



# DEVELOPING SAFETY CULTURE OF PROFESSIONAL ACTIVITIES OF FUTURE BUILDERS: THE RESULTS OF THE PEDAGOGICAL EXPERIMENT

**Natalia Kulalaieva,**

Candidate in Chemical Sciences, Associate Professor, the Head of the Laboratory for professional training technologies, Institute of vocational education and training of NAES of Ukraine,  
<http://orcid.org/0000-0002-8613-1495>, e-mail: [culture2016@ukr.net](mailto:culture2016@ukr.net)

## **Abstract.**

*Relevance:* the article substantiates the need to develop and experimentally test the effectiveness of the author's methodological system. Theoretical analysis of the problem under study is carried out on the basis of scientific works on the formation of life safety cultures in young people and the development of pedagogical and methodological systems.

*Aim:* of the article was to experimentally test the developed methodological system of forming a safety culture of professional activity for future builders and to substantiate its future prospects.

*Methods:* theoretical; empirical (self-evaluation methods; peer evaluation); mathematical and statistical (frequency analysis; criterion test of statistical hypotheses; Spearman's rank correlation coefficient; Statistical Package for the Social Science for the social sciences, Microsoft Excel).

*Results:* a purposeful, personally-oriented, culturally appropriate and self-organizing methodological system has been developed that provides a continuous process of improving the complex of values and motives, knowledge and skills, as well as the development of professionally important qualities for the prevention and overcoming of dangerous situations and ecological threats literate behaviour, building effective communication in the professional environment during their training in vocational (vocational) educational institutions. The author defines the criteria and the corresponding indicators for assessing the levels of formation of a safety culture of professional activity in future builders.

*Conclusions:* the results of the experiment confirmed the positive influence of the developed methodological system on the growth of the level of safety culture formation of professional activity in them. In the future, it is envisaged to study and apply the best foreign practices on its formation and development in future specialists, construction workers and teachers, to create an informational educational environment for its formation among vocational education institutions.

**Keywords:** *professional activity safety culture, future construction workers, methodical system, professional (vocational) education schools.*

**Introduction.** There is only one possibility to develop the economy and society of the world as a whole – to increase the quality of its main source – human capital. The lack of attention to its development leads to significant losses, limits opportunities for economic growth and management efficiency at all institutional levels. In addition, changes in the techno-economic sphere far outstrip human opportunities for adapting to

them (Pyshchulina and others, 2018). Thus, the rapid updating and complication of production technologies leads to limiting the time for employees to launch the industrial safety systems in time. Especially it is crucial for industries with outdated linear models of economic consumption and production, active and purposeful ignorance of introducing the professional safety systems personnel, particularly in construction.

Under following circumstances, the issues of need for forming and developing future professionals on professional activity safety culture is becoming the one of high priority. Thus, the “benchmark point” of VET modernization should be the safety and development of an “individual as the highest value of the state and the most important engine for updating its industrial relations” (Ershova, 2018, pp. 162). Against this background, the experience on vocational education system organization in the countries with highly developed economies is useful as the issue on health keeping plays the key role in providing training for professionals of construction industry (Pukhovskaya, Vornachev and Leu, 2015; Leu, 2018, pp. 5; Kulalaieva and Leu, 2019, pp. 162-163).

Therefore, it is not in doubt to assure forming of professional activity safety culture for future skilled construction workers (hereinafter referred to as PASC). It should be noted that PASC formation is the most important direction for implementing the strategy of sustainable (balanced) development for society. That assures the life quality improvement for people, namely: rising life safety, health, social and economic security, safe interpersonal communication, environment friendly living, work safety, efficient use of natural resources etc. The implementation of the outlined foresees the development, theoretical substantiation and experimental efficiency verification of methodological system on PASC forming for future skilled construction workers in professional (vocational) education schools (P(V)E schools).

**Materials.** Theoretical analysis for the studied problem is based on papers on life safety formation for the youth (S. Abramova, V. Akimov, I. Vorobiov, I. Golubieva, L. Horyna, R. Durniev, T. Zyrianova, M. Zorina, A. Kazmina, S. Kosynkina, N. Lyz, V. Moshkin, I. Nemkova, V. Sapronov etc.), in particular in the system of professional education (V. Behun, V. Berezutskyi, M. Vlasova, O. Dronov, O. Zaporozhets, M. Zorina, O. Mykhailov, V. Mykhailiuk, L. Sorokina, O. Sharovatova etc.).

While developing and theoretical substantiation of the author’s methodological system, the research on creating pedagogical and methodological systems was taken into account (H. Aleksandrov, N. Ivankova, N. Timoshkina, T. Chshyieva, N. Kuzmina, O. Mykhailov, M. Mykhniuk, A. Kalenskyi, M. Ryzhakov, V. Zhuchkov, O. Ponomariova, T. Smykovska, T. Ivanova, T. Feshchenko etc.). Thus, according to O. Ponomariova, the methodological system is the ordering of the interconnected components set those generally characterize all pedagogical activity components in the given social conditions (Ponomariova, 2013). N. Kuzmina includes the purpose, content, methods and means of training and

organizational forms of the educational process to the methodical system. She notes that these components are the same as in the pedagogical system, but “the difference is that each of them has acquired a methodical function” (Kuzmina, 2002). O. Mykhailov, while substantiating the design of the methodological training system for a future life safety teacher, notes that it is capable to functioning only if it defines its goals, training objectives and content via including educational process planning, control, analysis and adjustment (Mykhailov, 2016, pp. 115). The results of the following scientific research testify their based on necessity and expediency for developing the appropriate methodological system.

**The article aims** to present the results of the experimental verification of the developed methodological system for forming the professional activity safety culture for future skilled construction workers and substantiate the future prospects of this system.

**Methods.** Theoretical (induction, deduction, synthesis and generalization; modeling); empirical (praximetric (study and analysis of pedagogical experience, work plans, training programs for future skilled construction workers and the results of their activities); questionnaire-diagnostic (questioning, conversation, testing, interviewing); self-assessment; expert evaluation (Delphi method, method of commission)); mathematical and statistical (graphoanalytic, method of hierarchy analysis; ranking and scaling; frequency analysis; test of statistical hypotheses (Pearson’s criterion  $\chi^2$ ); Spearman’s rank correlation coefficient; Statistical Package for the Social Sciences for Social Sciences, Excel).

**Results and discussion.** In the course of the research it is proved that the methodological basis for PASC formation for future skilled construction workers consists of following approaches: system (provides the appropriate methodological system development, promotes forming students’ systemic thinking), synergy (considers a student’s personality as a system capable for self-organization, and self-realisation), activity (provides efficient activity management via purposeful modeling of conditions and means for its improvement based on synthesis of theoretical knowledge and empirical experience), cultural (allows to create favorable conditions for comprehensive development of youth, provides for formation of a student’s personality in socio-cultural significance), anthropological (pays considerable attention to ergonomics and safe working conditions in the workplace), competent (enables professional safety; correctly apply the acquired competencies of commitment to safety in practice), environment-friendly (helps to create an innovative cultural and educational environment in P(V)E schools with

the priority for future professionals' health benefits and lives); personal development (foresees the development of students' potential opportunities and abilities, their professional and personal qualities for future safe professional activity).

Based on this, a purposeful, personally-oriented, culturally appropriate and self-organizing methodical system for PASC formation for future skilled construction workers is developed. That provides a continuous process for improving the complex of values and motives, knowledge and skills, as well as professional important skills development for preventing dangerous situations and threats for construction workers' health and life at workplace, environmentally competent and energy-saving professional behavior, completing efficient communication in professional environment while their studying in P(V)E schools. It structurally and functionally envisages the gradual realization of PASC formation goals via its diagnosis, implementation, evaluation and management. It is built on theoretical grounds based on principles, factors, pedagogical conditions, means and ways of PASC forming as a personality's integrative formation. It is provided by the author's methodology that consists of diagnostic-prognostic, design-organizational, innovation-activity and reflexive-evaluation stages.

The structural components of the author's methodical system include: purpose, content, means of pedagogical communication, teachers, students, diagnostics and control and the following methodological system. The functional components of the proposed system are: design, cognition, procedure, gnostic, reflexivity, control and evaluation (Kulalaieva, 2018, pp. 139). This methodological system is provided at two levels: content and activity. That implies gradual PASC formation for future constructors based on content mastering, appropriate forms applying, methods, interactive technologies, as well as the developed author's methodology, and use of the developed educational-methodical complex. It includes the program and the author's course "The professional activity safety culture for construction workers"; calendar-thematic planning of lessons; educational and methodical manual "The professional activity safety culture for construction workers"; trainings for teachers; distance courses for pedagogical workers, "The professional activity safety culture for construction workers", "Energy-efficient competence for pedagogical workers of P(V)E schools of construction profile"; "Safety Culture" web-site, guidelines "Forming the professional activity safety culture for future skilled construction workers"; self-control tests; means of control (tests for ongoing and final control of students' academic achievement, questions

for students' self-control); the list of recommended literature and the Internet resources for studying the course; glossary (dictionary of terms); educational information visualization tools (multimedia presentations, videos, reference charts, etc.).

We emphasize that PASC formation for future skilled construction workers is reflected in their conscious professional behavior in compliance with them. It is formed via their acquisition of theoretical and practical knowledge in PASC field, acquiring the PASC based professional skills, developing the professionally important qualities those are important for the mastering and value-based attitude to PASC (Kulalaieva, 2018, pp. 22).

The PASC formation level assessment of future skilled construction workers was carried out according to the developed criteria and their corresponding indicators: value-motivational (value-based attitude to professional and personal safety; positive attitude to own health keeping while professional activity; need in eco-smart professional behavior; motivation to energy-saving professional behavior; desire for constructive professional communication), innovative-cognitive (theoretical knowledge on methods and means of preventing hazardous situations in the construction site; knowledge of ensuring the health of workers at the construction site; understanding of environmental threats from pollution and harmful substances generated in the construction industry; knowledge of energy-efficiency in construction; rules and basics based on awareness of construction workers' communicative interaction), behavioral-active (ability to plan own strategy of safe behavior; skills for preventing occupational injuries and illnesses for construction workers; skills and environmentally conscious professional behavior; possession of energy efficient technologies, methods and means of energy saving in construction; professional communication skills at the construction site), and evaluation-reflexive (professionally important qualities, important for: own strategy of safe professional behavior; prevention of professional injuries and diseases for builders; ensuring environmentally conscious professional behavior; ensuring professional efficiency; activity). There are three levels of its formation: the first level – low (consumer), the second – medium (reproductive), the third – high (productive). The transition from low to high levels of professional safety culture is provided via purposeful measures based on changes made at previous levels.

Pedagogical experiment was carried out on the basis of P(V)E schools (Kamianka professional lyceum, Vasylykiv professional lyceum, Voznesensk professional lyceum, Snegurov professional lyceum, Mykolaiv professional lyceum, Odesa Center for

VET, Odessa professional lyceum for building architecture and construction, Chernivtsi professional lyceum for construction, Kyiv Regional high VET school for construction, Romny High VET school).

While the parallel experiment, the experimental and control groups were formed (number of students in control groups was 396; number of students in experimental groups was 382). The students of control groups were trained based on traditional approaches and students of experimental groups – had changed training conditions based on introducing the author’s methodical system for future skilled construction workers’ PASC formation.

The diagram shows comparative results on diagnosing PASC levels formation for future skilled workers of construction profile at control and experimental groups (at ascertaining and forming stages of experiment) (*Drawing 1-2*).

At the experimental stage of experiment, the differences between indicators of control and experimental groups were not statistically significant at the level  $\alpha = 0.05$  by all criteria, namely: value-motivational ( $\chi^2 = 0.39$ ); innovative-cognitive ( $\chi^2 = 0,270$ ), behavioral-activity ( $\chi^2 = 0,072$ ); evaluative-reflexive ( $\chi^2 = 0,33$ ). Such results attest the uniform quality of selection.

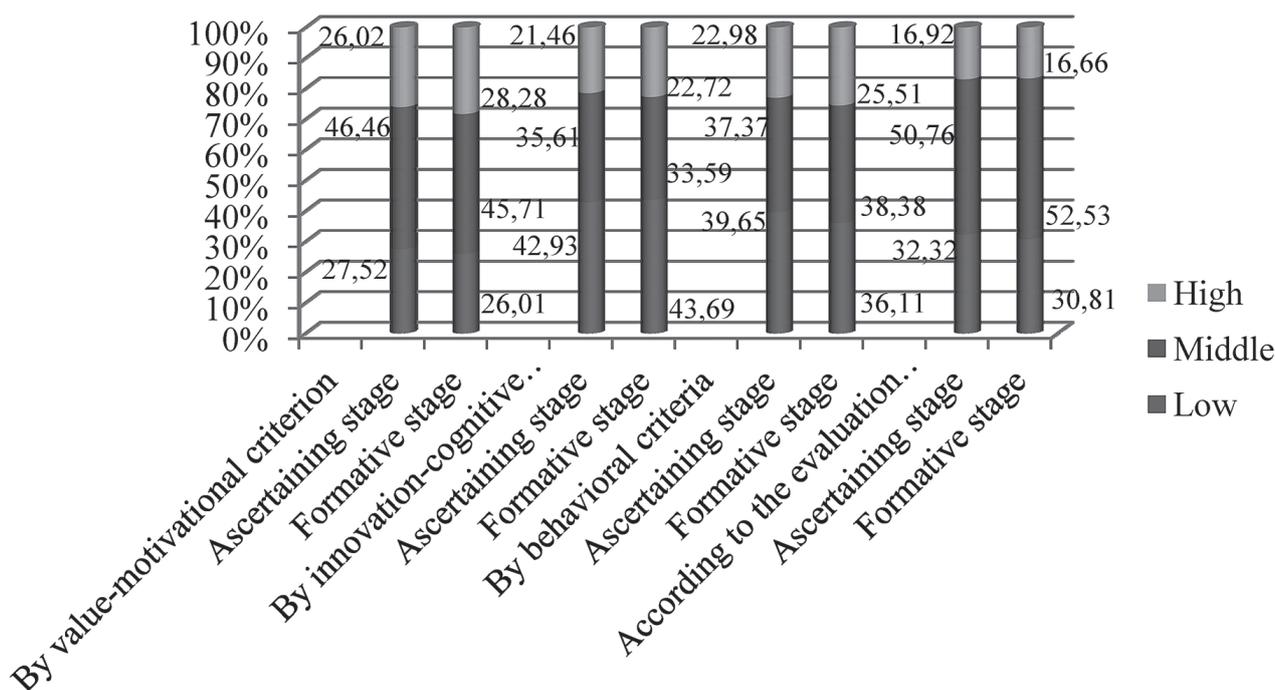
The analysis results on PASC levels formation of future skilled workers of construction profile of control and experimental groups by all criteria at the formative stage showed more significant positive

changes for the students of experimental groups. Differences between control and experimental groups were statistically significant at the level  $\alpha = 0.05$  by all criteria: value-motivational ( $\chi^2 = 12,613$ ); innovative-cognitive ( $\chi^2 = 11,974$ ); behavioral activity ( $\chi^2 = 14,747$ ); evaluative-reflexive ( $\chi^2 = 12,449$ ). The given data make it possible to confirm the positive influence of developed and scientifically grounded methodological system on raising PASC level formation of future skilled workers of construction profile.

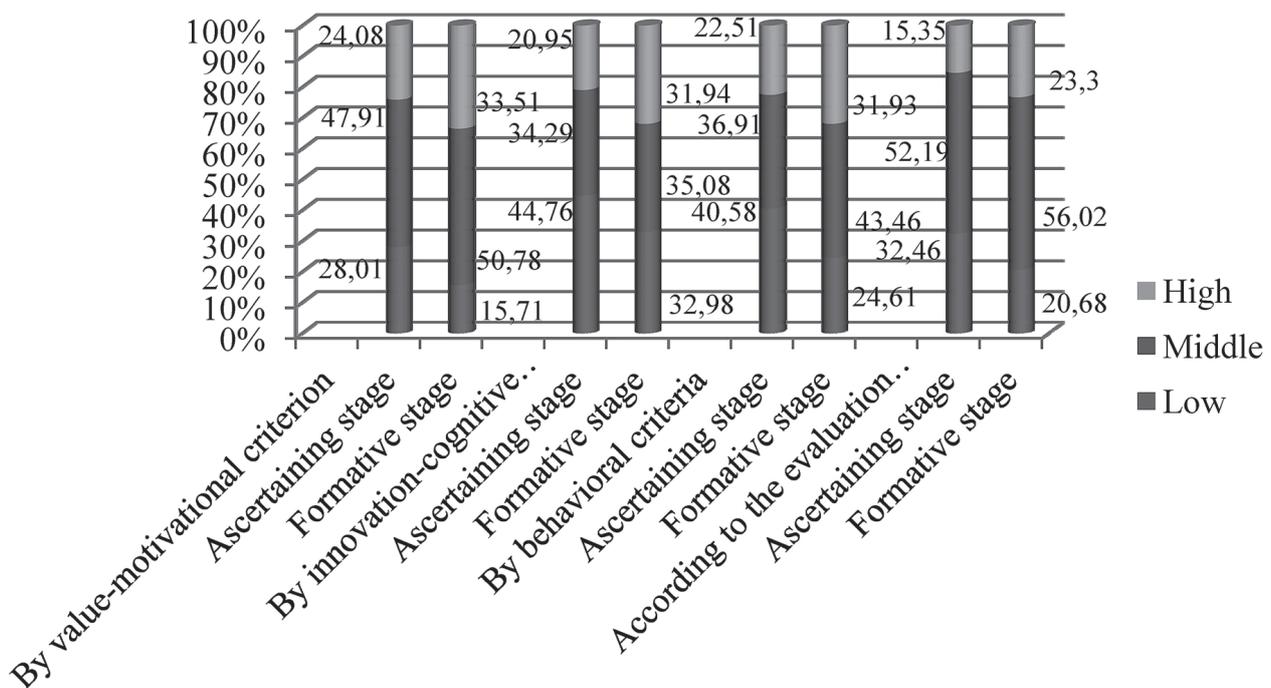
In addition, the expert efficiency evaluation for developed curriculum of the author’s course and training manual “Professional activity safety culture for construction workers” by three groups of experts (scientists, methodologists of Training-methodological centers of VET and pedagogical staff of VET schools). The calculated values of Spearman’s rank correlation coefficients confirmed the consistency of experts’ opinions.

In the future, it is planned to develop methodological bases for PASC development of construction enterprises personnel and pedagogical staff of P(V) E schools for construction profile, study and use of best foreign practices for future professionals’ PASC formation and development, creating educational information environment for PASC formation P(V) E network.

**Conclusions.** The efficiency of developed methodological system for professional activity safety culture



*Drawing 1. Comparative results on diagnosing PASC formation levels for future skilled workers of construction profile (%) at control groups (at ascertainning and forming stages of experiment)*



Drawing 2. Comparative results of PASC diagnostic levels for future skilled workers of construction profile (%) at experimental groups (at ascertainning and forming stages of experiment)

of skilled construction workers, that is purposeful, person-oriented, culture responsive and capable to self-organization, consists of structural units and functional components. It provides at content and activity levels the step-by-step PASC formation of future construction workers based on mastering the content, using appropriate forms, methods, interactive technologies, as well as developed author's methods

and training-methodological complex. The study prospects include the development of methodological bases for PASC development of construction industry enterprises personnel and pedagogical employees of P(V)E schools for construction profile, study and use of best foreign practices for future specialists' PASC formation and development, creation of educational information environment for PASC formation in the network of domestic P(V)E schools.

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## **Формування культури безпеки професійної діяльності майбутніх будівельників: підсумки педагогічного експерименту**

**Наталя Кулаласва,**

кандидат хімічних наук, доцент, завідувач лабораторії технологій професійного навчання, Інститут професійно-технічної освіти НАПН України

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### **Реферат.**

*Актуальність:* необхідність розроблення та експериментальної перевірки результативності авторської методичної системи визначається завданнями збалансованого розвитку світової економіки і суспільства, зокрема потребою в підвищенні якості людського капіталу.

*Мета:* експериментальна перевірка розробленої методичної системи формування культури безпеки професійної діяльності в майбутніх будівельників та обґрунтування його подальших перспектив.

*Методи:* теоретичні; емпіричні (методи самооцінювання; експертного оцінювання); математичні та статистичні (частотний аналіз; критерій перевірки статистичних гіпотез; коефіцієнт рангової кореляції Спірмена; статистичний пакет SPSS (Statistical Package for the Social Science) для соціальних наук, програма Microsoft Excel).

*Результати:* розроблено цілеспрямовану, особистісно орієнтовану, культуровідповідну та здатну до самоорганізації методичну систему, що забезпечує безперервний процес удосконалення комплексу цінностей і мотивів, знань і вмінь, а також розвиток професійно важливих якостей щодо попередження та подолання небезпечних ситуацій і загроз здоров'ю та життю будівельників, екологічно грамотної поведінки, побудови ефективної комунікації у професійному середовищі під час їхньої підготовки в закладах професійної (професійно-технічної) освіти; визначено критерії та відповідні їм показники для оцінювання рівнів сформованості культури безпеки професійної діяльності у майбутніх будівельників.

*Висновки:* експериментально доведено, що відмінності контрольних та експериментальних груп є статистично значущими на рівні  $\alpha = 0,05$  за всіма критеріями: ціннісно-мотиваційним ( $\chi^2=12,613$ ), інноваційно-когнітивним ( $\chi^2=11,974$ ), поведінково-діяльним ( $\chi^2=14,747$ ), оцінно-рефлексивним ( $\chi^2=12,449$ ), що доводить результативність розробленої методичної системи формування культури безпеки професійної діяльності в майбутніх кваліфікованих робітників будівельного профілю.

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**Ключові слова:** *культура безпеки професійної діяльності, майбутні будівельники, методична система, заклади професійної (професійно-технічної) освіти.*

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Received: 22 August 2019

Accept: 04 November 2019