifestation of divergence between the understanding of the need to use information and communication technologies and mainly personal obstacles to their use. The international significance of the article lies in the fact that its conclusions can be used in modeling innovative conditions for the advanced training of teachers of natural sciences in the countries of “late democracies”.

Keywords *future psychologists; self-development and professional development of teachers; internship; application of Coworking, BarCamp and Workshop technologies; application of SMART and BYOD technologies.*

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1. Introduction

The modernization of the natural science training of future psychologists in higher education institutions is under the pressure of dynamic changes in the labor market, which requires comprehensively developed specialists who can quickly adapt to its domestic and global expanses, and also requires the expansion of the information space in the field of natural sciences. Such modernization cannot be successfully completed without constant self-development and professional improvement of teachers who carry out this type of training.

The experience of cooperation of the authors of the article with the student community and practicing psychologists testifies: the majority of teachers of natural sciences hold to an opinion that improving their qualifications will lead to an improvement in the quality of natural science training of future psychologists.

In this context, we also considered it appropriate to analyze the opinions of Ukrainian scientists on the impact of advanced training on the quality of their professional activities. V.V. Oliynyk (2010, p. 90), believes that for the training of a modern highly qualified, comprehensively and harmoniously developed future specialist, "the training of a teacher of a higher education institution should be of a forward-looking nature": "Any pedagogical ideas, innovations and reforms can be introduced into educational practice only if they are perceived and corresponding changes in the professional consciousness and behavior of the teacher" (Oliynyk, 2010, p. 90). And in light of the fact that for majority of teachers the main barriers in professional activity are the lack of a system of knowledge about the principles of introducing innovative educational technologies, lack of knowledge of foreign languages, not possession, or even shyness to use modern information and communication technologies, the presence of certain stereotypes in thinking, we note : these statements are confirmed by the results of our survey of teachers.

We understand that the modernization of the natural-scientific training of future psychologists is constantly exposed to dynamic changes in the labor market, which requires comprehensively developed specialists who are able to quickly adapt to its domestic and global expanses (Gerasymova et al., 2019; Maksymchuk et al., 2020a; Maksymchuk et al., 2020b; Melnyk et al., 2019; Nerubasska & Maksymchuk, 2020; Nerubasska et al., 2020; Onishchuk et al., 2020; Palamarchuk et al., 2020; Sheremet et al., 2019). Also, the development of the information space in the field of natural

sciences cannot be successfully completed without constant self-development and professional improvement of teachers who carry out this type of training (Moroz, 2014; Myronchuk, 2013). In addition, the hypothesis of the study is the thesis: Ukrainian teachers who took part in an internship in Western European countries can become exactly the people who will introduce integrative information and communication ideas for transforming national education in the current context.

The purpose of the article is to determine the destructive aspects of the readiness of advanced training of natural sciences teachers using information and interactive technologies; to confirm the ideas of the expediency of such training aiming to improve their ability to demonstrate professional orientation and functional multivector nature of the natural-scientific training of future psychologists. For this purpose, we conducted a survey of teachers of higher educational institutions who took part in an international internship. The text of the questionnaire was developed by us. The propedeutic goal is to preliminarily prove the importance of integrative teaching in the humanities and natural sciences. Argumentation of the synergy of such integration with the methods of organizing an integrative, interactive information space for the exchange of experience and the generation of new knowledge in the process of discourse.

76 teachers of four institutions of higher education of Ukraine took part in the survey, among them: 27 teachers of the National Pedagogical University named after M.P. Drahomanov, 19 - from the State Institution "South Ukrainian National Pedagogical University named after K.D. Ushinsky », 16 - from East European National University named after Lesya Ukrainka and 14 teachers of National University« Chernihiv Collegium » named after Taras Shevchenko. Such a sample of teachers is due to our own experience gained in the course of repeated advanced training, internships in natural and pedagogical fields at the Krakow Pedagogical University (n.d.), as well as in the international programs "ERASMUS +", "PROM", "Podwójny Dyplom-Double Degree".

The following research methods were chosen: generalization of the integrative expediency of teaching the natural sciences for psychologists by analyzing and synthesizing the latest trends (based on the study of foreign methodological sources); the expediency of the correlativeness of the integrative study of the natural and human sciences in the context of information-interactive dialogue with the help of ICT (this was proved by conducting epistemological and methodological analogiessociological methods (survey) of teachers with basic experience of such a dialogue, as

well as their willingness to introduce integrative information-interactive training of psychologists in Ukrainian conditions.

The ethics of the research lies in the informed participation in the sociological survey and the written consent of the teachers of psychology of the above universities, their desire to share pedagogical problems that have formed on the contradictions of domestic and foreign experience.

2. Integrity of psychological and natural aspects and tools for their improvement

The need for a holistic humanistic and at the same time natural-scientific description of a person's personality in modern psychology was proven back in the early 1960s. The destructive divergence between the humanities and natural sciences in the concept of human psychology was overcome: "We believe that it is impossible to study the whole person by examining only his individual parts. We cannot understand the nature of personality through a limited analysis of learning, motivation, language, complex of attitudes and values, folk traditions and customs of the community" (Bonner, 1961). It was found that the dynamic and complete pattern of the personality should be studied both in a social context and in connection with neurophysiological natural laws.

Recently, in order to clarify the current situation, needs and prospects in the training of psychological and pedagogical personnel, which corresponds to the modern holistic interdisciplinary paradigm, monitoring and sociological research are being carried out in many countries. Thus, a sociological survey which focused on self-esteem demonstrates: the natural training of humanitarian specialists, which is de facto below the expected competencies (Febrianis et al., 2014). In addition, practicing educators have found sensitivity and readiness to improve such training through ICT, reforming the principles of teaching in integrated science, updating discussion and research work in the classroom, and even developing new curricula.

In order to find out the readiness and needs of future psychologists for natural science research activities, a similar study was carried out. It will foster creativity and the integration of natural sciences into psychological science through innovative technology (Bilyk, 2020). V. Bilyk's article also used a sociological survey, indicators of self-reflection and self-development, as well as professional and pedagogical motivation. The study was conducted in Ukraine, as in a post-colonial state, which requires a deeper introduction of advanced learning technologies. The study revealed a positive motivation

and a high need for students to introduce the latest informational and interactive training conditions.

In modern neuropsychological discourse, the neurobiological connections of a person with the external environment are proved at the experimental level. In particular, biomarkers such as allostatic loads, the activity of the autonomic nervous system, the specificity of the hypothalamic-pituitary function indicate the adaptive processes of the peripheral nervous system occurring in cultural and social processes (Doane et al., 2018). Therefore, neurobiology becomes "cultural" because it avouches the correlative nature of the natural and cultural environment.

Modern trends of the integration of natural and anthropological sciences are determined by the nature of discursive psychology and even psychiatry. The main question of such integration is: "What are biological processes in relation to cultural diversity and global political and economic contexts?" (Kirmayer, 2006). According to L. Kirmayer, promising directions are the multitasking of psychology, the recognition of the social and personal determinism of psychological processes, the "culture of biology"(2006, p. 126). These new challenges are related to some humanitarian irony, which can be overcome by the self-critical consciousness of specialists, their flexibility and readiness to provide humane assistance in changed contexts.

D. Crews believes that biology and psychology "meet" in the space of definition of human phenotypic plasticity. At the same time, the internal context and the environment cause different phenotypic results (2003). The behavior of adults is determined by phenotypic flexibility and psychobiology of personal development, manifests itself in sexuality, the degree of aggressiveness and vital activity in general. Elucidation of the balance between biological and social requires discussion and in-depth study of personality ontogenesis. This requires significant discussions and consultations at the level of psychological training and practice, and at the level of professional development - as much interactive and mutual professional communication as possible. Moreover, both in general patterns and at the level of individual clinical cases.

Therefore, at this stage of the study, we believe that in the mode of actual discourse, the integrity of natural and anthropological sciences, when such knowledge arises, is determined by the corresponding integrity. The arguments regarding the appropriateness of specific interactive technologies of interdisciplinary educational discourse are given below.

At the moment, the most common is Coworking technology. Scientists note that in Ukraine "Coworking technologies" are innovative and

educational content in higher education. The integrative essence of the natural and humanitarian training of future psychologists requires a Coworking space. This is the innovative and educational content of electronic Coworking as a method of relevant interdisciplinary analysis, successful socialization, minimization of time and economic resources, expansion of business partnerships, mutual assistance and a comfortable atmosphere (Ganicheva et al., 2020). Coworking is now viewed as a virtual cluster with all educational products attached to it, where a basic platform for educational content is created. As part of our research focused on integrative improvement of psychological and natural science competence, coworking can be a design and modeling environment, chat conversations, questionnaires, mathematical methods for processing results (quantitative and qualitative analysis of research results) (Ganicheva et al., 2020).

In our opinion, Coworking technologies correlate directly with the integrative nature of knowledge acquisition, their exchange and discussion in live discourse. R. Bunken justifies the organization of university Coworking spaces as those that will help build an integrated concept of the work of universities, enterprises and public structures, the expectation of new services and products (2018). This interaction is based on the formation of spontaneous new communities, their international character (absence of barriers), free "flow of knowledge", awakening of "self-efficacy, inspiration and autonomy" (Bouncken, 2018, p. 38). Within the Coworking space, inter-scientific, social and inter-institutional integrity contributes to their synergy and a new type of self-management of knowledge and their practical application. In our opinion, it is relevant to study the readiness of Ukrainian scientists who have acquired such international experience to form a Coworking space on the territory of postcolonial education.

The new intra- and interdisciplinary scientific-practical communication BarCamp complements the pattern. Even in Western scientific discourse, this is a fairly new phenomenon. Its essence lies in a spontaneously organized online conversation or virtual meeting "where everyone can contribute by formulating a relevant topic and generating discussion" (Azzimonti et al., 2015). Numerous experiments are now taking place in European universities, where the validity of BarCamp technologies for obtaining, transferring and qualitative discussion of statistical knowledge is confirmed. This can be useful for prognostics, identifying latent zones of development, the possibility of including various specialists and involved persons in discussions.

In education in Russia and other post-Soviet republics, scientists studying the introduction of CHAT technologies (BarCamp, Unconference)

are still conducting pilot attempts to implement them. They argue: it is necessary to break stereotypes of institutional directive planning and introduce informal learning within the community (Martin & Bracken, 2013). Such technologies and an open approach should be a framework that defines the ways of understanding the process of collective learning, where there is no clear division into subjects and objects of education. This is the best way to understand the activity as a complex individual learning that has an equally important involvement in general learning. According to scientists, this method of learning and obtaining relevant knowledge overcomes psychological resistance, becomes meaningful and cultured. And the main thing is that their result is greater than the sum of the knowledge or achievements of individual persons. This refers to the "golden gain" effect: egalitarian education (even in the conditions of a deficit of neoliberalism) becomes "open source" for understanding previously unattainable nuances of a holistic vision of science, education and work experience internship.

In the aspect of their natural-scientific training, the propaedeutic study of the experience of integrative improvement of future psychologists makes it possible to single out workshop technologies as a special type of creative acquisition of new knowledge through new experience of independent or collective discoveries (Bulaeva et al., 2020). As for our subject of research, we assume that the "Pedagogical workshop" allows then and there to determine the problem, the algorithm of action and the essence of social, personal and natural in the formation of certain psychological phenomena. Creative activity is a much more effective method of integrative assimilation of interdisciplinary knowledge than ready-made theoretical material.

The involvement of pedagogical departments in this process contributes to the organization of technological and communication links between social needs, enterprises, educational institutions and "home scenarios" for the preparation and participation of personsK. Reilly predicts the possibility of an avalanche effect from the use of these technologies by teachers: "Since they understand disciplinary norms and can talk with their colleagues about the specific educational needs that these technologies can provide, then such technologically experienced teachers (hereinafter they are simply called classmates) may be interested in their colleagues in the use of such technologies. In turn, IT can introduce team faculty members, especially newcomers, to the range of technologies and resources supported on campus" (Reilly, 2005). This way it is possible to organize technologically informational initiatives that will be a resource for ensuring the integration of technologies, sciences and practices at the highest levels of society.

3. Studying the readiness of Ukrainian psychology students for natural science training using the latest integration interactive information technologies

We consider it appropriate to note that the process of advanced training of teachers of higher educational institutions of Ukraine is regulated by the Regulations on advanced training and training of pedagogical and scientific-pedagogical workers, which defines the procedure for advanced training and normalizes the procedure for the implementation of training of teachers and scientific-pedagogical workers of higher educational institutions (Ministry of Education and Science, Youth and Sports of Ukraine, 2013).

However, UNESCO (2020) experts point to the imperfection of domestic legislation in the field of professional development of scientific and pedagogical staff, due to the low level of its funding. First, we will consider specific trends in the discourse of modern Ukrainian methodologists.

A review of domestic literature on the issues of modern advanced training of scientific and scientific-pedagogical workers testifies: this form of educational work provides a deepening of previously acquired competence and contributes to the acquisition of new practical experience (Skakun, 2019, p. 80). This idea is appropriately elaborated by N.S. Bordyug: «internship as a form of implementation of advanced training contributes to the expansion of the specialist's worldview, the formation of new professional and practical competencies, strengthening of responsibility, initiative and independence» (2018, p. 62). As we can see, the domestic scientific discourse is moving towards the individualization of learning and learning throughout life.

V. Pansyryeva and V. & Monarkh summarizes the above: “the internship is a form of teacher education that provides their individual needs in acquiring certain knowledge and skills, professional and personal self-improvement, creates conditions for learning and learning about best practices, supports self-realization of the teacher's personality and development of connections between institutions of higher education» (2019, p. 239). An educational motivational resource for advanced training of psychologists in Ukraine is theoretically created, but the question remains open: are Ukrainian teachers ready to borrow innovative forms of acquiring professional competencies in an integrated information environment?.

We pay special attention to the practice of universities that directly exchange experience with Western European universities in order to improve the qualifications of teachers of higher educational institutions. Thus, the teaching staff of the Department of Medical, Biological and

Valeological Fundamentals of Life and Health Faculty of Pedagogy and Psychology named after M.P. Drahomanov, which provides natural science training for future psychologists, improves his skills in the field of natural and pedagogical sciences both in higher education institutions of Ukraine and abroad, in particular at the Krakow Pedagogical University named after the Commission of Public Education (Krakow, Poland). Similar activities are carried out by the East European National University named after Lesya Ukrainian and the National University "Chernihiv Collegium" named after Taras Shevchenko.

The sociological results of a survey of teachers of the above institutions on certain aspects of integrative interactive-informational training of psychologists are given below. Analysis of the teachers' answers to the first question of the questionnaire about the expediency of implementing natural science training of future psychologists in higher education institutions showed that 94% of respondents fully support the opinion about its expediency; 3.12% of the respondents recognize its expediency only in a small amount; 2.88% of respondents were undecided about the answer to the questionnaire, so they chose the option "I find it difficult to answer". Among the interviewed teachers, there were no those who recognized the need to carry out the natural science training of future psychologists in higher education institutions (Figure 1).

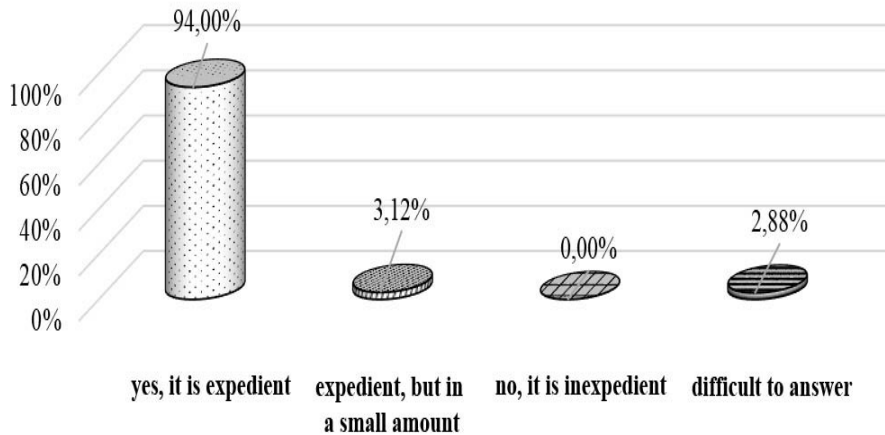


Figure 1. Distribution of teachers' answers on the expediency of carrying out natural science training of future psychologists in higher education institutions (%)
Source: Authors' own conception

This result of the basic question allows us to continue the search for the root causes of the lack of integration of such training in the universities of Ukraine. Thus, in the context of this study, we also consider it appropriate to find out the opinion of teachers on the factors that negatively affect the effectiveness of natural science training of future psychologists in higher education.

The results of the survey show that the reason for the low efficiency of natural science training of future psychologists in higher education institutions teachers attribute to: low motivation of student psychologists to study natural sciences (31.79% of respondents); low level of basic (school) natural science training of future psychologists - 12.56% of respondents; reduction of credit volume of natural science training in higher education institutions - 17.23% of teachers; reduction of the number of disciplines that provide natural science training for future psychologists in higher education institutions - 11.43% of respondents; lack of sufficient modern scientific and educational literature on natural science training - 9.87% of teachers; imperfection of material and technical support of natural science training - 14.64% of respondents; low motivation of teachers of natural sciences to modernize the natural science training of future psychologists in higher education - 2.48% of respondents (Figure 2).

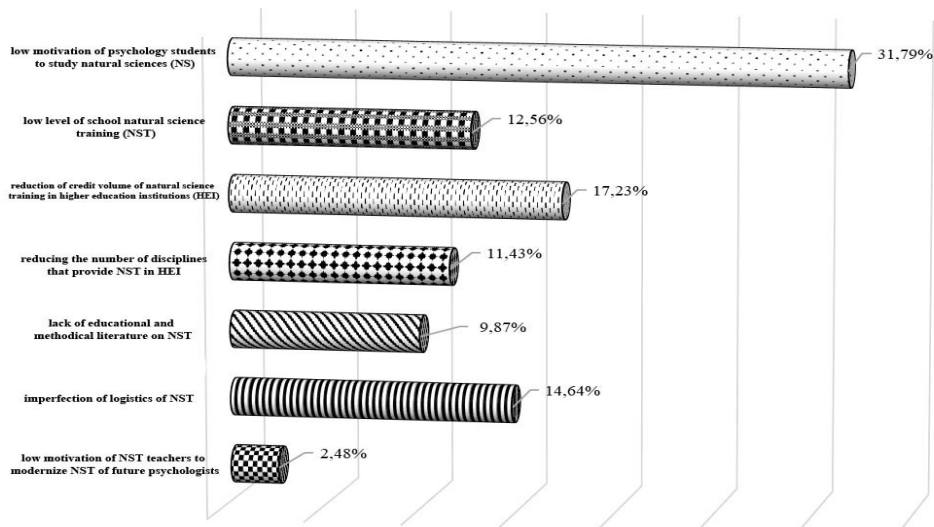


Figure 2. Distribution of teachers' answers on the factors that affect the effectiveness of natural science training of future psychologists in higher education institutions (%)

Source: Authors' own conception

The second question revealed the personal, methodological and administrative shortcomings of psychological education in Ukraine. We need not only international scientific and methodological experience to overcome them, but also a deep transformation of the principles of humanitarian education.

The next two questions of the questionnaire were aimed at finding out whether teachers of higher education institutions of Ukraine are acquainted with foreign experience of natural science training of future psychologists (question 3) and teachers' opinion on the relevance of modernization of natural science training of future psychologists in higher education institutions of Ukraine (question 4) (Figure 3).

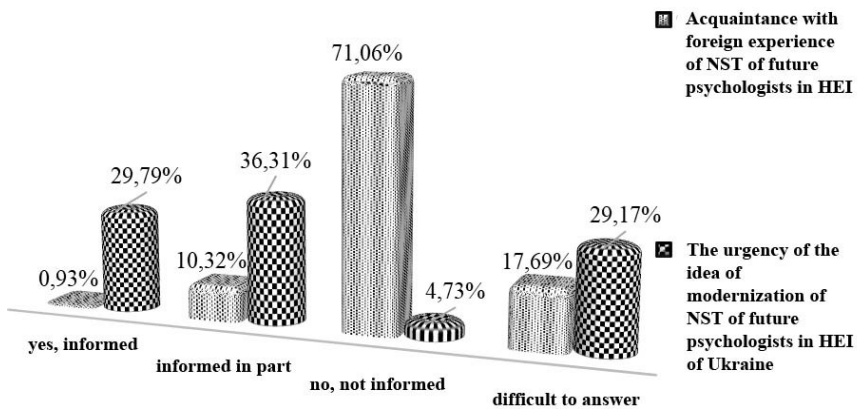


Figure. 3. Distribution of teachers' answers on acquaintance with foreign experience of natural science training of future psychologists and relevance of the idea of modernization of natural science training of future psychologists in higher education institutions of Ukraine (%)

Source: Authors' own conception

Quantitative analysis of the results gave grounds to state that only 0.93% of teachers gave a positive answer to get acquainted with foreign experience of natural science training of future psychologists and 29.79% of respondents acknowledge the relevance of the idea of modernization of natural science training of future psychologists in higher education in Ukraine; 10.32% of respondents indicate their partial acquaintance with the foreign experience of natural science training of future psychologists, and 36.31% partially support the relevance of the idea of modernization of natural science training of future psychologists in higher education institutions of Ukraine; 71.06% say that they are not completely informed

with the foreign experience of natural science training of future psychologists, and 4.73% do not consider the idea of modernization of natural science training of future psychologists in higher education institutions of Ukraine; 17.69% and 29.17% of respondents found it difficult to answer questions about familiarity with foreign experience of natural science training of future psychologists and the relevance of the idea of modernization of natural science training of future psychologists in higher education institutions of Ukraine (Fig. 4).

These results indicate that short-term internships generate interest, but do not lead to profound personal and systemic changes. Obviously, a solution to this problem must be sought in long-term measures in relation to domestic education. The latter should be aimed at deep motivation, readiness and need.

In the framework of our study it was also necessary to find out whether teachers are satisfied with the available educational and methodological literature on natural science training of future psychologists in higher education institutions and what contribution they make to its improvement (Figure 4).

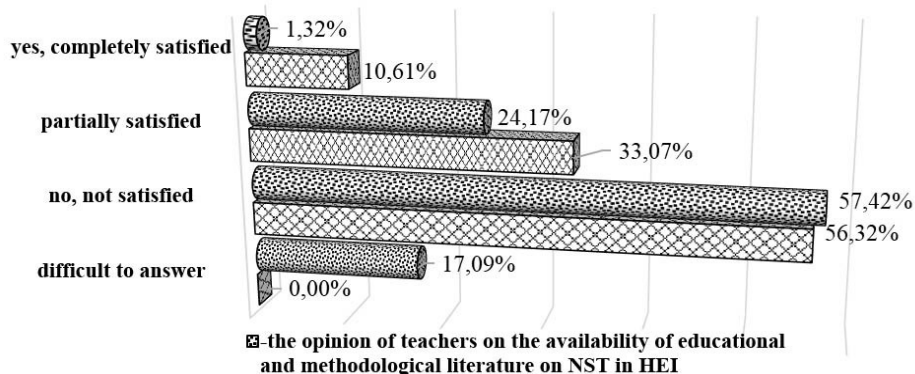


Figure 4. Distribution of teachers' answers on satisfaction with the available educational and methodical literature on natural science training of future psychologists in higher education institutions and their personal contribution to its development (%)

Source: Authors' own conception

From the data obtained after the survey of teachers, we state that: 1.32% of respondents are completely satisfied with the available educational and methodological literature on natural science training of future psychologists in higher education institutions; 24.17% of respondents are

partially satisfied with it; dissatisfied - 57.42%; unfortunately, a significant number of teachers (17.09%) chose the answer "difficult to answer". In addition, only 10.61% of surveyed teachers focus their efforts on developing their own textbooks, manuals and other resources for natural science training of future psychologists; 33.07% develop them irregularly, and 56.32% of respondents do not develop them at all (Fig. 5).

These data indicate the need to encourage personal participation in the development of methodological support. Moreover, the first place is given not to educational and methodological literature, but to the development of one's own pedagogical style and compact electronic manuals and guides to action.

It is well known that the success of any reforms largely depends on knowledge of the mechanism of their implementation. Therefore, our next task was to find out the opinion of teachers on the feasibility of changing the emphasis from traditional methods of teaching natural sciences to innovative (Figure 5).

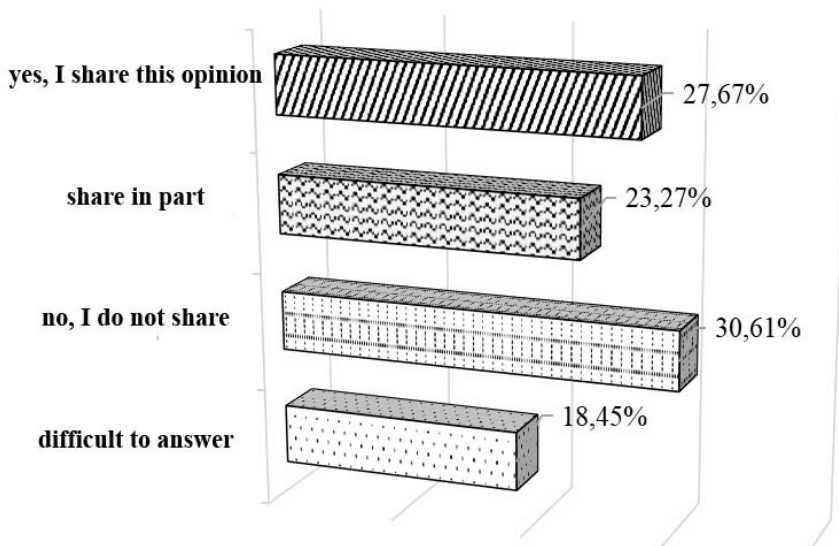


Figure 5. Distribution of teachers' answers on the expediency of changing the emphasis from traditional methods of teaching natural sciences to innovative (%)
Source: Authors' own conception

The analysis of teachers' answers showed that 27.67% of respondents fully share the opinion about the expediency of changing the emphasis from traditional methods of teaching natural sciences to innovative ones; 23.27% of respondents share it only partially; a large number of teachers (30.61%) are not aware of this need at all; 18.45% of those who did

not decide on the answer to the question. The results of teachers' answers to the previous question of the questionnaire prompted us to investigate whether teachers are familiar with the practice of Coworking, BarCamp and Workshop technologies in the educational process in higher education institutions. Analysis of the answers of the surveyed teachers regarding their acquaintance with the practice of Coworking technology allowed to state that 2.49% of respondents are fully informed with it; partially informed - 23.99%; not informed - 44.67%; and 28.85% of respondents found it difficult to answer the question (Figure 6).

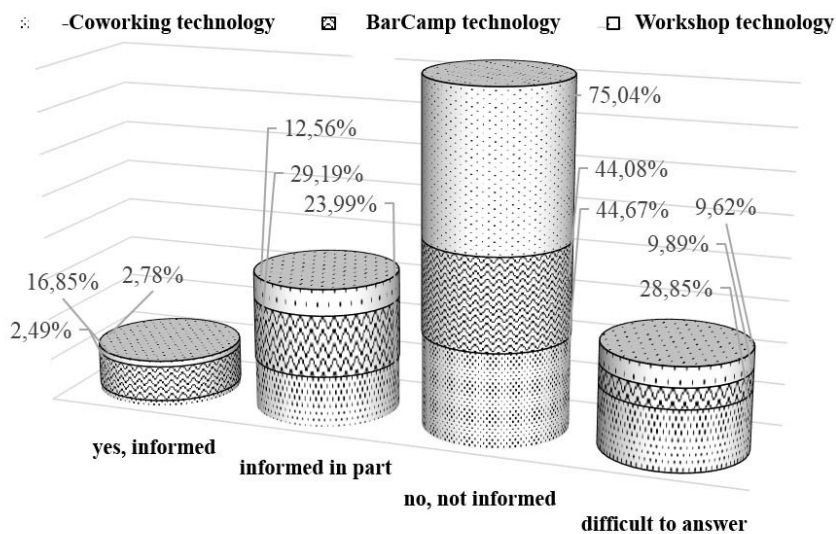


Figure 6. Distribution of teachers' answers on familiarity with the practice of Coworking, BarCamp and Workshop technologies in the educational process in higher education institutions (%)

Source: Authors' own conception

Teachers' answers about whether they are informed with the practice of using BarCamp technology showed that 16.85% of respondents are fully informed with it; partially informed - 29.19%; not informed - 44.08%; did not decide on the answer of 9.89% of respondents (Fig. 7). The results of the survey of teachers showed that 2.78% of respondents are fully informed with the practice of using Workshops in the educational process in higher education institutions; partially informed - 12.56% of respondents; not informed - 75.04%; did not decide on the answer 9.62% of respondents (Figure 7).

An analysis of teachers' answers about whether they use SMART and BYOD technologies in the process of natural science training of future

psychologists in higher education institutions, found that 41.44% are regularly using SMART technologies, and BYOD technologies - only 0.93% respondents; apply, but not regularly: SMART technologies - 49.66% of respondents, BYOD technologies - 18.37%; SMART technologies are not used - 8.90% of teachers, BYOD technologies - 80.70% (Figure 7).

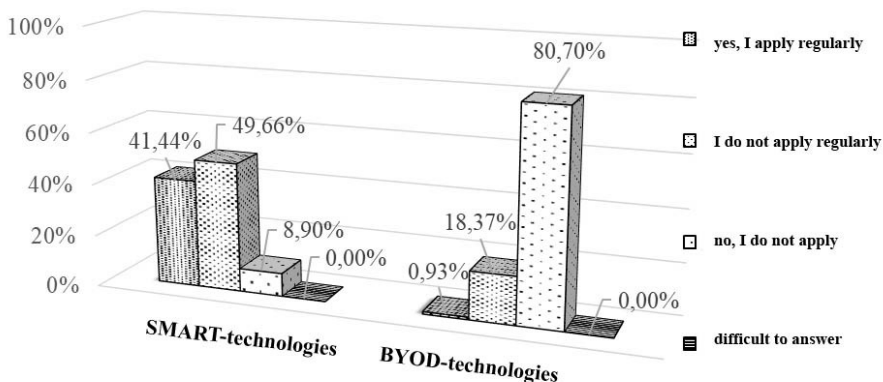


Fig. 7. Distribution of teachers' answers on the use of SMART and BYOD technologies in the process of natural science training of future psychologists in higher education institutions (%)
Source: Authors' own conception

The results of a survey of teachers on the use of video lectures and lecture-visualization in the process of natural science training of future psychologists in higher education institutions show that 2.24% of respondents regularly use video lectures and 30.71% - lecture-visualization; use, but not regularly - 20.08% of respondents video lecture and 42.40% - lecture-visualization; 77.68% of teachers do not use video lectures and 19.30% - lecture-visualization; 7.59% of respondents found it difficult to answer the question about the use of lecture-visualization in the process of natural science training of future psychologists in higher education institutions (Figure 8).

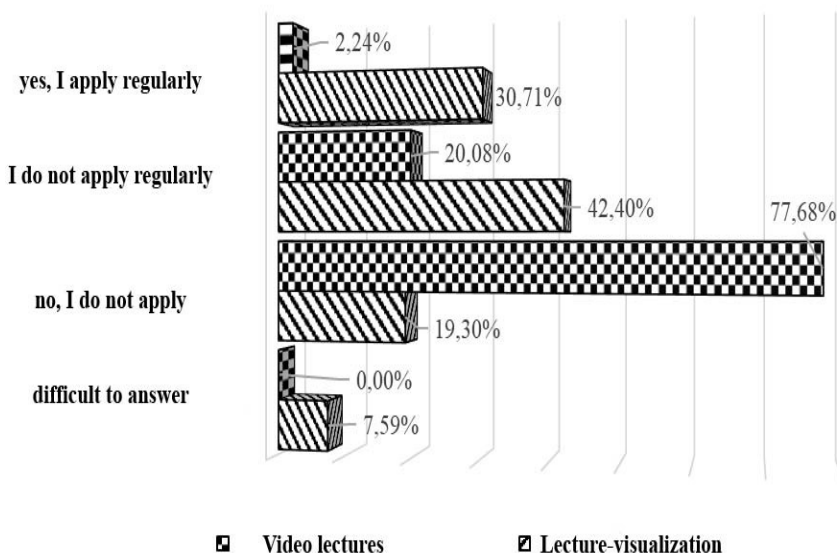


Figure 8. Distribution of teachers' answers on the use of lecture-visualization and video lectures in the process of natural science training of future psychologists in higher education institutions (%)
Source: Authors' own conception

The analysis of the results of the survey of teachers on whether they use problem-discussion and research methods in the process of natural science training of future psychologists in higher education institutions showed that 53.28% of respondents answered positively to the use of problem and discussion methods and 12.11% regarding the use of search and research methods; 28.98% and 31.91% of respondents do not regularly use problem and discussion and research methods, respectively; 2.63% of teachers do not use problem and discussion methods, and 31.23% do not use search and research methods; 15.11% of respondents did not decide on the answer to the question on the use of problem and discussion methods, and 24.75% on the use of search and research methods (Fig. 9).

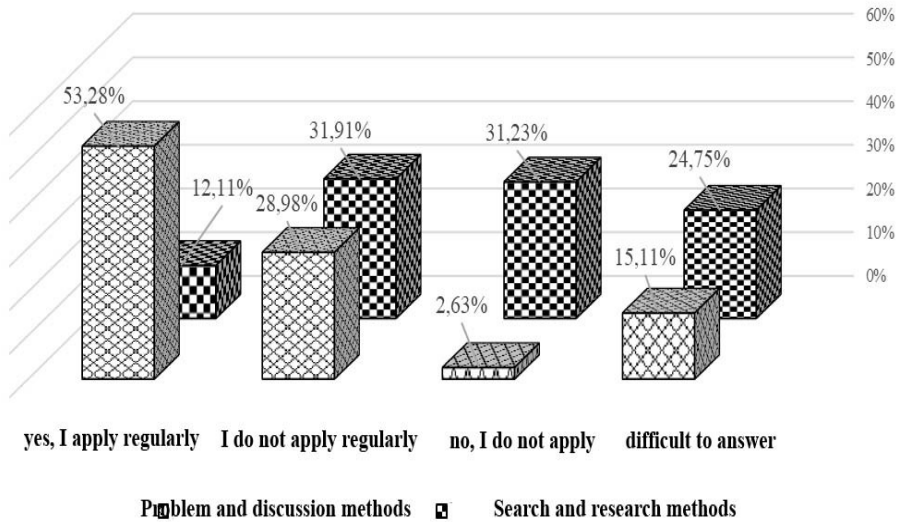


Figure 9. Distribution of teachers' answers on the use of problem and discussion and search and research methods in the process of natural science training of future psychologists in higher education institutions (%)

Source: Authors' own conception

In the context of representing teachers' answers to the previous question, we thought it appropriate to find out whether teachers are informed with the method of conducting "electronic brainstorming" and whether they use project-role play as a method of teaching future psychologists in natural sciences. The results of the study revealed that only 20% of respondents are informed with the method of conducting "electronic brainstorming" and 3.71% constantly use project-role play as a method of training future psychologists in natural sciences; 25.53% of the respondents are partially informed with the methodology of conducting "electronic brainstorming", and 14.18%, although not regularly, nevertheless use the design-role-playing game as a method of teaching future psychologists of natural science disciplines; not informed with the method of conducting "electronic brainstorming" and do not use the project-role-playing game as a method of teaching future psychologists of natural sciences 40.35% and 49.28% of teachers, respectively; 14.12% of respondents did not decide to answer the question about awareness with the method of conducting "electronic brainstorming", and 32.83% about the use of project-role play as a method of training future psychologists of natural sciences (Figures 10 and 11).

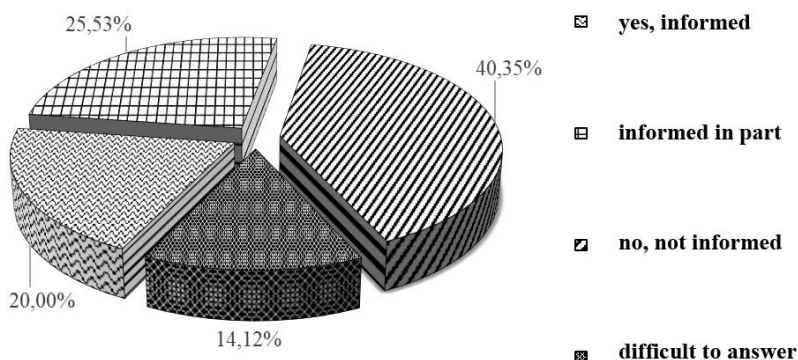


Figure 10. Distribution of teachers' answers on their familiarity with the method of "electronic brainstorming"
Source: Authors' own conception

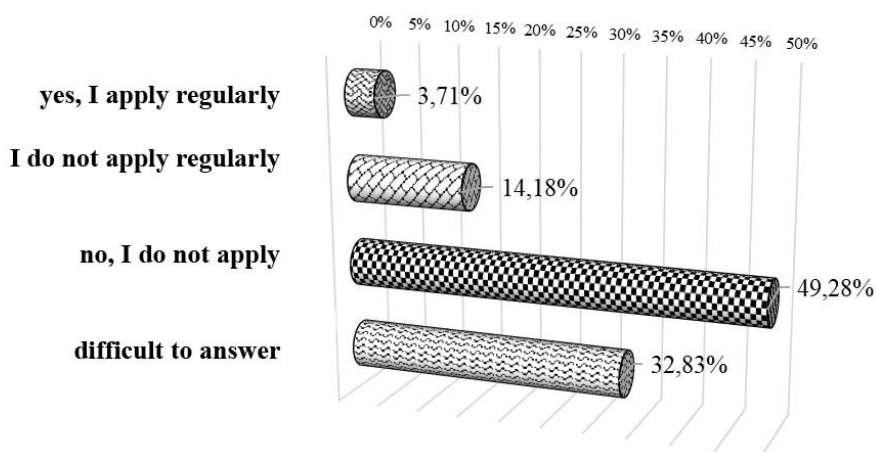


Figure 11. Distribution of teachers' answers on the use of project-role play as a method of teaching future psychologists of natural sciences (%)
Source: Authors' own conception

We believe that in the educational process a significant percentage of teachers are not familiar with the practice of using Coworking, BarCamp and Workshop technologies etc., which is a personal problem. Teachers of universities with a classical training program are accustomed to using traditional teaching tools, so they should make efforts to reformat the personality into an innovative vector.

To the question of the questionnaire "Do you think that professional development of teachers who provide natural science training for future

psychologists will improve its quality?", 84.61% of teachers gave a positive answer; 6.23% of respondents believe that teacher training can only partially affect the quality of training of future psychologists in higher education; among the respondents there were no those who do not support the idea of the need to improve the skills of teachers in order to improve the quality of training of future psychologists in higher education, but those who could not decide on the answer to the question - 9.16%.

The last question shows that teachers intuitively understand the effectiveness of the use of innovative technologies, but the contrast with the previous questions again brings us back to the personal flatness of personal obstacles.

The above theoretical generalizations and the unexpected result of a sociological survey allow us to make a number of conclusions, which are given below.

5. Conclusions

Theoretical generalization of the survey of higher education teachers who have gained experience in advanced training at the Krakow Pedagogical University, as well as in the international programs "ERASMUS +", "PROM", "Podwójny Dyplom-Double Degree", allow us to conclude about an intuitive or conscious sense of the need for innovation and integrity. However, it seems that this is not conducive to practical change yet.

For the transitional postcolonial system of training future psychologists, the main conclusions of the article contain contradictions. On the one hand, teachers who have fragmentarily received internship experience are aware of the need and effectiveness of advanced training through the integrative mastering of interdisciplinary experience through the use of innovative technologies. On the other hand, respondents found a conscious or unconscious unwillingness. It is explained by the following tendencies: a) methodological and administrative shortcomings of psychological education, it is delegated according to the "order" (administration) principle; b) lack of deep personal motivation for innovative educational activities; c) lack of professional readiness and the need for personal participation in the development of methodological support; d) stereotyped attachment to the use of traditional teaching aids.

We see the prospects for improving the qualifications of Ukrainian teachers of natural science disciplines in a change in the vector of methodological orientation (from directive administration by the Ministry of Education and Science to the delegation of powers to the localities), as well as any motivation for personal activity (motivation can be financial, career,

etc.). In our opinion, the feeling of being an autonomous subject outside the framework of a certain system is the main incentive resource. It provides for the personal responsibility and personal meaning of the teacher, who will direct this towards improving the implementation of professional competence and functional multivector nature of the natural-scientific training of future psychologists in the context of innovative opportunities.

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References

- Azzimonti, L., Cremona, M. A., Ghiglietti, A., Ieva, F., Menafoglio, A., Pini, A., & Zanini, P. (2015). BarCamp: Technology Foresight and Statistics for the Future. In *Advances in Complex Data Modeling and Computational Methods in Statistics* (pp. 53-67). Springer. https://doi.org/10.1007/978-3-319-11149-0_4
- Bilyk, V. (2020). Natural Science and Research Training of Future Psychologists for Health-Promoting Activities. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(2), 01-17. <https://doi.org/10.18662/rrem/12.2/262>
- Bonner, H. (1961). *Psychology of personality*. Ronald Press Company. <https://doi.org/10.1037/13143-000>
- Bordyug, N. S. (2018). Osoblyvosti stazhuvannya fakhivtsiv iz monitorynhu dovkillia v systemi pislyadyplomnoyi osvity [Peculiarities of internship of

- specialists in environmental monitoring in the system of postgraduate education]. *Scientific journal of the National Pedagogical University named after M.P. Drabomanov. Series Pedagogical sciences: realities and prospects*, 60(1), 62-65. <http://enpuir.npu.edu.ua/handle/123456789/23410>
- Bouncken, R. B. (2018). University coworking-spaces: Mechanisms, examples, and suggestions for entrepreneurial universities. *International Journal of Technology Management*, 77(1-3), 38-56. <https://doi.org/10.1504/IJTM.2018.091709>
- Bulaeva, M. N., Vaganova, O. I., Vorobyov, N. B., Chaikina, Z. V., & Shobonova, L. Y. (2020). Technology of Pedagogical Workshops in Professional Education. In *Growth Poles of the Global Economy: Emergence, Changes and Future Perspectives* (pp. 425-432). Springer. https://doi.org/10.1007/978-3-030-15160-7_43
- Crews, D. (2003). The development of phenotypic plasticity: where biology and psychology meet. *Developmental Psychobiology: The Journal of the International Society for Developmental Psychobiology*, 43(1), 1-10. <http://sites.utexas.edu/crewslab/files/2016/06/DevPhenoPlastic.pdf>
- Doane, L. D., Sladek, M. R., & Adam, E. K. (2018). An introduction to cultural neurobiology: Evidence from physiological stress systems. In J. M. Causadias, E. H. Telzer, & N. A. Gonzales (Eds.), *The handbook of culture and biology* (p. 227-254). John Wiley & Sons, Inc.
- Febrianis, I., Muljono, P., & Susanto, D. (2014). Pedagogical competence-based training needs analysis for natural science teachers. *Journal of Education and Learning*, 8(2), 144-151. <https://doi.org/10.11591/EDULEARN.V8I2.216>
- Ganicheva, A., Kaitov, A., Nikitina, E., Savenkova, T. D., & Riekkinen, A. M. (2020). Coworking As Innovative Educational Content in Modern Higher Education. In *SHS Web of Conferences*, 79, 02007. EDP Sciences. <https://doi.org/10.1051/shsconf/20207902007>
- Gerasymova, I., Maksymchuk, B., Bilozero,va, M., Chernetska, Yu., Matviichuk, T., Solovyov, V., & Maksymchuk, I. (2019). Forming professional mobility in future agricultural specialists: the sociohistorical context. *Revista Romaneasca pentru Educatie Multidimensionala*, 11 (4), 345-361. <https://doi.org/10.18662/rrem/195>
- Kirmayer, L. J. (2006). Beyond the 'new cross-cultural psychiatry': Cultural biology, discursive psychology and the ironies of globalization. *Transcultural psychiatry*, 43(1), 126-144. <https://doi.org/10.1177/1363461506061761>
- Maksymchuk, B., Gurevych, R., Matviichuk, T., Surovov, O., Stepanchenko, N., Opushko, N., Sitovskiy, A., Kosynskiy, E., Bogdanyuk, A., Vakoliuk, A., Solovyov, V., & Maksymchuk, I. (2020a). Training Future Teachers to Organize School Sport. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(4), 310-327. <https://doi.org/10.18662/rrem/12.4/347>

- Maksymchuk, B., Matviichuk, T., Solovyov, V., Davydenko, H., Soichuk, R., Khurtenko, O., Groshovenko, O., Stepanchenko, N., Andriychuk, Y., Grygorenko, T., Duka, T., Pidlypniak, I., Gurevych, R., Kuzmenko, V., & Maksymchuk, I. (2020b). Developing Healthcare Competency in Future Teachers. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(3), 24-43. <https://doi.org/10.18662/rrem/12.3/307>
- Martin, S. E., & Bracken, S. J. (2013). A CHAT-based Case Study of Informal Adult Learning and Technology: BarCamp, the Unconference. *Adult Education Research Conference*. <https://newprairiepress.org/aerc/2013/papers/30>
- Melnyk, N., Bidyuk, N., Kalenskyi, A., Maksymchuk, B., Bakhmat, N., Matviienko, O., Matviichuk, T., Solovyov, V., Golub, N., & Maksymchuk, I. (2019). Modely y orhanyzatsiyone osobyne profesyonalne obuke vaspytacha u pojedynym zemlyama Evropske Unyje y u Ukrayiny [Models and organizational characteristics of preschool teachers' professional training in some EU countries and Ukraine]. *Zbornik Instituta za pedagogska istrazivanja*, 51(1), 46-93. <https://ipisr.org.rs/images/pdf/zbornik-51/Natalija-Meljnik.pdf>
- Ministry of Education and Science, Youth and Sports of Ukraine. (2013). Regulations on advanced training and internships of pedagogical and scientific-pedagogical employees of higher educational institutions, 48, dated 24.01.2013. *Official Gazette of Ukraine*, 28, 328. <https://zakon.rada.gov.ua/laws/show/z0488-13#Text>
- Moroz, V. M. (2014). Mekhanizm orhanizatsiyi pidvyshchennya kvalifikatsiyi naukovo - pedahohichnykh pratsivnykiv yak ob"yekt derzhavnoho upravlinnya yakosti osvity [The mechanism of the organization of advanced training of scientific and pedagogical workers as object of the state management of quality of education]. *Scientific notes of the Institute of Legislation of the Verkhovna Rada of Ukraine*, 3, 107-113. http://www.irbis-nbu.gov.ua/cgi-bin/irbis_nbu/cgiirbis
- Myronchuk, N. M. (2013). Stazhuvannya yak forma pidvyshchennya kvalifikatsiyi pedahohichnykh i naukovo-pedahohichnykh pratsivnykiv [Internship as a form of professional development of pedagogical and scientific-pedagogical workers]. *Andragogical Bulletin*, 4, 64-69. <http://eprints.zu.edu.ua/12403/1/11.pdf>
- Nerubasska, A., & Maksymchuk, B. (2020). The demarkation of creativity, talent and genius in humans: a systemic aspect. *Postmodern Openings*, 11(2), 240–255. <https://doi.org/10.18662/po/11.2/172>
- Nerubasska, A., Palshkov, K., & Maksymchuk, B. (2020). A Systemic Philosophical Analysis of the Contemporary Society and the Human: New Potential. *Postmodern Openings*, 11(4), 275-292. <https://doi.org/10.18662/po/11.4/235>

- Oliynyk, V. V. (2010). Profesiynne udoskonalennya naukovo-pedahohichnykh pratsivnykiv: problemy ta shlyakhy vyrishennya. Problemy ta perspektyvy formuvannya natsional'noyi humanitarno-tekhnichnoyi elity [Professional improvement of scientific and pedagogical workers: problems and solutions. Problems and prospects of formation of the national humanitarian and technical elite]: a collection of scientific works. *National Technical University "Kharkiv Polytechnic Institute"*, 27(31), 1, 88-97. <http://repository.kpi.kharkov.ua/handle/KhPI-Press/11456>
- Onishchuk, I., Ikonnikova, M., Antonenko, T., Kharchenko, I., Shestakova, S., Kuzmenko, N., & Maksymchuk, B. (2020). Characteristics of Foreign Language Education in Foreign Countries and Ways of Applying Foreign Experience in Pedagogical Universities of Ukraine. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(3), 44-65. <https://doi.org/10.18662/rrem/12.3/308>
- Palamarchuk, O., Gurevych, R., Maksymchuk, B., Gerasymova, I., Fushtey, O., Logutina, N., Kalashnik, N., Kylivnyk, A., Haba, I., Matviichuk, T., Solovyov, V., & Maksymchuk, I. (2020). Studying Innovation as the Factor in Professional Self-Development of Specialists in Physical Education and Sport. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(4), 118-136. <https://doi.org/10.18662/rrem/12.4/337>
- Pantsyрева, G. V. & Monarkh, V. V. (2019). Stazhuvannya yak forma pidvyshchennya profesiynoyi maysternosti vykladacha zakladu vyshchoyi osvity. Sil's'ke hospodarstvo ta lisivnytstvo [Internship as a form of improving the professional skills of a teacher of higher education. Agriculture and forestry]. In *A collection of scientific papers Vinnytsia National Agrarian University*, 12, 234-243. <http://repository.vsau.org/getfile.php/20325.pdf>
- Pedagogical University of National Education commission in Krakow. (n.d.). *Schedule and plans*. Institute of Psychology. <https://ipsych.up.krakow.pl/studia/harmonogram-i-plany/>
- Reilly, C. (2005). Teaching by Example: A Case for Peer Workshops about Pedagogy and Technology. *Innovate: Journal of Online Education*, 1(3). <https://www.learntechlib.org/p/107301/>
- Sheremet, M., Leniv, Z., Loboda, V., & Maksymchuk, B. (2019) The development level of smart information criterion for specialists' readiness for inclusion implementation in education. *Information Technologies and Learning Tools*, 72, 273-285. <https://doi.org/10.33407/itlt.v72i4.2561>
- Skakun, S. (2019). Pravove rehulyuvannya stazhuvannya naukovykh i naukovopedahohichnykh pratsivnykiv [Legal regulation of internships of scientific and scientific-pedagogical workers]. *Entrepreneurship, economy and law*, 1(275), 80-83. <http://pgp-journal.kiev.ua/archive/2019/1/16.pdf>

UNESCO (2020). *Lifelong learning. Global Report on Adult Education and Education*.
UNESCO Institute. <http://www.lawinrussia.ru/kabinet-yurista/zakoni-inormativnie-akti/2010-0328/globalniy-otchet-po-obrazovaniyu-i-prosveshcheniyuvzroslih.html>