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FORMATION OF WORK SAFETY CULTURE OF THE TECHNICAL SPECIALISTS

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Abstract

Relevance: the lack of motivation to comply with occupational safety requirements both among employers and among employees, insufficient awareness of the staff of the organizations regarding the existing professional risks that arise in the process of carrying out professional activities, actualizes the issue of purposeful formation of an occupational safety culture among students of higher education institutions.

Objective: analyze the peculiarities of the safety culture formation among future specialists in the process of training at higher education establishments, based on theoretical studies and the conducted pilot exper-iment, develop directions for ensuring the effectiveness of the study of occupational safety disciplines.

Methods: theoretical (analysis and synthesis, abstraction and idealization, generalization, induction and deduction, analogy); empirical (study of literature, observation, conversation, survey, study of the results of educational activities and generalization of pedagogical experience, experiment); statistical (methods of processing statistical data, Pearson's $\chi 2$ test).

Results: it was established that the occupational safety culture of a specialist is an open system, the development of which depends on the available theoretical knowledge obtained during training and awareness of the importance of safety for the professional activity. The factors of occupational safety culture formation were determined and directions for the improvement of the educational process on occupational safety during the professional training were proposed.

Conclusions: statistically significant results were obtained that confirm the proposed hypothesis. It has been established that the solution to the problem of occupational safety culture formation of future specialists in technical specialties in the process of professional training becomes possible during the professional train-ing by transforming students from passive consumers of ready-made knowledge into competent individuals. The prospects for further research are the development of methodological principles for the formation of oc-cupational safety culture , taking into account the peculiarities of the professional training of future specialists.

Keywords: *occupational safety culture, institutions of higher education, improvement of the educational process, risk-oriented approach, specialists of technical specialties*

Introduction. Modern production requirements increase the specialist's responsibility not only for individual technological operations, but also for the technological process as a whole, with the mandatory consideration of the human factor. Occupational health and safety, as a system of ensuring life, health and working capacity of a person in the process of work, is a significant component of higher technical education. Ensuring the quality of occupational health and safety knowledge is decisive in the training of specialists in technical professions. It is stipulated by the increase of industrial injuries, which has been recorded in statistical indices in recent years. The detailed analysis of statistical data proved that ignoring and non-compliance with safety requirements at work is the most common cause of injuries.

The lack of the motivation to comply with occupational safety requirements both among employers and among employees, insufficient awareness of the staff of organizations regarding the existing professional risks that arise in the process of professional activity, actualizes the issue of purposeful formation of occupational safety culture among students of higher education institutions. however, it is worth mentioning that the process of establishing a safety culture should be continuous, since only consistency and continuity can guarantee the formation of stable relationships between the safety of labor processes and the comfort of professional activity conditions in the mind of a future specialist.

Research sources. Analysis of the state of research and publications on the specified problem made it possible to find out that the peculiarities of the formation of professional competence were the object of research by scientists of various fields of knowledge. Psychological features of professional activity and formation of a future specialist are reflected in the publications of L. Vygotsky, G. Kostyuk, O. Leontiev, B. Lomov, A. Maslow, A. Petrovsky, and S. Rubinstein. The scientific research of R. Bayza, K. Buck, and J. Leonhard were carried out in the direction of establishing the peculiarities of professional communication, and the fundamentals of the theory of motivation and the search for ways of its effective formation are reflected in the scientific works of A. Maslow, D. McGregor, and D. Adair.

The fundamentalization of the higher humanization of education and ways to ensure the quality of the educational process in the conditions of modern technical higher education institutions were of interest to, in particular, S. Amelina, V. Astakhova, G. Ball, I. Bekh, P. Blonsky, M. Gurevichov, M. Dobruskin, I. Zyazyun, M. Kasyanenko, V. Sagatovskyi, P. Sklyar, A. Sushchenko and others. O. Avramenko, V. Zhdanova, V. Zatsarny, R. Sabarno, K. Tkachuk studied the process of formation of labor protection skills of students.

Such researchers as Tseng and Hsu (2022), Kintu, Kyakula, Kikomeko (2015), Hussain, Pedro, Lee (2020) and others emphasized the need to create a safety culture for risk-oriented thinking. However, despite the lively interest of scientists in the issue of professional training of graduates of technical higher education institutions, the problem of forming knowledge, skills on labor protection and ways of risk-oriented thinking among future specialists in higher education institutions has not been fully resolved.

The objective of the article is to analyze the peculiarities of the formation of the safety culture of future specialists in the process of training in higher education institutions, to characterize its formation, on the basis of theoretical studies and the conducted pilot experiment, to develop directions for ensuring the effectiveness of the study of occupational safety disciplines.

Research methods: theoretical (analysis and synthesis, abstraction and idealization, generalization, induction and deduction, analogy); empirical (study of literature, observation, conversation, survey, study of the results of educational activities and generalization of pedagogical experience, experiment); statistical (methods of processing statistical data, criterion for testing statistical hypotheses, Pearson's $\chi 2$ criterion, Microsoft Excel program).

Results and discussion. It should be noted that the Recommendations, adopted in June 2006 at the 95th International Conference of International Labor Organization, provide that ILO member states, within the framework of promoting a national culture of prevention in the field of labor protection, have to:

- ensure an increase in the level of employee awareness and public understanding in general of the problems of industrial safety and occupational hygiene through the implementation of national and international initiatives on labor protection;
- to organize continuous training on occupational health and safety issues, both for employees and managers of various departments responsible for occupational safety as a whole;
- create conditions for the organization and study of actual courses on occupational safety and hygiene issues in general educational and professional educational institutions;
- promote the exchange of statistical data and in

formation on health and safety at work between competent authorities, employers, employees and their representatives;

- provide information and advisory services to employers, employees and their organizations and encourage or facilitate cooperation between them to eliminate or minimize industrial risks;

- to encourage the development of health and safety issues and the appointment of representatives of working groups responsible for health and industrial safety at industrial facilities in accordance with national legislation;

- effectively solve the problems faced by enterprises during the implementation of a risk-oriented approach in labor protection in accordance with national legislation and the practice of its use in developed countries of the world.

A survey of students of the Vinnytsia National Technical University showed that a significant part of them considers the disciplines of the labor protection cycle unnecessary for their future professional activities, and, accordingly, the study of such disciplines causes internal resistance and is ineffective. Exactly 68% of respondents noted that the study of labor protection and safe methods of professional activity should be carried out at the workplace in real conditions of the production process.

However, the results of the analysis of industrial injury statistics indicate that the main conditions for the occurrence of accidents at work are incorrect decision-making in extreme industrial situations and failure to fulfill professional duties in the field of occupational health and safety, the growing influence of the human factor in the management of occupational safety and health in modern production and industrial injury One of the main reasons is the inadequate quality of knowledge received by employees both at the stage of training at the workplace and during work. Therefore, the improvement of labor safety is directly proportional to the safe behavior of the employee at the workplace. To ensure it, it is necessary not only to stimulate safe behavior, but also to teach safe activities at the stage of professional training.

For this purpose, occupational safety disciplines, such as «Occupational safety», «Fundamentals of occupational safety» and «Occupational safety in industry» are included in the curricula of future specialists in technical specialties. The purpose of their study is the formation of a system of knowledge and skills on legal and organizational issues of labor protection, occupational hygiene, industrial sanitation and fire safety, as well as a conscious attitude towards the implementation of the priority principle of protecting the life and health of employees in the process of professional activity.

However, due to the small number of hours, the study of labor protection disciplines is of superficial character. We believe that the study of safety requirements should be related to professional disciplines. In addition, one of the primary tasks is the development of the ability to critically evaluate professional tasks, in particular, from the point of view of safety, as well as readiness to act in possible dangerous and extreme production situations. Therefore, on our opinion, the formation of positive motivation to study the disciplines of the labor protection cycle is one of the means to improve the quality of knowledge on labor protection issues. Detailed substantiation of this provision is given in separate publications (Dembitskaya, Kobylianskyi, & Pugach, 2020; Dembitskaya, Kobylianskyi, Pugach, 2022; Zayukov, Kobylianska, Kobylianskyi, & Dembitska, 2022).

The occupational safety culture of a specialist is an open system. Its development depends not only on the degree of receiving and processing of information regarding safety in professional activities. We think that at the initial stage of formation, the culture of occupational safety is formed on the basis of theoretical knowledge obtained during training and awareness of the importance of occupational safety (Fig. 1).

Taking into account the determined factors of the occupational safety culture formation, provision of the effectiveness of the study of occupational safety disciplines is possible by means:

- reconsideration of the programs of labor protection disciplines taking into account the specific features of the professional training of the future specialists;

- use of the possibilities of modern information technologies in the educational process. The example of the implementation of this point is given in the publication of Kuzmenko, Dembitska, Miastkovska, Savchenko, and Demianenko (2023);

- continuous implementation of the necessary and high-quality control of students' achievements of the appropriate level of knowledge, skills and abilities. The example of the implementation of this point is given in the publication of Dembitzka (2019);

- ensuring methodical training of teachers of professional disciplines, taking into consideration the labor protection component. Main directions

of this work for teachers who train specialists in mechanical engineering are given in the Concept of future specialists training in mechanical engineering for labor protection professional activity (Dembitska, & Kobylanskyi, 2020).

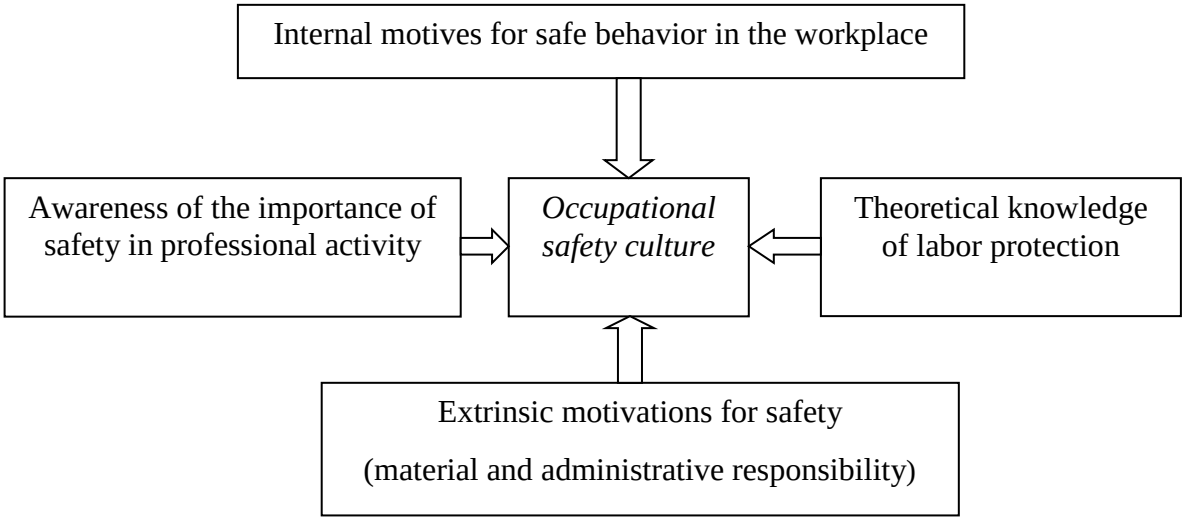

Fig.1 Factors of occupational safety culture formation

At the same time, it is necessary to take into account both the specific character of the future professional activity and the requirements of regulatory legal acts on labor protection.

The improvement of the educational process of labor protection during the professional training of students of technical specialties is shown in Fig. 2.

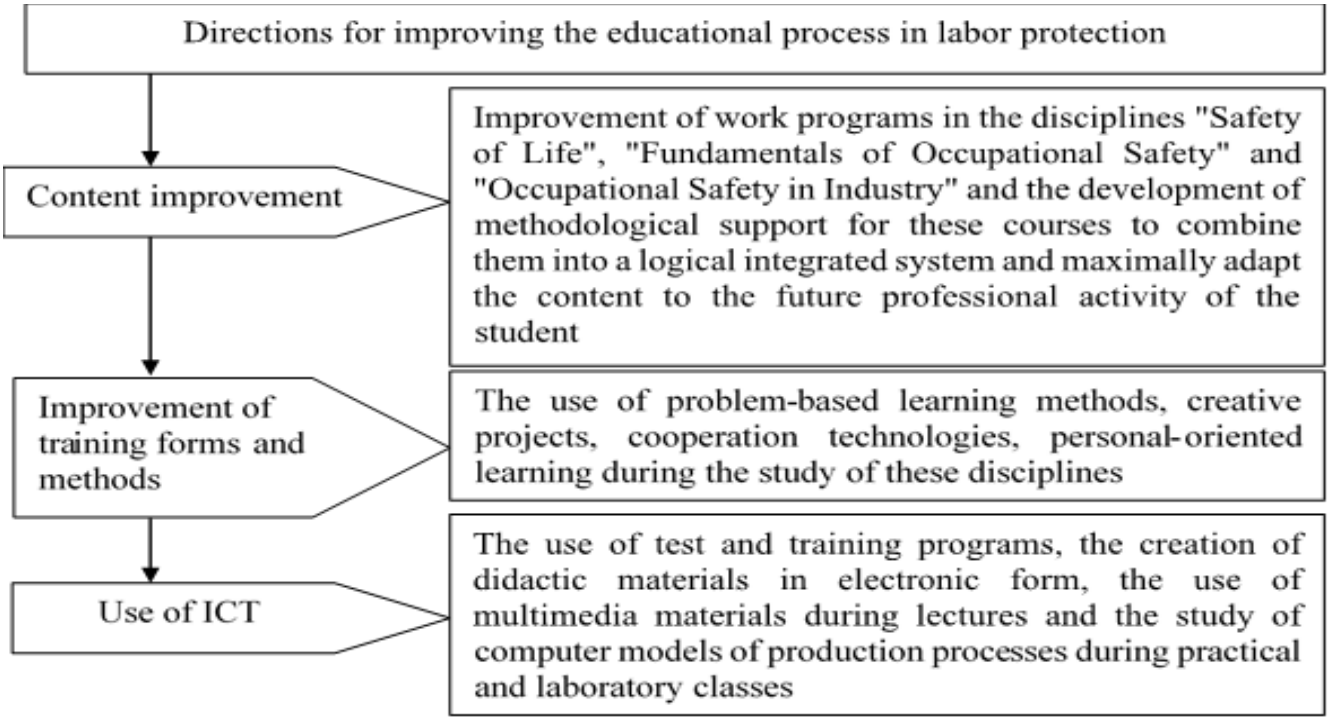

Fig. 2. Improvement of the educational process in order to form a culture of labor protection among future specialists

Improvement of the content of occupational safety study involves, first of all, the development of methodological support in order to transform the courses "Safety of Life", "Occupational Safety" and "Fundamentals of Occupational Safety in Industry" into a logical integrated system, establishment of

the interaction with other educational disciplines and future student's professional activity. All this is possible as labor protection subject widely uses the latest achievements of science and technology, is based on theoretical developments in physics, chemistry, mathematics, electronics, medicine, economics, etc. (Dembitska, 2014, p. 386).

Improvement of the forms and methods of education includes the application of new pedagogical technologies, creative projects, cooperation technologies, principles of personal-oriented education in the training process. This allows not only to effectively organize the educational and cognitive process in higher education institutions, but also effectively stimulate students' interest in studying labor protection disciplines.

During the study of theoretical material, it is expedient to fill the standard forms of classes with interesting facts, statistics, examples from the production activities of real organizations. In the process of conducting practical classes and organizing independent work, it will be useful to foresee the solution of certain real situations and conduct the analysis of all possible consequences, etc.

The application of modern information technologies in the educational process is stipulated by the rapid growth of the role of informatization in social life. To obtain reliable information, we recommend using verified sources, in particular, official websites of scientific centers and research institutions, educational portals, peer-reviewed electronic publications, etc. It is also useful to analyze several sources and form own opinion based on the information received.

Solution of the problem of the optimization of the educational process and provision of active position of students in the study of occupational health and safety discipline enables: involving students in research projects, developing their own thematic websites, working in remote access laboratories, writing articles for the Internet publications, visiting virtual thematic excursions, Internet communication technologies (web forums, e-mail, video conferences, online communication between students and teachers).

To confirm the expediency of the proposed measures, during 2019–2021, a chamber pedagogical experiment was conducted at Vinnytsia National Technical University to verify the proposed hypothesis regarding the possibility of purposeful formation of the safety culture of future specialists. The chamber experiment included eight academic groups of second- and third-year students (164 students in total), experimental (89 students) and control (75 students) groups were formed. The results of the experiment were evaluated according to the levels of educational achievements in occupational health discipline students obtained during the testing. The chamber pedagogical experiment included the analysis of the selection of control and experimental groups of students. We use the non-parametric Pearson test to check the homogeneity of the distribution of the isolated groups:

$$\chi^2_{empir} = N \cdot M \cdot \sum_{i=1}^{L} \frac{\left(\frac{n_i}{N} - \frac{m_i}{M}\right)^2}{n_i + m_i}$$

where N and M are the number of members of the control and experimental groups; n_i, m_i – is the number of members of the control and experimental groups who demonstrated the i-th level of educational achievements in labor protection; L is the number of isolated levels.

Before calculating the Pearson test, hypotheses with the following formulation will be suggested:

- the null hypothesis is that the proportion of students who showed a certain level of educational achievements in labor protection at the beginning of the chamber experiment in the experimental group is not greater than in the control group;
- an alternative hypothesis is that the proportion of students who showed a certain level of educational achievements in labor protection at the beginning of the chamber experiment is greater in the experimental group than in the control group.

According to the results of calculations $\chi^2_{емпір.} < \chi^2_{крит.}$ which for a significance level of 0.01 is 9.2. This gives reason to believe that at the beginning of the chamber experiment, the samples are homogeneous. As part of the analysis of the dynamics of the educational achievements of occupational health students during the chamber experiment, we present the data obtained at the beginning and at the end of the experiment in graphic form (Fig. 3).

As it can be seen from Fig. 3, at the end of the chamber experiment, the share of students with the initial level of educational achievements of competence in the experimental group decreased from 54.55% to 22.73%, in the control group – from 46.51% to 44.19%; a significant increase in the number of students with sufficient and high levels is observed in the experimental group from 9.09% to 20.45% and from 0.00% to 11.36%, respectively, against the background of the absence of such dynamics in the control group. The use of the Pearson test confirms the significance of the obtained results.

Therefore, the positive results obtained in the process of the chamber pedagogical experiment confirm that the solution to the problem of forming a safety culture of future specialists in technical specialties during the professional training is possible only under the condition of the formation of motivation for studying labor protection disciplines.

In the process of professional training, future employees need to learn how to solve occupational health and safety problems by understanding and applying scientific approaches and methods, be able to formulate and detail the existing problem, analyze ways to solve it and options for achieving the best results under constantly changing circumstances.

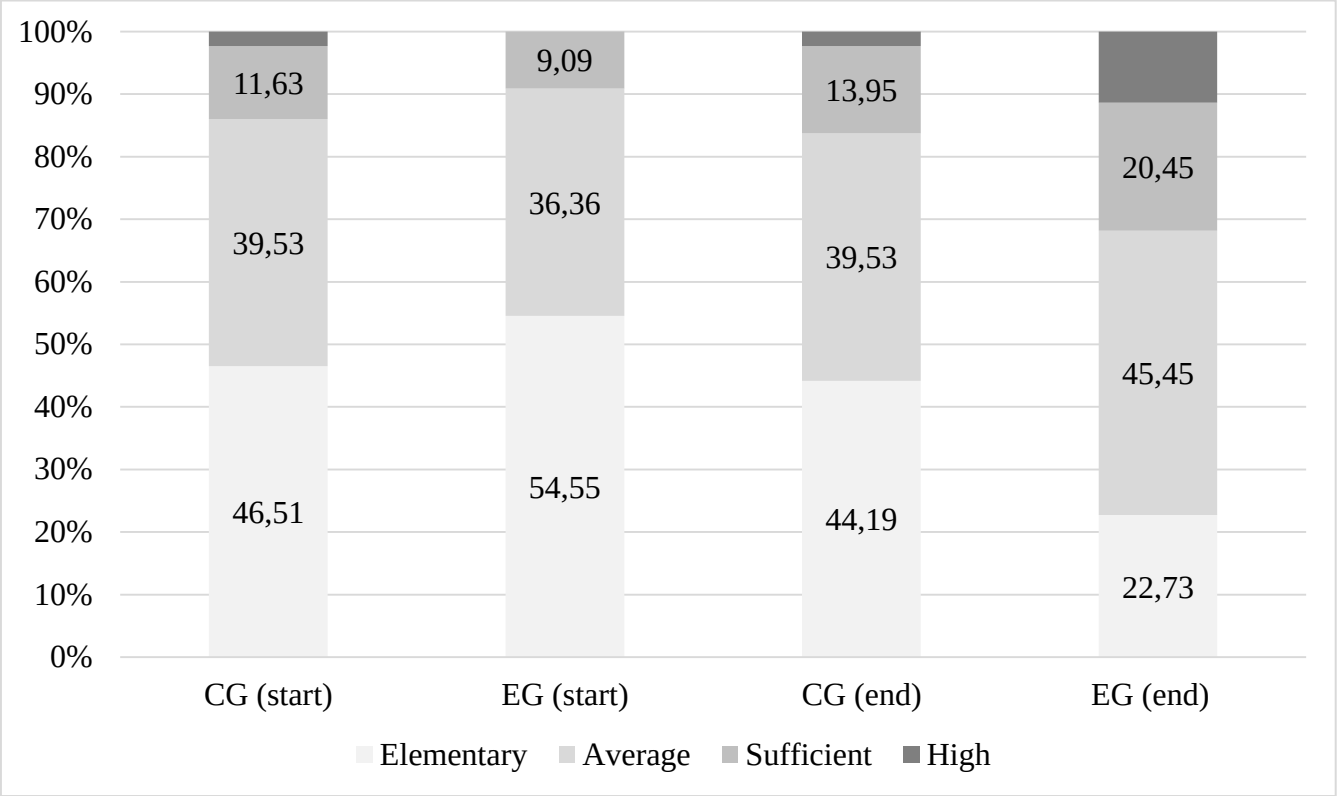

Fig. 3. Dynamics of educational achievement levels of the students in occupational health from the beginning to the end of the chamber experiment

Conclusions. Formation of the conviction of the importance of observing safe methods of performing professional tasks and the priority of the employee's health during work activities are priority issues of the professional development of the individual. This puts on the agenda of the institutions of higher education the necessity of forming occupational health and safety competence of future specialists in technical specialties who will have to work in conditions with the increased risk. At the same time, the educational process should be focused not only on the transfer of information, but also on the development of the ability to apply what has been learned during the safe performance of professional practical tasks.

A detailed analysis of accident statistics shows that greater part of them is caused by inefficient management decisions. Taking into account the fact that some specialists will occupy high managerial positions in the future, their level of occupational safety competence must be sufficient to ensure not only their own safety, but also the occupational safety of other persons participating in the production process.

Therefore, the issue of ensuring the quality of knowledge on labor protection in the process of training specialists in technical specialties is quite relevant. The formation of labor protection competence requires the improvement of forms and methods of labor protection training, the introduction and usage of informational, person-oriented methods, as well as the creation of conditions for the development of motivation based on the professional orientation of labor protection disciplines. The results of the conducted chamber experiment using statistical tools confirm the feasibility of the outlined approach. The prospects for further research are the development of methodological prin-

ciples for the formation of a culture of occupational safety, taking into consideration the peculiarities of the professional training of future specialists.

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ФОРМУВАННЯ КУЛЬТУРИ БЕЗПЕКИ ПРАЦІ ФАХІВЦІВ ТЕХНІЧНИХ СПЕЦІАЛЬНОСТЕЙ

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Реферат

Актуальність: відсутність мотивації до дотримання вимог безпеки праці як у роботодавців, так і у самих працівників, недостатня обізнаність персоналу організацій щодо наявних професійних ризиків, що виникають в процесі провадження професійної діяльності, актуалізує питання цілеспрямованого формування культури охорони праці у студентів закладів вищої освіти.

Мета: проаналізувати особливості формування культури безпеки майбутніх фахівців в процесі навчання у ЗВО, на підставі теоретичних напрацювань та проведеного пілотного експерименту розробити напрями забезпечення ефективності вивчення працеохоронних дисциплін.

Методи: теоретичні (аналіз і синтез, абстрагування та ідеалізація, узагальнення, індукція й дедукція, аналогія); емпіричні (вивчення літератури, спостереження, бесіда, опитування, вивчення результатів освітньої діяльності і узагальнення педагогічного досвіду, експеримент); статистичні (методи опрацювання статистичних даних, критерій $\chi 2$ Пірсона).

Результати: встановлено, що культура безпеки праці фахівця є відкритою системою, розвиток якої залежить від наявних теоретичних знань, отриманих під час навчання та усвідомлення значущості безпеки для фахової діяльності. Визначено чинники формування культури безпеки праці та запропоновано напрямки вдосконалення навчального процесу з охорони праці в процесі фахової підготовки.

Висновки: отримано статистично значущі результати, які підтверджують висунуту гіпотезу. Встановлено, що вирішення проблеми формування культури безпеки праці майбутніх фахівців технічних спеціальностей в процесі фахової підготовки стає можливим в процесі професійної підготовки шляхом перетворення студентів із пасивних споживачів готових знань на компетентних особистостей. Перспективами подальшого дослідження вважаємо розробку методичних засад формування культури безпеки праці із врахуванням особливостей професійної підготовки майбутніх фахівців.

Ключові слова: *культура безпеки праці, заклади вищої освіти, вдосконалення освітнього процесу, ризик-орієнтований підхід, фахівці технічних спеціальностей*

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