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MODEL OF EXPERT ASSESSMENT OF PEDAGOGICAL RESEARCH RESULTS

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Abstract

Relevance: in the conditions of rapid development of scientific and technological progress, there is an urgent need to use expert evaluation in pedagogical research, which is an effective tool for establishing the possible impact of developed innovations on higher education applicants and the educational process as a whole.

Purpose: experimental verification of the developed model of the expert evaluation process in pedagogical research.

Methods: theoretical; empirical: praxemetric, survey-diagnostic, self-assessment and expert evaluation; mathematical and statistical.

Results: based on theoretical analysis, a number of factors that complicate the process of scientific research have been identified, and the need to improve the quality of pedagogical research has been substantiated. The need for the use of expert evaluation in pedagogical research is confirmed as one of the effective tools for determining the possible impact of the developed innovations on higher education applicants and the educational process as a whole. The developed model reproduces the general sequential process of conducting the research, but allows the researcher to independently choose the options for its application, depending on the unique features of his specific research. The effectiveness of the model is demonstrated on the example of determining the significance of the proposed innovations in improving the training of specialists in the specialty "Environmental Protection Technologies". 54 experts were involved in the experimental study, of which: 22 doctors and 25 candidates of sciences. Thanks to the use of a number of statistical criteria during the expert evaluation of the proposed innovations aimed at improving the training of specialists in the field of "Environmental Protection Technologies", compliance of the proposed innovations with didactic, informational and scientific and technical requirements, as well as their readiness for testing in real conditions of the educational process, which are also prospects for further scientific research, was established.

Conclusions: currently, expert assessment has unequivocally emerged as a vital component of contemporary pedagogical research, significantly contributing to the quality and validity of pedagogical practices and decision-making. Our study included a quantitative assessment of expert competence, yielding an average competence coefficient (K) of 0.79. This value surpasses the normative threshold of 0.67, indicating a high level of qualification among the experts involved in evaluating the innovations. All participating experts provided positive assessments of the updated educational program for "Environmental Protection Technologies." Moreover, with a calculated coefficient of variation of 8.45% (which is < 10%), this assessment can be considered highly reliable, signifying a strong consensus among the experts' opinions.

Keywords: *pedagogical research, innovations, expert assessment, model, educational environment.*

Introduction. Continuous improvement of the higher education system amidst rapid scientific and technological progress involves not only enhancing teaching methods and conditions but also addressing a range of urgent problems. These include: developing and updating standards, ensuring academic integrity, providing opportunities for student and faculty mobility, building an inclusive educational environment, and fostering global cooperation. To solve these outlined tasks, researchers constantly develop innovative approaches to organizing the educational process. However, before implementing proposed innovations in the educational process, their potential impact on higher education students must first be determined. It's worth noting that in pedagogical research specifically, a number of factors complicate the scientific inquiry process:

- Multiplicity of variables influencing the educational process, limited knowledge about their interaction, and the dynamic nature of the educational environment.
- Lack of a sufficient sample size or a deficit of empirical data to formulate generalized statements about a particular object.
- Existence of multiple alternative approaches to solving this problem, which, in turn, requires detailed analysis and the development of clear criteria for selecting the optimal solution.
- Uniqueness of each pedagogical study, which makes it impossible to accurately predict results, even when reproducing similar circumstances of pedagogical influence.

Consequently, this necessitates the use of expert evaluation in pedagogical research, which serves as an effective tool for establishing the possible impact of developed innovations on higher education students and the educational process as a whole.

Sources: Modern higher education pedagogy requires a scientifically sound approach to teaching and learning, which, in turn, demands thorough pedagogical research for the development and implementation of innovative methodologies, the evaluation of their effectiveness, and the continuous improvement of educational quality in higher education institutions. Pedagogical research forms the foundation for enhancing educational systems and programs, as well as for identifying students' educational needs. Furthermore, such research contributes to the development of creative teaching approaches and the use of interactive methods and innovative technologies in education, thereby fostering an increase in educational quality and the training of highly qualified specialists (Figure 1).

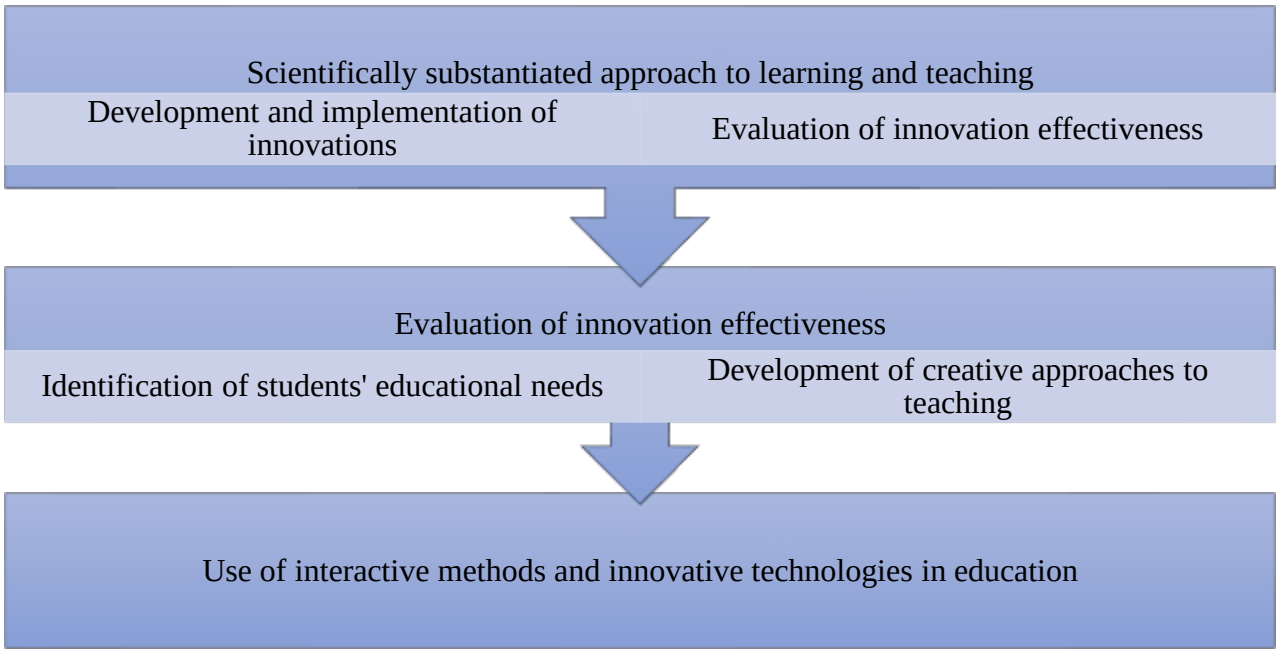

Figure 1. Algorithm for Improving Educational Process Quality

According to P. Wood and M. O'Leary (2019), ensuring teaching quality is only possible through continuous pedagogical inquiry. This involves analyzing modern trends in education, innovative teaching approaches, implementing advanced technologies and methodologies, and continuously monitoring educational outcomes and student reactions to these innovations. Such an approach allows teachers and lecturers to adapt their work to the constantly changing needs of pupils and students, ensuring increased effectiveness of the educational process amidst rapid societal development and scientific advancements. However, disciplinary and contextual nuances in pedagogical research prevent a full assessment of the effectiveness of these innovations.

Researchers F. Ferretti, Â. G. Pereira, D. Vértesy, and S. Hardeman (2018) noted that there are problems regarding the reliability of processes and procedures in pedagogical research that require resolution. We agree with the scholars' statement and believe that researchers should pay attention to the following issues:

- Ensuring measurement reliability in pedagogical research: In many pedagogical studies, it is difficult to determine how accurately and consistently certain indicators or parameters are measured and controlled, particularly student knowledge or test results. Developing reliable and valid measurement instruments is a crucial aspect of research.
- Adhering to internal consistency in diagnostic tools: It is important that the measured indicators are logically related and do not contradict each other, which, overall, will positively impact the quality of the research.
- Mandatory use of test-retest reliability procedures: This will address the problem of ensuring the stability of measurement results when the same instrument is applied repeatedly after a certain period.
- Ensuring inter-rater reliability: In pedagogical research where interpretation or evaluation results may depend on the interpreter, such as the evaluator of a final project, conditions must be ensured so that different interpreters make similar decisions.
- Adhering to external validity: It is important to ensure that research results correspond to real phenomena and can be generalized to other groups or situations.
- Diverse data types in pedagogical research: Pedagogical studies use various types of data (quantitative and qualitative); therefore, determining reliability for each data type requires the use of different methods and approaches.

According to C. Evans, C. K. Howson, and A. Forsythe (2018), there is a gap between research and practice, and effective mechanisms for their interaction are lacking. In this context, it is worth noting that a number of pedagogical studies focus on developing theoretical concepts and methodologies rather than solving specific practical problems in education. This leads to research results not always being easily implementable in the educational process. Furthermore, many education systems lack clear mechanisms both for implementing research results into pedagogical practice and for collecting feedback from practitioners. This results in the isolation of researchers and educators. Overcoming this gap requires developing effective mechanisms for collaboration between researchers and practitioners, creating platforms for exchanging ideas and experiences, increasing the significance of practical research, and implementing research results into real pedagogical practice. Only by strengthening interaction and cooperation can this gap be reduced and greater effectiveness achieved in the educational system (Figure 2).

The presented diagram shows that the gap between research and practice in education is a serious problem with a significant negative impact on the effective functioning of the educational system. Overcoming this gap requires developing effective mechanisms for collaboration between researchers and practitioners, creating platforms for exchanging ideas and experiences, increasing the significance of practical research, and implementing research results into real pedagogical practice. Only through strengthening interaction and cooperation can this gap be reduced and greater effectiveness achieved in the educational system.

E. Cleaver, M. Lintern, and M. McLinden (2014) hold a similar view, believing that a number of pedagogical studies are too formalized, making it unclear what impact they will have in real educational settings. Specifically, this is related to the fact that many studies concern specific conditions or groups that are not representative of general pedagogical practice. The results of such studies may be difficult or even impossible to apply in other contexts. Improving this situation is possible by developing a system for evaluating pedagogical research (Kaynardağ, 2019).

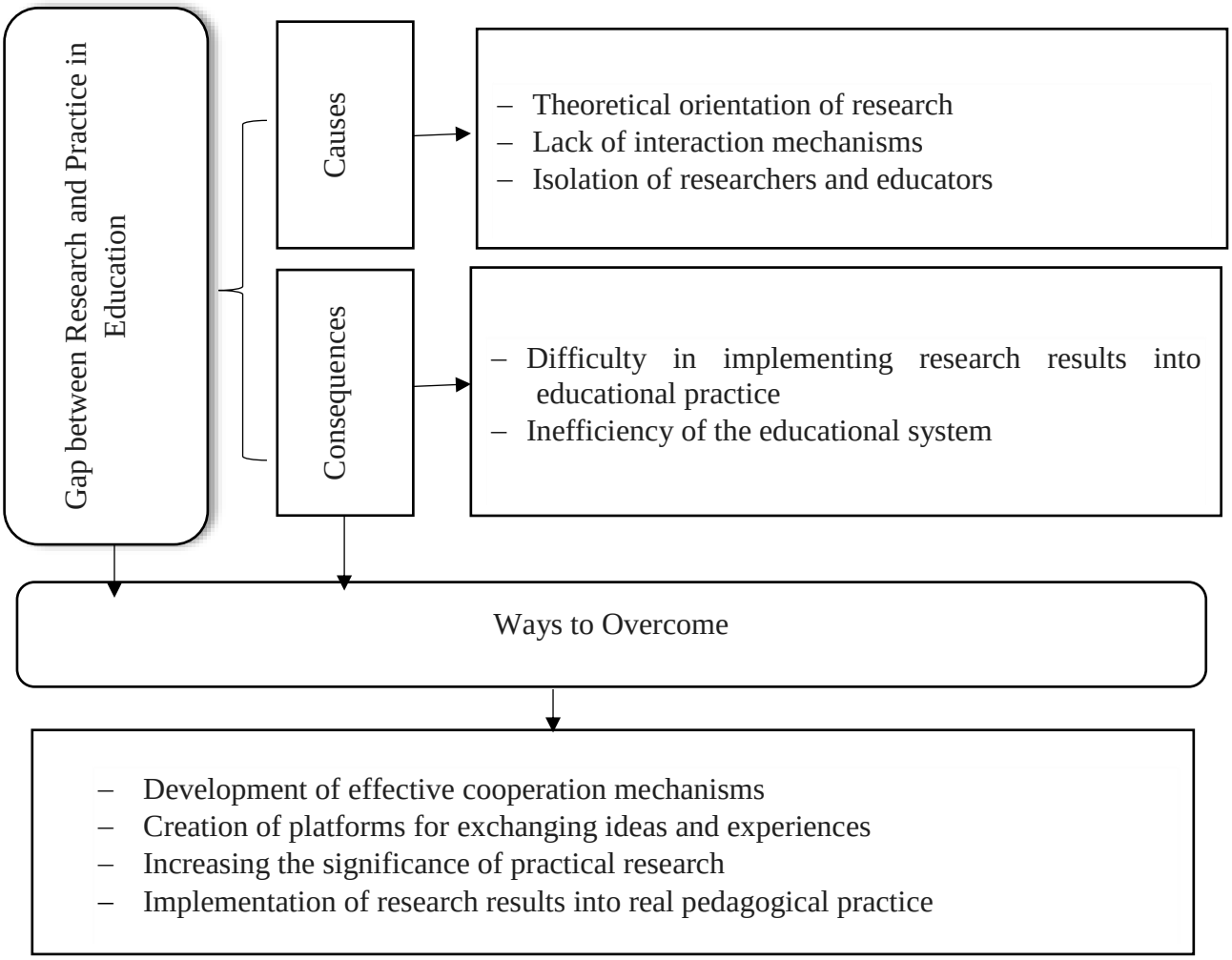

Figure 2. Algorithm for Ensuring the Effectiveness of the Educational System

– C. Evans, X. Zhu, N. Winstone, K. Balloo, A. Hughes, and C. Bright (2019) emphasized the importance of creating research communities of practitioners to validly evaluate proposed innovations. Such communities can unite teachers, administrators, pedagogical researchers, and other interested participants in the educational process with the goal of jointly studying, testing, and adapting new pedagogical approaches and methods into pedagogical practice.

The aim of this article is the experimental verification of the author's model for expert evaluation of pedagogical research results.

Research Methods: Theoretical: synthesis and generalization, modeling. Empirical: Praximetric: analysis and study of pedagogical experience, educational and training programs for specialists, etc. Survey-diagnostic: questionnaires, testing, etc. Self-assessment methods. Expert evaluation (commission method). Mathematical and statistical: graph-analytical, scaling and ranking; expert argumentation coefficient based on self-assessment; expert competence coefficient, coefficient of variation of expert opinion agreement.

Results and Discussion. During the research, it was proven that the opinion of researchers C. Evans, X. Zhu, N. Winstone, K. Balloo, A. Hughes, and C. Bright (2019) regarding the creation of communities of all educational process participants is valid. The creation of such communities will allow for the fulfillment of five main tasks to increase the effectiveness of pedagogical research for improving the educational process in modern dynamic societal conditions.

1. Uniting the Interests of Educational Process Participants:

– *diversity of participants*: The community should include participants with different roles in the educational process to ensure a diversity of perspectives and experiences. This can help ensure that research is more comprehensive and relevant;

– *shared interest:* participants should have a shared interest in implementing innovations to ensure that research is aimed at solving real problems in education;

– interaction: The community should promote interaction among participants with different roles to ensure the exchange of ideas and experiences. This can help increase the effectiveness of research.

2. Effective Research Planning. Requirements for research planning:

– defining research goals: The community should define specific goals it wants to achieve through the research. This will help determine which methods and tools need to be applied.

– defining resources needed for the research: The community should determine what resources should be involved for conducting the research, such as time, finances, and human resources. This will help avoid unjustified resource expenditures.

– defining research methodology: The community should develop a research methodology that will be applied for data collection and analysis of results. This will help ensure the objectivity of the research.

3. Data Collection and Analysis of Pedagogical Research Results. Requirements for research organization:

– choosing data collection methods: The community should choose the data collection methods that will be used to evaluate the effectiveness of innovations, including surveys, observations, comparative analysis, expert surveys, etc.

– data collection: The community should collect data according to the chosen methodology, including conducting surveys, observing students, comparing learning outcomes, etc.

– data analysis: The community should analyze the data to determine the effectiveness of innovations, including statistical analysis, group comparisons, trend identification, etc.

– reporting results: The community should present the research results in the form of a report that will be accessible to all participants in the educational process.

4. Defining Feedback Mechanisms and Ways to Improve Research. Requirements for feedback:

– creating a platform for experience exchange: The community should create a platform where educational process participants can exchange experiences and opinions about innovations, such as an online platform, forum, conference, etc.

– collecting feedback from participants: The community should regularly collect feedback from educational process participants about innovations, including through surveys, focus groups, interviews, etc;

– analyzing feedback: The community should analyze feedback from educational process participants to determine how it can be applied to improve innovations.

– making adjustments to the innovation process: The community should use the results of feedback analysis to make adjustments to the innovation process, including changes in methodology, content, or approaches to implementing innovations.

5. Dissemination of Positive Results. Overall, we agree with the opinion of Cotton D. R. E., Miller W., Kneale P. (2018) that, given the lack of clear mechanisms for determining the effectiveness of pedagogical research results, they have a lower level of recognition and respect than other fields of research and scientific inquiry. We explain this situation as follows:

– subjectivity in evaluation: Evaluating the effectiveness of pedagogical research often relies on subjective judgments, as pedagogical phenomena and processes are complex to measure objectively. This raises doubts about the reliability of the results.

– specificity of the educational environment: In the pedagogical sphere, research often takes place in a complex, dynamic sociocultural environment where many variables are difficult or impossible to control. This complicates the establishment of cause-and-effect relationships and the isolation of the specific impact of innovations on the formation of the studied characteristic in students.

– ambiguity of results: Pedagogical studies do not always yield unambiguous results due to the individuality of each educational institution, student group, teachers, and teaching methods.

– significant influence of time on research results: The positive impact of some pedagogical innovations may only become apparent over time, when the children who participated in the study complete their education. This significantly complicates the evaluation of results in the short term. At the same time, innovations that showed positive results may have no impact on students after 5 years.

– importance of context: In pedagogical research, the conditions under which the research was conducted are of great importance. Such specific features significantly complicate the generalization of the obtained results and their interpolation in the educational environment.

– pragmatism in other sectors of Ukraine's economy: In a number of such sectors, like medicine or engineering, research results are more concrete, expressed in clear numerical indicators, and direct practical application only increases their weight.

Given the above, it is necessary to improve methodologies for evaluating pedagogical research, make them more objective and practically oriented, and foster comprehensive interaction between educators and researchers to enhance the quality of education and increase the impact of pedagogical research on practice.

The method of expert evaluation, as a systematized procedure for collecting and processing subjective opinions of experts, is an effective tool for forecasting the development of complex systems. It allows for the evaluation of a phenomenon that takes into account the expert's point of view, confidence, and experience, and objectively considers the totality of individual opinions.

Expertise is a systematized process of analyzing and evaluating the results of activities, carried out by competent specialists, with the aim of determining their compliance with established criteria.

In pedagogical research, this method is not used very often, usually in its simplest form (expert surveys, generalization of their opinions, summarizing results). We explain this by a number of reasons:

– *subjectivity of evaluation*: Pedagogical phenomena and processes are often subjective and difficult to measure objectively; evaluation is carried out based on expert opinions, which may raise doubts about the reliability of the results.

– *significant influence of social aspects on pedagogical research results*: In pedagogy, a number of variables related to social, cultural, and individual factors are applied; expert evaluations can vary depending on the context, which reduces their objectivity.

– *insufficient objectivity*: In pedagogy, there is often a lack of clear objective considerations that can be used to evaluate the effectiveness of pedagogical methods or innovations; the effectiveness of pedagogical innovations is determined using various indicators (student motivation, level of satisfaction with learning), which are contradictory.

– *measurement complexity*: Evaluating pedagogical results can be complex due to the large number of variables affecting student learning and development.

– *time constraints*: In pedagogical research, decisions need to be made and pedagogical practices improved in a timely manner, and expert evaluation can be a costly and time-consuming process.

Despite the existing difficulties, we believe that proposed pedagogical innovations should undergo expert evaluation using appropriate statistical methods before implementation. Only in such a case can researchers reliably confirm the correctness of the theoretical study and proceed to organize a pedagogical experiment. This type of evaluation can become a tool for making scientific and practical improvements in curricula, teaching methodologies, and innovative approaches to pedagogical practice. Expert opinions are valuable for improving the quality of teaching and achieving desired pedagogical results.

Through properly organized expert evaluation, valuable recommendations and insights can be obtained from specialists with significant experience in pedagogy. Such feedback helps solve problems and improve the pedagogical process to achieve better results. Therefore, we consider expert evaluation an important component of pedagogical research that can contribute to the continuous improvement of the educational system. Analysis of theoretical studies shows that expert evaluation is considered a certain accompanying control of activity that allows the researcher to adjust the pedagogical process.

Generalizing the findings on this problem allowed for the creation of an expert evaluation model for pedagogical research, which is presented in Figure 3.

The proposed model is a concept that describes and explains the features of using expert evaluation in pedagogy. The created model reflects the general steps taken in the research process. At the same time, the researcher chooses the implementation options depending on the specifics of the initiated research. The elaboration of the goal identified in the pedagogical research and the attempt to determine the optimal ways for further development that will lead to the planned result, in fact, determine the need for expert evaluation. To create an expert evaluation program in a specific study, we clarify the purpose

and methodological foundations of the research. The methodological foundations of expert evaluation include the following aspects:

– selection of the expert group: The composition of the expert group should be representative and include specialists with the necessary qualifications and experience in the relevant field;

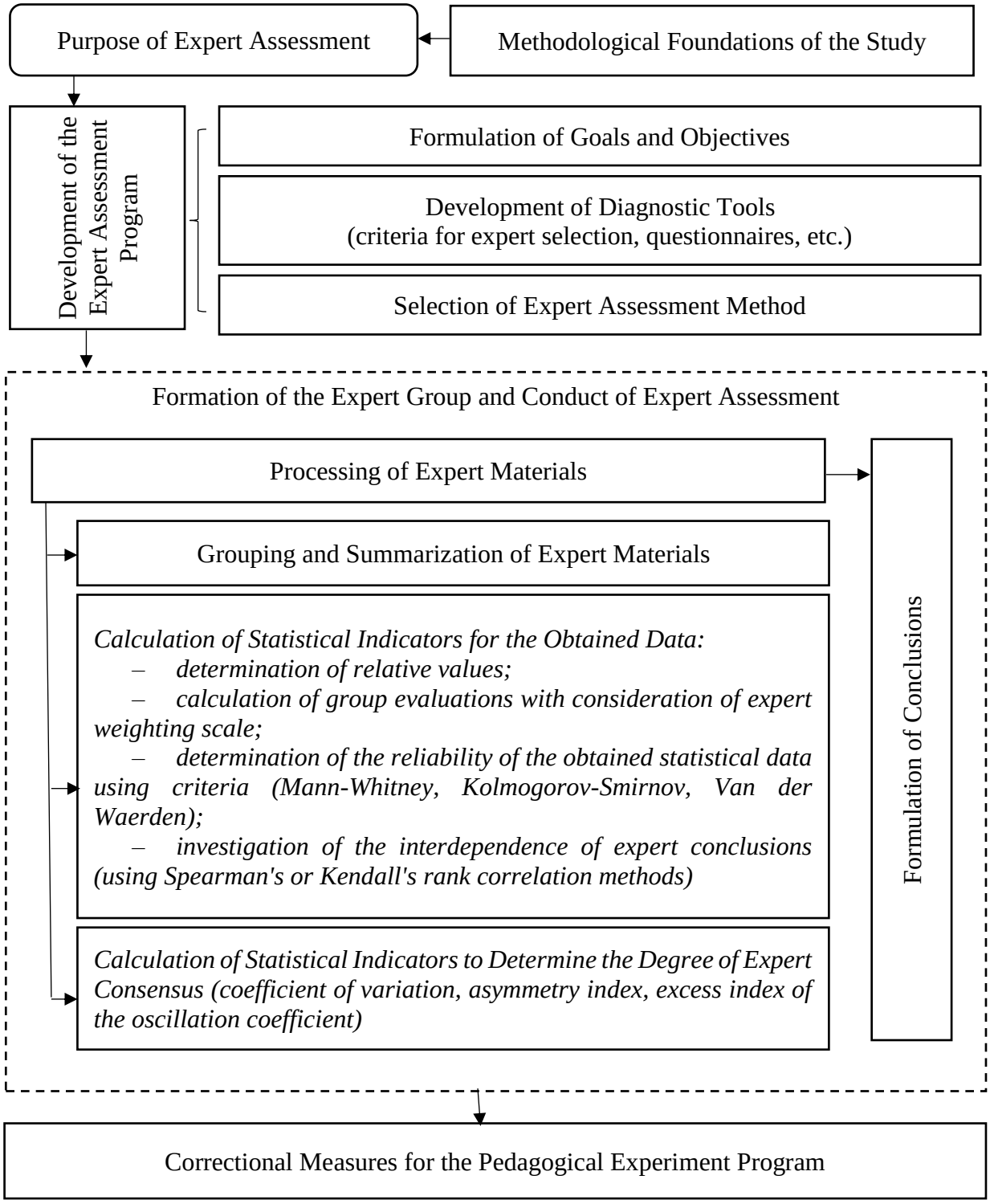

Fig. 3. Model of the expert assessment process in pedagogical research

– defining criteria and evaluation scales: experts should have access to clear evaluation criteria and scales to determine the quality level or importance of the parameters being assessed;

– determining methods and means of information gathering;

– analysis and generalization of data: processing and analyzing information obtained from experts is typically performed using statistical methods and software;

– ensuring reliability and objectivity: this includes avoiding the influence of personal preferences and excluding systematic errors;

– defining feedback mechanisms.

The methodology of expert evaluation may vary depending on the specific task and research context. However, its primary goal is to obtain high-quality information that can be used for decision-making and to improve certain aspects of the pedagogical process.

The final, yet equally crucial, stage involves formulating conclusions based on the obtained results. Key aspects to consider during this process include:

– General characterization of the results: This provides a comprehensive overview of the findings, establishing the overall context of the study.

– Identification of contradictory aspects and their causes: If experts presented differing viewpoints, these discrepancies must be noted, and an overview of the various positions provided.

– Formulation of recommendations based on the results: This may involve developing strategies, improving processes, or making specific decisions.

– Identification of limitations and shortcomings of the pedagogical study: This helps in understanding the objectivity and reliability of the obtained results.

– Determination of the need for additional research: If the results are ambiguous, further research or adjustments to the experimental design may be necessary.

Given current conditions, and with the aim of determining the significance of the proposed innovations for improving the training of specialists in the "Environmental Protection Technologies" specialty, an expert assessment was conducted. This assessment involved academic staff experienced in training specialists in technical fields. The purpose of the expert assessment was to obtain objective information, based on expert opinions and knowledge, for making informed decisions and developing a strategy for improving the educational program for training specialists in the "Environmental Protection Technologies" specialty, considering modern challenges.

The expert group that evaluated the results of the pedagogical experiment included 54 researchers, among whom were Doctors of Sciences (22 individuals) and Candidates of Sciences (25 individuals). Among the experts, 18 individuals held the academic title of professor, and 26 – associate professor. The expert group also included representatives of the administrative staff of higher education institutions (4 heads of educational and methodical departments) and 3 specialists from the academy of continuous education.

To ensure the objectivity of the research results, an analysis of expert competence was conducted, taking into account key factors influencing their professional qualifications and the quality of expert assessments, specifically:

– duration of pedagogical activity aimed at the professional training of future specialists in the field of "Production and Technologies";

– presence of an academic degree and academic title;

– position held by the expert;

– awareness in the studied subject area (development of professional competence of specialists in the field of "Production and Technologies");

– practical experience (availability of methodological and scientific developments) in the studied subject area.

All the listed properties can be quantitatively assessed, which allows for the quantitative assessment of expert competence. The competence of an expert is assessed using the formula: Given contemporary conditions, and with the aim of determining the significance of the proposed innovations for improving the training of specialists in the "Environmental Protection Technologies" specialty, an expert assessment was conducted. This assessment involved academic staff with experience in training specialists in technical fields. The purpose of the expert assessment was to obtain objective information, based on expert opinions and knowledge, for making informed decisions and developing a strategy for improving the educational program for training specialists in the "Environmental Protection Technologies" specialty, considering modern challenges.

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$$К = \alpha_{кв} \cdot К_{кв} + (1 - \alpha_{кв}) \cdot К_{\alpha}\ , \quad (1)$$

where $\alpha_{кв}$ – the coefficient that determines the level of expert qualification ($\alpha_{кв} \in [0{,}5 \ldots 1]$). Considering the specific characteristics of the phenomenon under investigation (formation of professional competence of specialists in the field of "Production and Technologies"), the qualification coefficient level is estimated as $\alpha_{кв} = 0{,}4$.

The quantitative assessment of expert qualification $К_{кв}$ is performed using the formula::

$$К_{кв} = \frac{\varphi_{ij}}{\varphi_{max}}\ , \quad (2)$$

where φ_{ij} – degree of compliance of qualifications with job requirements and academic degree ($\varphi_{ij} \in [1 \ldots 12]$); φ_{max} – maximum value of the qualification indicator.

The indicator value φ_{ij} is calculated using the methodology described in the study by Korchenko, Hornitska, Zakharchuk (2010), in accordance with Table 1.

Table 1

SYSTEM OF VERBAL-NUMERICAL ASSESSMENT OF EXPERTS' PROFESSIONAL TRAINING

Academic Degree / Position	**Asst.**	**Sr. Lecturer**	**Assoc. Prof.**	**Prof.**	**Head of Dept.**	**Head of Educ. & Method. Dept.**	**Administrator (Dean, Rector)**
No degree	1	1.2	2	2.5	2	3.5	4
Cand. Sci.	1.5	2.25	2.5	3	4	4.5	5
Cand. Sci., Assoc. Prof.	1.75	2.5	3	3.5	4.5	5	6
Doctor of Sci.	2	3	3.5	4	5	6	7
Doctor of Sci., Assoc. Prof.	2.25	3.5	4	4.5	5.5	7	8
Doctor of Sci., Prof.	2.75	4	4.5	5	6	8	9
Doctor of Sci., Prof., Academician	3	4.5	5.5	6	7	9	10

D. Sci., Prof., Acad., Corr. Member	4	5	6	7	8	10	12

The expert's qualification assessment, obtained from Table 1, is independent of any subjective opinion, as it is determined based on objective, documented facts of the expert's activity: position held, presence of an academic degree, academic title, etc.

Next, we determine the expert's argumentation coefficient (Kα) based on a self-assessment of identified argumentation sources. The expert performs a self-assessment of their professional knowledge and skills through a questionnaire. However, according to studies by O. Korchenko, D. Hornitska, and T. Zakharchuk (2010), expert self-assessment largely depends on their personal characteristics, which can lead to systematic errors in evaluation.

According to the methodology of B. Hrabovetskyi (2010), to determine the validity of research conclusions, we propose that experts evaluate the level of argumentation using the following verbal scale: H – High, M – Medium, L – Low. According to reference Table 2, the experts' verbal evaluations are converted into numerical values, which serve as the basis for further quantitative analysis and calculation of the argumentation coefficient (Leonov, Vorovich, 2014, p. 16):

$$K_a = \sum_{n=1}^{N} \cdot a_n, \qquad (3)$$

Where a_n – numerical evaluation of the expert, n – source of argumentation..

Table 2

MATRIX FOR CONVERTING QUALITATIVE ARGUMENTATION ASSESSMENTS INTO QUANTITATIVE ONES

Argumentation Item	Level of Argumentation		
	B (High)	C (Medium)	H (Low)
Knowledge of the specifics of professional training of specialists in the field of «Production and Technologies»	0,3	0,2	0,1
Your professional competence, confirmed by practical experience and scientific developments	0,5	0,4	0,2
Your level of awareness of domestic scientific research in the specified field	0,05	0,05	0,05
Your knowledge of global achievements in this field	0,05	0,05	0,05
Your awareness of trends in the training of engineering personnel	0,1	0,1	0,1

We perform a quantitative assessment of expert competence based on the obtained data. The formed working group of experts is highly qualified and capable of effectively solving the assigned tasks, as $0.67 \leq K \leq 1$ (Podolyanchuk, 2014, p. 120). According to Figure 4, the competence coefficient of each expert exceeds the established threshold, which indicates the high professionalism of the involved specialists.

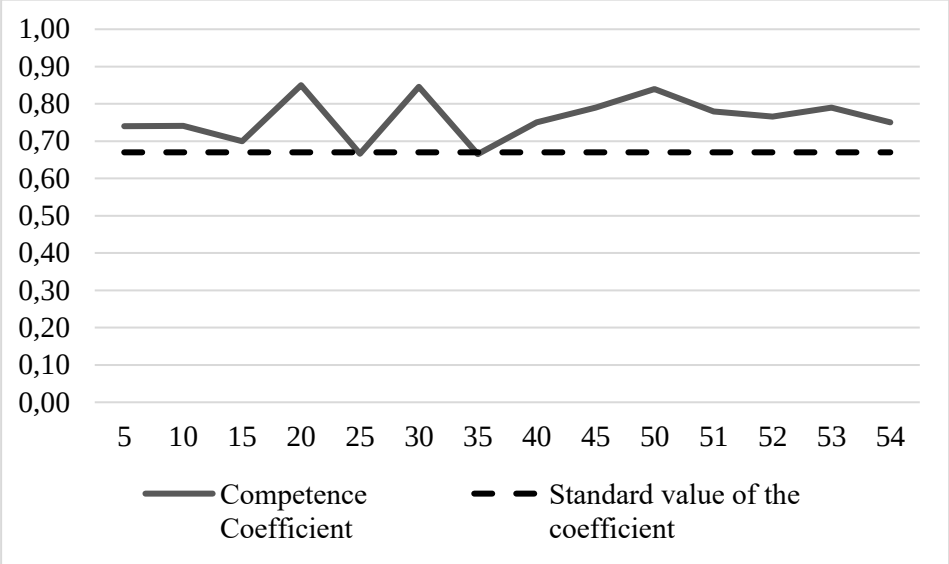

Fig. 4. Values of Expert Competence Coefficients

We will calculate the average value of the competence coefficient:

$$K = \frac{42{,}40}{54} = 0{,}79.$$

Since the average value of the competence coefficient K is 0.79, exceeding its normative value (0.67), the selected group of experts possesses a sufficient level of qualification to evaluate innovations aimed at improving the training of specialists in the "Environmental Protection Technologies" specialty.

The following were proposed for expert review: an improved educational program, methodological guidelines for students' independent and individual work, diagnostic tools for assessing professional competence (based on fuzzy logic methods), the essential features and principles of which are reflected in the authors' publications (Dembitska, Kobylianskyiy, Puhach, 2022; Dembitska, Kobylianskyiy, 2022; Kuzmenko, Dembitska, Miastkovska, Savchenko, Demianenko, 2023, and others). To determine the significance of each criterion, the following indicators were applied: statistical indicators for sample evaluation (to determine the generalized opinion indicator), degree of expert opinion agreement, statistical reliability of expert assessment results, and indicators of expert involvement in implementing innovations for improving the training of specialists in the "Environmental Protection Technologies" specialty.

To calculate the indicators of generalized opinion, we apply statistical indicators for sample evaluation: the arithmetic mean of the score for a specific requirement (in points), the variance of the score for each indicator, its standard deviation, and the coefficient of variation.

We evaluate the research results. If experts demonstrate a very strong degree of opinion agreement, the coefficient of variation V≤10%; strong – if 10%≤V≤20%; and medium, if V≥30% (Yashkina, 2013, p. 443).

Given the limited publication volume, we provide calculations for the results of the updated educational program for training specialists in the "Environmental Protection Technologies" specialty as an example:

- average value M=91.28;
- variance D=59.44;
- standard deviation σ=7.71;
- coefficient of variation V=7.71/91.28·100%=8.45%.

Thus, all experts positively evaluated the updated educational program for training specialists in the "Environmental Protection Technologies" specialty. Based on the calculated coefficient of variation of 8.45% < 10% (indicating a very strong degree of expert opinion agreement), this assessment can be considered reliable, and the expert opinions – consistent.

Therefore, the expert assessment of the proposed innovations for improving the training of

specialists in the "Environmental Protection Technologies" specialty meets didactic, informational, scientific, and technical requirements, and proves that the improved educational program for training specialists in this specialty can be piloted in a real educational process.

Conclusions. The conducted research provides grounds to state that the use of expert assessment in pedagogical research is necessary due to the following main reasons:

- involvement of expert knowledge and experience in the analysis of pedagogical innovations. Experts in a given field possess profound knowledge that enables them to conduct substantiated and valid evaluations and provide recommendations for improving the educational process. In pedagogical research, experts can be experienced teachers, methodologists, researchers, or specialists from other related fields;
- objectivity and independence. Experts have no personal interests regarding a specific study, so their evaluations are usually objective and independent, allowing for a realistic assessment of proposed pedagogical innovations and their potential impact on learners;
- verification and confirmation of hypotheses and theories. With the help of experts, it is possible to test hypotheses, theories, and research methodologies. Their comments and evaluation results help determine whether the proposed concept or methodology is truly effective;
- reduction of errors and refutation of bias. An important advantage of expert assessment is the ability to identify errors or refute potential bias in the research, which increases the reliability of its results;
- determination of practical significance. Experts can help determine the extent to which research results are practically important and useful for pedagogical practice;
- support in decision-making. The results of expert assessment can be useful for making decisions regarding the further direction of research or the development of educational programs;
- improvement of research quality. It is precisely through expert assessment that weaknesses and shortcomings of the research can be identified, and necessary adjustments can be made even at the stage of theoretical exploration, with the aim of improving its quality;

Considering these advantages, expert assessment becomes an important component of pedagogical research and contributes to enhancing the quality and validity of pedagogical practices and decisions.

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МОДЕЛЬ ЕКСПЕРТНОГО ОЦІНЮВАННЯ РЕЗУЛЬТАТІВ ПЕДАГОГІЧНИХ ДОСЛІДЖЕНЬ

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Реферат:

Актуальність: в умовах стрімкого розвитку науково-технічного прогресу виникла нагальна потреба у використанні експертного оцінювання в педагогічних дослідженнях, що є дієвим інструментом для встановлення впливу розроблених інновацій на здобувачів вищої освіти та освітній процес в цілому.

Мета: експериментальна перевірка авторської моделі експертного оцінювання результатів педагогічних досліджень.

Методи: теоретичні; емпіричні: праксиметричні, опитувально-діагностичні, самооцінювання й експертного оцінювання; математичні та статистичні.

Результати: на підставі теоретичного аналізу виокремлено низку факторів, які ускладнюють процес наукового пошуку; обґрунтовано потребу в підвищенні якості педагогічних досліджень; підтверджено необхідність застосування експертного оцінювання в педагогічних дослідженнях, як одного із дієвих інструментів для визначення можливого впливу розроблених інновацій на здобувачів вищої освіти та освітній процес в цілому; створена модель відтворює загальний послідовний процес проведення дослідження, але дозволяє досліднику самостійно вибирати варіанти її застосування, в залежності від унікальних особливостей його конкретного дослідження; продемонстровано дієвість моделі на прикладі визначення значущості запропонованих інновацій щодо вдосконалення підготовки фахівців зі спеціальності «Технології захисту навколишнього середовища»; до експериментального дослідження залучено 54 експерти, з яких 22 доктора та 25 кандидатів наук; завдяки використанню низки статистичних критеріїв під час експертного оцінювання запропонованих інновацій, спрямованих на вдосконалення підготовки фахівців у галузі «Технології захисту навколишнього середовища», встановлено дотримання запропонованим інновацій дидактичним, інформаційним і науково-технічних вимогам, а також їхню готовність до апробації в реальних умовах освітнього процесу, що є і перспективами подальших наукових пошуків.

Висновки: у процесі проведеного дослідження було здійснено кількісне оцінювання компетентності експертів; з'ясовано, що середнє значення коефіцієнта компетентності К становило 0,79 і перевищило його нормативне значення (0,67), що свідчить про достатній рівень кваліфікації експертів для оцінювання інновацій; всі залучені експерти позитивно оцінили оновлену освітню програму підготовки фахівців зі спеціальності «Технології захисту навколишнього середовища», а за розрахованим значенням коефіцієнту варіації 8,45% < 10% (дуже високий ступінь згоди думок експертів), цю оцінку можна вважати достовірною, а думки експертів – узгодженими.

Ключові слова: *педагогічне дослідження, інновації, експертне оцінювання, модель, освітнє середовище.*

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