



# DEVELOPING ENVIRONMENTAL COMPETENCE IN FUTURE TEACHERS OF SPECIALIZED SUBJECTS FROM AGRICULTURAL VOCATIONAL EDUCATION INSTITUTIONS: RESULTS OF PEDAGOGICAL EXPERIMENT

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## Abstract.

*The relevance* of the article lies in the lack of experimentally verified methods for developing environmental competence in future teachers of specialized subjects from agricultural vocational education institutions.

The article *aims* to experimentally verify the author's methods for developing environmental competence in future teachers of specialized subjects from agricultural vocational education institutions.

*Research methods* include the following: theoretical (analysis, synthesis, comparison – to clarify the concept of “environmental competence of future vocational agriculture teachers”; to describe its structure, criteria, indicators and levels of development); empirical (questionnaires, observation of participants in the educational process, pedagogical experiment, methods of mathematical statistics – to determine the status and levels of environmental competence in future teachers from vocational education institutions).

*Results:* The article presents the author's methods for developing environmental competence in future teachers of specialized subjects from agricultural vocational education institutions. These methods ensure continuing improvement of the necessary knowledge, skills and abilities. Next, they nurture future teachers' awareness of the physical environment and its impact on one's professional and daily activities, and vice versa. Finally, the author's methods increase future teachers' environmental literacy.

*Conclusions:* The results of the formative experiment indicate some positive dynamics in the levels of environmental competence in future teachers of specialized subjects from agricultural vocational education institutions. This proves the effectiveness of the author's methods. It has been experimentally confirmed that the differences between control and experimental groups are statistically significant by all criteria: the motivational criterion (a sufficient level – 0.18%, a high level – 15.75%), the cognitive criterion (0.14% and 6.21%, respectively), the activity-related criterion (1.2%, and 13.21%), the actor-related criterion (0.6% and 11.78%).

**Keywords:** *vocational education, environmental competence, future teachers, pedagogical experiment.*

**Introduction.** Nowadays, it is crucial to discover ways of solving the global environmental crisis. In the early 21st century, the civilized world witnessed and realized the scale and possible consequences of environmental neglect at all levels (planetary, national, personal). Despite the globality of environmental problems, the solution must begin with the personal level at which environmental awareness, values and culture are formed. It

must be noted that this strategy for raising environmental awareness among citizens is regulated by the state and is implemented by the education system. The key actor in this process is the teacher (mentor, coach, facilitator), namely, a person whose environmental competence affects the development of future specialists as citizens in the post-industrial era with all its environmental problems and prospects.

**Sources.** This research relies on scientific views on a) the goals, objectives and principles of environmental education (N. Avramenko, N. Bakhmat, P. Bachynskiy, M. Bauer, O. Mitriasova, N. Ridei); the ways of developing environmental culture in pupils and pedagogy students (N. Kulalaieva, L. Pavliuk, H. Ponomarova, M. Shved); environmental views of agriculture students (N. Nehrutsa); environmental competence of pupils and students (O. Horenkova, L. Lukianova, V. Marshytska, S. Tytarenko); environmental competence in the context of 21st-century skills and values (H. Odnoroh, O. Radkevych, V. Radkevych, M. Yershov). The standard procedure for conducting a pedagogical experiment (P. Luzan, I. Sopivnyk, S. Vyhovska) has determined an algorithm for experimental verification of the effectiveness of the author's methods.

**The article aims** to experimentally verify the author's methods for developing environmental competence in future teachers of specialized subjects from agricultural vocational education institutions.

Research methods include the following: theoretical (analysis, synthesis, comparison – to clarify the concept of “environmental competence of future vocational agriculture teachers”; to describe its structure, criteria, indicators and levels of development); empirical (questionnaires, observation of participants in the educational process, pedagogical experiment, methods of mathematical statistics – to determine the status and levels of environmental competence in future teachers from vocational education institutions; to evaluate the accuracy, reliability and effectiveness of the selected empirical tools).

**Results and discussion.** As required by the education standard, future teachers should acquire generic and discipline-specific competences. Concerning vocational agriculture teachers, environmental competence is viewed as one of the main competences. The very concept of environmental competence as a psycho-pedagogical phenomenon is constantly optimized. It, as well as its structure, depends on the development of environmental studies as a field of scientific knowledge.

In pedagogy, there are several approaches to defining the concept of “environmental competence”. V. Marshytska (2005) claims that “environmental competence is one's ability to act accordingly in everyday life and towards the natural environment, to use the acquired knowledge, skills and experience to make concrete decisions in full awareness of their consequences for nature”. S. Aleksieiev (2006) views environmental competence as “one's ability to solve different problems that may occur in life and

work with the help of values and motives, knowledge, learning and life experience, individual characteristics”. L. Rudenko (2008) believes that “environmental competence consists of one's readiness and ability to practically solve environmental problems, personal qualities combined with the necessary stock of knowledge and skills to act effectively and expediently in problematic situations in different areas and discover the right ways to solve them”. According to L. Tytarenko (2007), environmental competence is “one's ability to apply environmental knowledge and experience in professional situations by prioritizing environmental values and non-pragmatic motivation of interaction with the environment and realizing the responsibility for environmental consequences of one's professional or other activities”. At the same time, some researchers state that environmental competence is “a set of abilities to solve various problems in everyday life and at work based on the respect for nature, learning and life experience, as well as individual needs and motives” (Lukianova and Horenkova, 2008).

Given the aim of this research, a detailed analysis of approaches to defining the specified concept allows one to interpret environmental competence as *one's quality that systematically combines the acquired environmental knowledge, skills, abilities, patterns of environmentally friendly behaviour, environmental values and readiness to act accordingly in professional, pedagogical and life situations, adhering to non-pragmatic motivation to interact with the environment.*

Environmental competence serves as the basis for developing environmental culture in future vocational agriculture teachers. It consists of the following components: motivational, cognitive, practical, self-evaluative.

Concerning the specifics of research objectives, it has been agreed to assess environmental knowledge of future vocational agriculture teachers through a parallel pedagogical experiment. The experiment was conducted at Mykolayiv National Agrarian University, Lviv National Agrarian University, Rivne State University of Humanities, the National University of Water and Environmental Engineering, Polissia National University.

The experiment aimed to verify the effectiveness of the author's methods for developing environmental competence in future teachers of specialized subjects from agricultural vocational education institutions. If there are appropriate pedagogical conditions in educational institutions, as the research hypothesis assumed, then one can achieve positive dynamics

in all the components of future teachers' environmental competence. These pedagogical conditions should be as follows: motivating future teachers to gain environmental knowledge; updating professional teacher training with the latest environmentally friendly technologies; promoting the use of interactive pedagogical technologies in professional-environmental training of future teachers.

A total of 384 respondents was determined as the required number for the conduct of the experiment. In fact, 397 university students (future vocational agriculture teachers) participated in the experiment. The typical selection method was employed to ensure the representativeness of experimental and control groups. The respondents were randomly divided into groups. The control group (CG) involved 199 students ( $n_1 = 199$ ) and the experimental one (EG) 198 ( $n_2 = 198$ ). The ascertaining stage of the experiment indicated that both EG and CG did not show any significant differences in the levels of students' discipline-specific training, as well as in the motivation for learning. The latter is seen as the basis for obtaining objective results on environmental competence levels in future teachers.

The experiment has allowed one to identify levels of environmental competence in future vocational agriculture teachers by certain criteria and corresponding indicators: the motivational criterion (one's attitude towards nature as an indisputable value; one's responsibility for preserving the environment; awareness of oneself as part of nature; the need for energy and resource conservation; the presence of environmental values and incentives in life and work); the cognitive criterion (a system of environmental knowledge (in the framework of natural

sciences); knowledge about protection of the natural environment, energy and resource conservation; the ability to apply this knowledge in environmental management and naturalist projects); the activity-related criterion (the ability to practically apply the acquired knowledge; the ability to act effectively in problematic situations related to health preservation; the ability to find alternative solutions for energy and resource conservation; readiness to organize environmental activities for young people); the actor-related criterion (the tendency towards environmentally friendly behaviour and activities; the ability to predict the consequences of one's behaviour and take responsibility for it due to the knowledge of environmental norms, laws and rules; self-motivation, reflection and awareness of healthy living and its role in self-development, self-fulfilment and self-regulation). Also, it was important to justify the levels (high, sufficient, basic) of environmental competence in future teachers of specialized subjects from agricultural vocational education institutions.

According to all the criteria, no statistically significant differences in the levels of EG and CG students' environmental competence have been found. Pearson's chi-squared test was applied to examine the significance of students' distribution by levels of environmental competence. Differences in EG and CG indicators under the specified criteria are at the level of  $p \leq 0.05$ , which confirms the homogeneity of the sample in both groups. At the beginning of the experiment, the levels of environmental competence in EG and CG students do not differ statistically significantly. The results of the ascertaining pedagogical experiment are presented in Table 1.

Table 1

**Levels of Environmental Competence in Future Vocational Agriculture Teachers by Criteria (the Ascertaining Experiment)**

Criteria	Levels						
	Basic			Sufficient		High	
	Number of students			Number of students		Number of students	
		abstract, respondents	relative, %	abstract, respondents	relative, %	abstract, respondents	relative, %
Motivational	CG	100	50.25	73	36.68	26	13.07
	EG	99	50.00	73	36.87	26	13.13
Cognitive	CG	87	43.72	74	37.19	38	19.09
	EG	88	44.44	73	36.87	37	18.69
Activity-related	CG	102	51.26	63	31.66	34	17.08
	EG	103	52.02	65	32.83	30	15.15
Actor-related	CG	85	42.71	79	39.70	35	17.59
	EG	88	44.44	73	39.90	31	15.66

To achieve positive dynamics in levels of future teachers' environmental competence and confirm the hypothesis of the research, the author's methods have been incorporated into professional teacher training in the above-mentioned institutions participating in the experiment. These methods have aimed a) to motivate future teachers to gain and consolidate environmental knowledge, b) update professional

teacher training with the latest environmentally friendly technologies and c) introduce interactive pedagogical technologies in professional-environmental training.

At the formative stage, the author's methods have been experimentally verified based on the analysis, generalization, statistical evaluation and comparison of the results obtained from experimental work (Table 2).

Table 2

**Levels of Environmental Competence in Future Vocational Agriculture Teachers by Criteria (the Formative Experiment)**

Criteria		Levels					
		Basic		Sufficient		High	
		Number of students		Number of students		Number of students	
		abstract, respondents	relative, %	abstract, respondents	relative, %	abstract, respondents	relative, %
Motivational	CG	95	47.74	74	37.19	30	15.07
	EG	63	31.82	74	37.37	61	30.82
Cognitive	CG	86	43.22	56	28.14	57	28.64
	EG	73	36.87	56	28.28	69	34.85
Activity-related	CG	95	47.74	73	36.68	31	15.58
	EG	66	33.33	75	37.88	57	28.79
Actor-related	CG	80	40.20	79	39.70	40	20.10
	EG	57	27.82	66	40.30	75	31.88

The obtained results prove that the author's methods have improved the indicators of sufficient and high levels under all criteria for future teachers' environmental competence. According to the motivational criterion, CG indicators of sufficient and high levels have increased by 0.6% and almost 15%, respectively, in contrast to EG (see Fig. 1). At the cognitive criterion, there are the following changes: indicators of sufficient and high levels have increased by 0.54% and 11.35%, respectively (see Fig. 2). The activity-related criterion also shows some positive dynamics in environmental competence levels at the sufficient level (by 0.82%) and the high level (by 12%) (see Fig. 3).

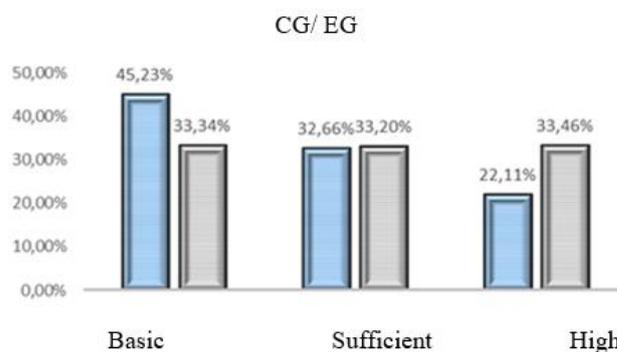


Fig. 2. Indicators of environmental competence levels in EG and CG at the formative stage (the cognitive criterion)

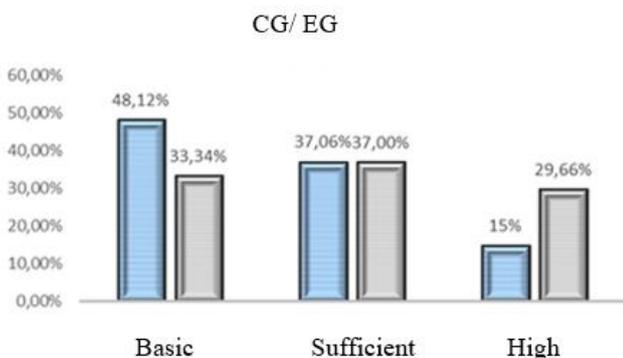


Fig. 1. Indicators of environmental competence levels in EG and CG at the formative stage (the motivational criterion)

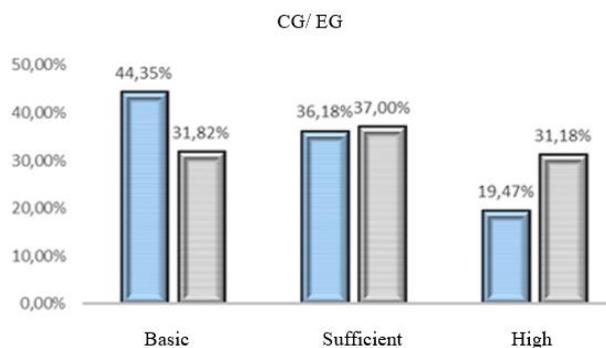


Fig. 3. Indicators of environmental competence levels in EG and CG at the formative stage (the activity-related criterion)

Concerning the actor-related criterion, indicators of environmental competence levels have increased by almost 1% and 17.3%, respectively (see Fig. 4).

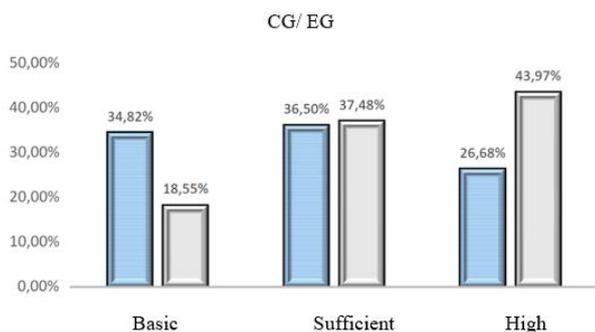


Fig. 4. Indicators of environmental competence levels in EG and CG at the formative stage (the actor-related criterion)

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## РОЗВИТОК ЕКОЛОГІЧНОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ ВИКЛАДАЧІВ СПЕЦІАЛЬНИХ ДИСЦИПЛІН ЗАКЛАДІВ ПРОФЕСІЙНОЇ ОСВІТИ АГРАРНОЇ ГАЛУЗІ: ПІДСУМКИ ПЕДАГОГІЧНОГО ЕКСПЕРИМЕНТУ

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### Реферат.

*Актуальність* зумовлена браком експериментально перевірених методик розвитку екологічної компетентності майбутніх викладачів спеціальних дисциплін закладів професійної освіти аграрної галузі.

*Мета:* експериментальна перевірка розробленої авторської методики розвитку екологічної компетентності майбутніх викладачів спеціальних дисциплін закладів професійної освіти аграрної галузі.

*Методи:* теоретичні (аналіз і синтез, порівняння й зіставлення – для з'ясування сутності поняття «екологічна компетентність майбутніх викладачів аграрного профілю»); визначення його структури, критеріїв, показників і рівнів розвитку); емпіричні (анкетування, спостереження за учасниками педагогічного процесу, педагогічний експеримент, математичної статистики – для з'ясування стану й результатів розвитку екологічної компетентності майбутніх викладачів закладів професійної освіти).

*Результати:* розроблено методику розвитку екологічної компетентності майбутніх викладачів спеціальних дисциплін закладів професійної освіти аграрної галузі, що забезпечує: безперервний процес удосконалення комплексу знань, умінь і навичок; розвиток професійно важливих якостей еколого-безпечної діяльності як у професійній діяльності, так і в повсякденному житті; покращення екологічної грамотності майбутніх викладачів спеціальних дисциплін закладів професійної освіти аграрної галузі.

*Висновки:* результати формульованого етапу експерименту свідчать про позитивну динаміку у рівнях сформованості екологічної компетентності майбутніх викладачів спеціальних дисциплін закладів професійної освіти аграрної галузі, що підтверджує ефективність впровадженої авторської методики; експериментально доведено, що відмінності контрольних та експериментальних груп є статистично значущими за всіма критеріями: за мотиваційним (на достатньому рівні зростання становить 0,18%, на високому – 15,75%), за когнітивним (відповідно – 0,14% та 6,21%), за діяльнісним (1,2%, та 13,21%), за суб'єктивним (0,6% та 11,78%).

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**Ключові слова:** професійна освіта, екологічна компетентність, майбутні викладачі, педагогічний експеримент.

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