

СОЦІАЛЬНА ЕКОНОМІКА І ПОЛІТИКА. МІЖДИСЦИПЛІНАРНІ ДОСЛІДЖЕННЯ В ЕКОНОМІЦІ

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EDUCATIONAL LABOR IN THE DIGITAL KNOWLEDGE SOCIETY: INDEX METHODOLOGY FOR MONITORING AND RISK ASSESSMENT

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Abstract. *The article substantiates the need to develop methodological approaches to monitoring and assessing educational labor in the context of the digital transformation of the knowledge society and prolonged security challenges. The relevance of the study is driven by the changing content and organization of educational labor, the intensification of personnel imbalances, the uneven resource provision of educational systems in the regions of Ukraine, as well as the increasing demands for the digital and communication competence of pedagogical workers. The purpose of the study is to develop an index approach to monitoring the risks of educational labor development and to test it using the institutional dimension as an example. A system of interrelated indicators, their normalization using the min-max method, and aggregation into sub-indices have been proposed. The methodology was tested using official statistical and administrative data for the regions of Ukraine for 2024. The institutional sub-index is formed from four indicators that characterize the use of educational subvention funds, the structure of teaching positions, the ratio of personnel needs and the potential for reproducing pedagogical staff, as well as the personnel density of general secondary education institutions. The calculation results revealed significant interregional differentiation in the institutional provision of educational labor: among regions with a full set of data, the sub-index value varies from 0.315 to 0.733. Lviv region received a value of 0.630, ranking sixth among regions with complete data. It has been established that a high level of financial resource utilization does not guarantee a correspondingly high level of institutional provision of educational labor, as the result also depends on the personnel structure, personnel deficit, and the level of personnel density of the educational network. The study substantiates the value of an index-based approach as a tool for interregional*



monitoring and identifying imbalances in the development of educational labor. Prospects for further expansion of the indicator system through digital, socio-labor, information-communication, and psycho-emotional dimensions have been identified.

Keywords: *educational labor, digital knowledge society, risks, index methodology, institutional sub-index, personnel provision, educational subvention, regional differentiation, Ukraine.*

Problem statement. The digitalization of social life, the rapid development of artificial intelligence, the “platformization” of the education system infrastructure, and the transformation of the labor market are significantly changing the content, forms of organization, and conditions for the implementation of educational labor. Along with new technologies, attention is also drawn to the risks of organizing this type of economic activity (institutional, technological, socio-labor, information-communication, socio-cultural, psychological), which affect the quality of the educational process, the efficiency of human capital utilization, and the sustainability of the educational system’s development. Questions about the lack of effective tools for analyzing and evaluating the processes occurring in the educational sphere are arising more and more often. Under the current conditions, educational policy relies on indicators that do not always allow for the identification of deep transformations, the assessment of risk levels, or the forecasting of crisis trends. This problem has become particularly acute in the post-COVID period, in conditions of mass digitalization of education, distance learning, and changes in the nature of educational labor. Currently, existing approaches to assessing the state of educational labor continue to be based on the use of fragmentary statistical indicators that do not provide a comprehensive measurement of the risks of educational labor development in the conditions of a digital knowledge society. This limits the possibilities for timely identification of negative trends, interregional comparisons, forecasting the consequences of digital transformations, and the information-analytical support of management decisions in the field of educational policy. In this regard, the need to develop a monitoring concept for educational labor risks is becoming increasingly urgent. The essence lies in the application of an index method and approaches to the integral assessment of these risks as a tool for diagnostics, comparative analysis, and forecasting the processes of digital transformation of education.

Analysis of recent research and publications. The current stage of human capital research is characterized by a shift in scholars’ attention from viewing it as a factor of economic growth (ideas and works of G. Becker, T. Schultz, J. Mincer) to a strategic resource for digital transformation, innovative development, and post-war recovery of the country. This is a fairly new phenomenon in world scientific thought against the backdrop of progress and the deepening of knowledge in the field of advanced technologies. This is also happening in Ukrainian science. On one hand, the theoretical-methodological foundations of human capital formation, its reproduction, assessment, and development continue to be developed in the works of O. Grishnova [1], O. Herasymenko [2], V. Antoniuk et al. [3]. On the other hand, the subject of research increasingly concerns the digitalization of life, the modernization of education infrastructure, the needs for acquiring new skills, the development of an innovative economy, and social resilience, etc. Thus, O. Hrynkevych, U. Sadova, O. Soroachak [4] investigate the interconnections of education, skills, the labor market, and human capital in the context of digital transformations; O. Shulha - problems of human capital management in

the context of the sustainable development concept [5]; Yu. Zaloznova, V. Antoniuk - regional features of human capital reproduction in Ukraine in the conditions of war and post-war reconstruction [6]; N. Azmuk - the digital transformation of the labor market, employment, new forms of labor organization in the digital economy [7], and others.

It is shown that in recent studies of educational topics, in particular, when assessing the state and processes of human capital development, the use of methods of statistics, econometric analysis, modelling, bibliometrics, spatial analysis, and educational and digital analytics is actively practiced. This to some extent indicates a transition from descriptive models to a methodology of quantitative measurement and forecasting of the socio-economic transformations of this phenomenon. At the same time, an analysis of domestic research shows that the vast majority of works are focused on issues of human capital formation, quality of education assessment, diagnostics of digital competencies, labor market functioning, demographic losses, and post-war reconstruction of Ukraine. Much less developed are the methodological foundations of comprehensive monitoring of educational labor as an independent object of research, especially in the conditions of a digital knowledge society. There are practically no integral index tools that would allow for the simultaneous assessment of the level of digitalization of educational labor, its productivity, risks, socio-economic consequences, and impact on human capital reproduction, which constitutes the research niche addressed by this study.

Research Objective. The purpose of the article is to substantiate an index methodology for monitoring and assessing the risks of educational labor development in the conditions of a digital knowledge society, and to develop a system of indicators and an integral index for a comprehensive assessment of the risks of digital transformation of education.

Results. Monitoring of educational labor is interpreted as a continuous process of observation, assessment, and interpretation of changes in the system of educational activity, labor practices, and professional interaction of the subjects of the educational process. Its purpose lies both in recording the statistical parameters of the functioning of the education system and in the timely identification of trends and threats that affect the reproduction of human capital in education, the quality of labor potential, the motivation for pedagogical activity, the digital transformation of educational labor, the professional well-being of educators, and the effectiveness of the educational process. The correctness of such an approach is confirmed by a whole range of facts that concern not only the process of educational labor but also education as a phenomenon in general. Thus, depending on the purpose of the study, the monitoring concept regarding risks can relate to qualification gaps in workforce skills, motivational dysfunctions within the employment system, professional burnout of personnel, and problems of labor-potential reproduction, among others.

Notably, the need for monitoring risks in the system of organizing educational labor has been repeatedly emphasized by scientists of different generations (regarding the detrimental effects of the residual principle in financing education [8], low motivation for employment in education in the absence of wage reforms [9; 10], and failure to account for new requirements of education digitalization [11], particularly with respect to regional educational systems [12]). Unfortunately, these recommendations were not taken into account.

For example, attention is drawn to the results of a study on the topic “Formation of a new Ukrainian teacher” (UNESCO, 2025) [13], which indicate that currently in Ukraine, almost three-quarters (73.2%) of modern educators identify the low level of wages as the main reason for professional disappointment. It is also worrying that a fifth of pedagogical workers (21.8%) carry out pedagogical activities without appropriate qualifications. These factors are no longer just risks of deepening personnel imbalances and reducing the attractiveness of the teaching profession; they also contribute to a rapid decline in the quality of educational services, growing fragmentation and duality in the segmentation of educational labor, and an increase in secondary employment. Prolonged neglect of risks in the sphere of educational labor generates not only economic, institutional, and socio-demographic challenges, but also socio-cultural and value-based problems in the transformation of the Ukrainian educational community.

Consider another example: the psycho-emotional state of pedagogical workers. According to the results of a survey conducted within the framework of the “University Community ‘How are you?’” project, which is a component of the All-Ukrainian Mental Health Program “How are you?” supported by the Ministry of Education and Science of Ukraine [14] in 29 higher education institutions, medium and high levels of professional burnout are common among lecturers. This reflects the accumulation of psychological, emotional, and informational load caused by the digitalization of the educational process, the need for constant adaptation to new work formats, and the prolonged functioning of the education system under martial law.

In Ukraine, monitoring the risks of educational labor cannot be addressed without taking into account the consequences of the war. Thus, according to the data of the Ministry of Education and Science of Ukraine at the end of the 2024/2025 academic year, more than a third of Ukrainian students did not have the opportunity to study fully in person, and 11% received education exclusively in a distance format [15]. At the same time, UNICEF warned that the prolonged use of distance and blended learning is accompanied by educational losses, unequal access to digital resources, and the need for ongoing development of educators’ digital competencies [16]. With this organization’s support, more than 13,200 teachers underwent training in organizing distance learning in 2024, and almost 39,000 laptops were provided to students to ensure access to online education [17]. These actions are not only a means of ensuring continuity of learning but also a source of new professional requirements for teachers, often accompanied by an additional workload and growing digital inequality among pedagogical staff.

Taken together, these facts give grounds to assert that the organization of educational labor is a complex mechanism for coordinating the goals, means, tools, needs, and development prospects of a distinct type of human activity, in which a wide range of risks may arise (*institutional, technological, socio-labor, information-communication, socio-cultural, psychological*). These risks should be tracked, analyzed, assessed, and mitigated. In essence, managing changes in the sphere of educational labor requires a transition from traditional statistical indicators to *comprehensive monitoring of this sphere*, capable of integrating the assessment of conditions, results, and risks of educational activity and providing an information basis for the formation of effective state policy in the sphere of human capital development. In other words, an integrated approach to monitoring is needed, capable of

reflecting not only the current state but also the dynamics and interconnections of the processes that determine the development of educational labor.

The methodological basis for building the monitoring of educational labor risks is an index approach. It is capable of ensuring the integration of heterogeneous quantitative and qualitative indicators into a single assessment system. Combining official statistics, administrative data, sociological survey results, and expert assessments creates the conditions for identifying latent risks that are not reflected in traditional statistical reporting.

The proposed methodology involves the step-by-step formation of an integral assessment of educational labor risks: (1) formation of an information base; (2) verification of the completeness and consistency of statistical indicators; (3) normalization of primary indicators; (4) determination of sub-indices for individual components; and (5) integration of sub-indices into a single indicator of educational labor development. For indicators for which open statistical data are unavailable, the results of official nationwide monitoring studies or average values for Ukraine (with an appropriate methodological note) were used.

At the first stage, the selection of indicators is carried out according to the defined monitoring blocks. Ideally, when checking indicators, special emphasis should be placed on compliance with three criteria: each indicator has an official source; each indicator is published annually; each indicator characterizes educational labor itself, and not the education system as a whole. In Ukraine, under conditions of war, not all sectors or regions face the same security situation. Therefore, if there are deviations (or the absence of an indicator), this must be noted additionally. In our case, the following indicators were selected for the work:

- *institutional sub-index* (coefficient of execution of the plan for the use of the state educational subvention; share of teacher positions directly involved in teaching in the total number of pedagogical positions; number of students per general secondary education institution; number of teachers per general secondary education institution, persons);
- *technological sub-index* (number of students per computer; share of institutions connected to the Internet; share of institutions with broadband Internet; number of computers per 100 students);
- *socio-labor sub-index* (ratio of wages in education to the average level in the economy; share of pedagogical workers under 35 years old; share of pedagogical workers 60+ years old; share of education workers in the total structure of the employed);
- *information-communication sub-index* (share of households with Internet; share of residents who use the Internet; level of use of electronic public services by the population; share of enterprises that use information and communication technologies (ICT));
- *sociocultural sub-index* (level of population coverage with preschool education; number of higher education students per 10 thousand population; share of the population with higher education; number of professional pre-higher education students per 10 thousand population).

It is worth noting that, during the study, an attempt was made to include an additional sub-index in the calculation – the psychological one. However, this could not be done due to the lack of relevant indicators.

At the second stage, the completeness, territorial, and temporal consistency of statistical indicators are checked, after which their normalization is carried out to ensure comparability. Given the heterogeneity of information support for the regions of Ukraine under martial law, only those values that have a confirmed statistical or administrative source are included in the calculation. The absence of data due to military actions is not equated to a zero value and is marked as “n/a”.

To test the methodology, four indicators of the institutional block were used: the coefficient of use of educational subvention funds; the share of teacher positions directly involved in teaching in the total number of pedagogical positions; the ratio of the need for subject teachers and primary school teachers to the number of students in pedagogical specialties; and the number of teachers per general secondary education institution.

The type of each indicator – stimulator or destimulator – was determined depending on the nature of its impact on the institutional capacity of the educational system. The coefficient of use of the educational subvention, the share of teacher positions directly involved in teaching, and the number of teachers per general secondary education institution are considered as stimulator indicators. In contrast, the ratio of personnel needs to the number of students in pedagogical specialties is a destimulator indicator, since its growth indicates an increase in personnel shortages relative to the potential resource for reproducing pedagogical personnel.

To ensure the comparability of indicators, the linear min-max normalization method was applied. For stimulator indicators, the normalized value is determined by the formula:

$$z_{ij} = \frac{X_{ij} - X_j^{\min}}{X_j^{\max} - X_j^{\min}},$$

for destimulator indicators:

$$z_{ij} = \frac{X_j^{\max} - X_{ij}}{X_j^{\max} - X_j^{\min}},$$

here – is the actual value of the indicator j for the region i ; and – respectively, the minimum and maximum value of the indicator among the regions included in the calculation; z_{ij} – its normalized value in the interval from 0 to 1.

The “Ukraine” value is used as a national benchmark for interpreting results, but is not included in the determination of minimum and maximum values during interregional normalization. Regions for which data for a specific indicator are missing due to military restrictions on statistical observation are not automatically excluded from the analysis, however, the corresponding indicator does not participate in the calculation of their sub-index.

For testing purposes, the four indicators were assigned equal weights. The institutional sub-index is defined as the arithmetic mean of the normalized values:

$$I_{ins} = \frac{1}{4} \sum_{j=1}^4 Z_j$$

Thus, the sub-index value ranges from 0 to 1 and reflects the relative position of a region based on the aggregate characteristics of the institutional support for educational labor.

We now present the results of the institutional sub-index calculation – understood as an institution’s ability to create conditions, provide resources, rules, and support that enable educational labor to be performed efficiently, stably, and effectively (Tables 1 and 2).

Table 1

**Indicators of the institutional sub-index of risks
in the development of educational labor [18; 19]**

Code	Indicator	Type
I1.1	Coefficient of utilization of educational subvention funds	stimulator
I1.2	Share of teaching positions directly involved in instruction in the total number of pedagogical positions, %	stimulator
I1.3	Ratio of the need for subject teachers and primary school teachers to the number of students in pedagogical specialties, %	destimulator
I1.4	Number of teachers per general secondary education institution, persons	stimulator

Table 2

**Normalized values of indicators and the institutional sub-index of risks of educational labor
by regions of Ukraine in 2024**

Region	I1.1	I1.2	I1.3	I1.4	I _{ins}
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Volyn	0,984	0,576	0,923	0,450	0,733
Sumy	0,868	0,637	0,851	0,300	0,664
Chernivtsi	1,000	0,363	0,690	0,550	0,651
Ivano-Frankivsk	0,965	0,211	0,774	0,650	0,650
m. Kyiv	0,119	0,613	0,792	1,000	0,631
Lviv	0,927	0,553	0,638	0,400	0,630
Cherkasy	0,766	0,430	1,000	0,300	0,624
Ternopil	0,992	0,373	0,986	0,100	0,613
Chernihiv	0,949	0,406	0,809	0,200	0,591
Rivne	0,946	0,142	0,707	0,500	0,574
Vinnysia	0,809	0,318	0,792	0,350	0,567
Kirovohrad	0,962	0,309	0,356	0,550	0,544
Poltava	0,810	0,195	0,917	0,250	0,543
Khmelnyskyi	0,905	0,148	0,767	0,300	0,530
Zakarpattia	0,925	0,059	0,732	0,400	0,529
Kharkiv	0,419	1,000	0,277	0,400	0,524
Kyiv	0,615	0,385	0,487	0,500	0,497
Dnipropetrovsk	0,630	0,594	0,314	0,400	0,484

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Odesa	0,644	0,559	0,236	0,450	0,472
Zhytomyr	0,923	0,000	0,663	0,300	0,471
Zaporizhzhia	0,000	0,210	0,707	0,400	0,329
Mykolaiv	0,800	0,460	0,000	0,000	0,315

Note: Donetsk, Luhansk, and Kherson regions are not included in the comparative series due to the lack of data for I1.3, caused by military restrictions on statistical observation. Ukraine is used as a national benchmark and is not included in the min-max normalization procedure.

Results of the institutional sub-index calculation. The results of the institutional sub-index calculation demonstrated significant differentiation of Ukraine's regions in terms of the capacity of educational institutions to provide proper conditions for the functioning of educational labor. The sub-index value among regions with a full data set varies from 0.315 in Mykolaiv region to 0.733 in Volyn region. Such variability indicates the heterogeneity of regional educational systems' financial capacity, as well as their organizational and staff-reproduction capacity.

The highest institutional sub-index values were obtained for Volyn (0.733), Sumy (0.664), Chernivtsi (0.651), and Ivano-Frankivsk (0.650) regions. The high positions of these regions are formed primarily by a combination of a sufficiently high level of educational subvention utilization, relatively low staffing needs compared to the potential resource for training teaching staff, and sufficient staffing density of general secondary education institutions.

Lviv region ranks sixth among regions with full data, with an institutional sub-index value of 0.630. The region is characterized by a high level of educational subvention fund utilization: the corresponding normalized value is 0.927. The share of teacher positions directly involved in teaching provides a normalized value of 0.553, while the ratio of the need for teachers to the number of students in pedagogical specialties forms a value of 0.638. The number of teachers per general secondary education institution is 31, which corresponds to a normalized value of 0.400.

The configuration of indicators obtained for the Lviv region is illustrative: a region's high financial capacity does not automatically translate into a correspondingly high value of the integral characteristic of institutional support for educational labor. Relatively lower values of staffing density of institutions and the structure of teaching positions partially negate the positive impact of the financial indicator. This confirms the value of a comprehensive, rather than a one-dimensional, assessment of the institutional conditions of educational labor.

The lowest sub-index values among regions with full data are observed in Mykolaiv (0.315), Zaporizhzhia (0.329), Zhytomyr (0.471), and Odesa (0.472) regions. Their lower positions are caused by different combinations of factors, which confirms the need to analyze not only the integral sub-index value but also the structure of its components. In particular, the Mykolaiv region is characterized by the highest ratio of staffing needs to the number of students in pedagogical specialties (7.73%) among available regions and, at the same time, the lowest number of teachers per general secondary education institution (23 persons).

At the same time, the obtained results should not be interpreted as an absolute assessment of the quality of work of educational institutions. The institutional sub-index reflects the relative position of regions within the constructed indicator space. Its analytical value lies primarily in identifying regional imbalances and determining those components of educational labor that require additional management intervention.

Territories for which statistical observations were limited due to military actions require separate consideration. For Donetsk, Luhansk, and Kherson regions, the absence of a value for the staffing-need indicator is not treated as zero need. The corresponding values are marked as “n/a”, which prevents an artificial improvement in these regions’ rankings due to statistical incompleteness. Such an approach is fundamentally important for monitoring educational labor in wartime conditions.

The testing conducted demonstrates that the index approach makes it possible to shift the assessment of institutional risks in educational labor development from fragmentary analysis of individual statistical characteristics to comprehensive interregional comparison. Importantly, the obtained result is shaped by indicators that differ in economic nature – financial, organizational, and personnel-reproduction indicators.

The calculation showed that a high level of budget resource utilization is not a sufficient condition for high institutional capacity. To ensure the sustainability of educational labor, it is necessary to simultaneously maintain a proper staffing structure, sufficient staffing density of educational institutions, and the capacity of the system to reproduce pedagogical potential. It is the combination of these characteristics that makes it possible to identify hidden imbalances that a single indicator would not capture.

The obtained results also confirm the need to consider institutional risk in the territorial dimension. Differences between regions can be caused not only by the volume of available financial resources but also by the peculiarities of staffing, the structure of the educational network, demographic processes, and the conditions of the educational system’s functioning under martial law.

At the same time, the testing revealed the limitations of the current statistical base. For some regions – primarily territories that have experienced the greatest impact of military actions – individual indicators are unavailable. This justifies the need for further development of the educational labor monitoring system, in particular by combining state statistics, administrative data, EDEBO (Unified State Electronic Database on Education) data, and special monitoring studies.

Conclusions and prospects for further research. The conducted research showed that the digital transformation of education changes not only the technological characteristics of the educational process but also the conditions, structure, and organization of educational labor. This necessitates a transition from fragmentary statistical observation to comprehensive risk monitoring, which combines financial, personnel, technological, socio-labor, information-communication, and psychological characteristics.

In this article, we have substantiated an index methodology for monitoring the risks of educational labor development, which involves the formation of a system of interrelated sub-indices, the normalization of primary indicators, and their subsequent aggregation. The

methodological advantage of the approach is the possibility of integrating diverse statistical characteristics into a comparable evaluation system and identifying regional imbalances.

Testing the methodology on the example of an institutional sub-index, calculated from data by regions of Ukraine (2024), confirmed its practical applicability. The evaluation system includes four indicators that characterize the financial capacity of the educational system, the structure of teaching positions, the ratio of staffing needs to the potential resource for reproducing teaching staff, as well as staffing density in general secondary education institutions.

The calculations carried out revealed a significant interregional differentiation in the institutional provision of educational labor in Ukraine. Among the regions with a full data set, the sub-index value ranges from 0.315 in Mykolaiv region to 0.733 in Volyn region. Lviv region, with a result of 0.630, ranks sixth, demonstrating a high level of educational-subvention utilization, while also revealing staffing and organizational reserves for further strengthening institutional capacity.

An important methodological result of the study is the substantiation of the need to distinguish between the actual absence of a phenomenon and the absence of statistical data. Under wartime conditions, zero or missing values cannot automatically be interpreted as a positive or negative characteristic of a region. Therefore, for Donetsk, Luhansk, and Kherson regions, data for individual indicators are marked as “n/a” and were not used in normalization.

We hope that further development of the proposed methodology will involve expanding the information base with other dimensions of educational labor and forming a complete integral index. A promising direction is the inclusion of indicators of digital infrastructure, socio-labor characteristics, information and communication workload, and the psycho-emotional state of pedagogical workers, subject to ensuring their territorial and temporal comparability.

References

1. Grishnova, O. (2025). Effective models of human capital management based on digital technologies. *Bulletin of Taras Shevchenko National University of Kyiv. Economics*, 1(226), 39–47. <https://doi.org/10.17721/1728-2667.2025/226-1/5>.
2. Kolot, A., Herasymenko, O., & Shevchenko, A. (2023). New challenges for the theory and practice of human capital under the formation of “Industry 4.0”: The competence aspect. *Economy and Society*, (53). <https://doi.org/10.32782/2524-0072/2023-53-8>.
3. Antoniuk, V. (2022). Losses of human capital as a result of the war as a threat to the postwar modernization of Ukraine’s economy. *Economy of Ukraine*, 65(8), 20–33. <https://doi.org/10.15407/economyukr.2022.08.020>.
4. Sadova, U., Hrynkevych, O., & Soroachak, O. (2025). Workforce skills gaps analysis under security challenges: Business needs and regional resilience—A case study of Lviv region during wartime. *Bezpieczeństwo. Teoria i Praktyka*, 58(1), 191–207. <https://doi.org/10.48269/2451-0718-btip-2025-1-012>.
5. Shulha, O. (2023). State management of human capital development in modern conditions. *Economy and Society*, (57). <https://doi.org/10.32782/2524-0072/2023-57-129>.
6. Antoniuk, V. P., & Zaloznova, Y. S. (2023). Human capital of the regions of Ukraine: Problems of reproduction under conditions of hybrid and full-scale war as a threat to the

- country's postwar recovery. Institute of Industrial Economics of the National Academy of Sciences of Ukraine. https://iie.org.ua/wp-content/uploads/application/pdf/mono_antoniuk_zaloznova_compressed.pdf.
7. Azmuk, N. A. (2022). Transformation of the labor market under wartime conditions: Challenges and strategies for workforce reproduction. *Herald of Economic Science of Ukraine*, 1(42), 171–179. [https://doi.org/10.37405/1729-7206.2022.1\(42\).171-179](https://doi.org/10.37405/1729-7206.2022.1(42).171-179).
 8. Dorohuntsov, S., & Kutsenko, V. (2002). Educational sphere in the information society. *Visnyk of the National Academy of Sciences of Ukraine*, (11), 3–10.
 9. Semykina, M. V. (2003). Motivation of competitive labor: Theory and practice of regulation. PiK.
 10. Kutsenko, V. I. (2008). Social sphere: Reality and outlines of the future (issues of theory and practice) (B. M. Danylyshyn, Ed.). Aspekt-Polihraf.
 11. National Academy of Educational Sciences of Ukraine. (2026). National report on the state and prospects of education development in Ukraine (V. H. Kremen, Ed.). Pedahohichna Dumka. <https://doi.org/10.37472/NAES-2026-ua>.
 12. Shevchuk, A. V. (2013). Regional educational systems: Theory, methodology, practice of innovative development. Institute of Regional Research of the National Academy of Sciences of Ukraine.
 13. UNESCO. (2025). Developing the new Ukrainian teacher. <https://unesdoc.unesco.org/ark:/48223/pf0000398197>.
 14. All-Ukrainian Mental Health Program “How Are You?”. (2025, February 4). Psycho-emotional state of teachers and students of the university community “How are you?”. <https://howareu.com/materials/opytuvannia-psykhoemotsiinyi-stan-vykladachiv-ta-studentiv-spilnoty-universytetiv-ty-iak>.
 15. UNICEF. (2025, September 1). 4.6 million children in Ukraine face obstacles in accessing education on the eve of the fourth academic year in wartime conditions [Press release]. <https://www.unicef.org/ukraine/press-releases/back-to-school>.
 16. UNICEF. (2025). Better learning and skills: Enhancing learning and creating meaningful opportunities for children and young people [Programme brief]. https://www.unicef.org/ukraine/en/media/53936/file/2025_Better%20Learning%20and%20Skills%20brief.pdf.
 17. UNICEF. (2025). Ukraine humanitarian situation report No. 47 (January–December 2024). <https://www.unicef.org/ukraine/en/documents/ukraine-humanitarian-situation-report-47>.
 18. Barabash, O. A., & Chytayeva, K. H. (2025). Analysis of the use of educational subvention funds for the remuneration of pedagogical workers in 2024. *Educational Analytics of Ukraine*, 4(36), 69–82. <https://doi.org/10.32987/2617-8532-2025-4-69-82>.
 19. Institute of Educational Analytics. (2023). On the number and composition of pedagogical workers of general secondary education institutions of the Ministry of Education and Science of Ukraine, other ministries and departments, and private institutions (2023/2024 academic year) [Data set]. https://iea.gov.ua/wp-content/uploads/2024/02/byuleten-83-rvk-2023_2024.xlsx.

ОСВІТНЯ ПРАЦЯ У ЦИФРОВОМУ СУСПІЛЬСТВІ ЗНАНЬ: ІНДЕКСНА МЕТОДОЛОГІЯ МОНІТОРИНГУ ТА ОЦІНЮВАННЯ РИЗИКІВ

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Анотація. У статті обґрунтовано необхідність розвитку методологічних підходів до моніторингу та оцінювання освітньої праці в умовах цифрової трансформації суспільства знань і тривалих безпекових викликів. Актуальність дослідження зумовлена зміною змісту та організації освітньої праці, посиленням кадрових дисбалансів, нерівномірністю ресурсного забезпечення освітніх систем регіонів України, а також зростанням вимог до цифрової та комунікаційної компетентності педагогічних працівників. Метою дослідження є розроблення індексного підходу до моніторингу ризиків розвитку освітньої праці та його апробація на прикладі інституційного виміру. Запропоновано систему взаємопов'язаних індикаторів, їх нормування методом min-max та агрегування у субіндекси. Апробацію методики здійснено на основі офіційних статистичних та адміністративних даних за 2024 рік для регіонів України. Інституційний субіндекс сформовано з чотирьох показників, що характеризують використання коштів освітньої субвенції, структуру педагогічних ставок, співвідношення кадрової потреби та потенціалу відтворення педагогічних кадрів, а також кадрову насиченість закладів загальної середньої освіти. Результати розрахунків засвідчили суттєву міжрегіональну диференціацію інституційного забезпечення освітньої праці: серед регіонів із повним набором даних значення субіндексу варіює від 0,315 до 0,733. Львівська область отримала значення 0,630, посівши шосту позицію серед регіонів із повними даними. Встановлено, що високий рівень використання фінансових ресурсів не гарантує відповідно високого рівня інституційного забезпечення освітньої праці, оскільки результат залежить також від кадрової структури, кадрового дефіциту та рівня кадрової насиченості освітньої мережі. Обґрунтовано доцільність використання індексного підходу як інструменту міжрегіонального моніторингу та виявлення дисбалансів у розвитку освітньої праці. Визначено перспективи подальшого розширення системи показників за рахунок цифрового, соціально-трудового, інформаційно-комунікаційного та психоемоційного вимірів.

Ключові слова: освітня праця, цифрове суспільство знань, ризики, індексна методологія, інституційний субіндекс, кадрове забезпечення, освітня субвенція, регіональна диференціація, Україна.

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