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FORMATION OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR IN PRESCHOOL CHILDREN AND PROFESSIONAL TRAINING OF EDUCATORS: A SYSTEMIC APPROACH

Abstract. The article substantiates the conceptual foundations of forming ecologically appropriate behavior in preschool children as an integrated result of the interaction of cognitive, emotional-value, and behavioral-activity components within a systemic approach to the professional training of preschool educators. The content is defined, the structural components of specialist readiness are characterized, and the pedagogical conditions for implementing the relevant process in the educational environment of a preschool institution are substantiated. The relevance of the study is driven by the need to find new approaches to nurturing a personality capable of harmoniously coexisting with nature amid global environmental challenges, resource depletion, and deteriorating environmental conditions. Early childhood is recognized as a sensitive period for laying the foundations of environmental consciousness, value orientations, and responsible behavioral patterns. The aim of the article is to substantiate the structure of professional training for educators and to determine the stages of forming ecologically appropriate behavior in preschool children in their systemic interrelation. Research methods include theoretical analysis of regulatory frameworks and scientific literature; systematization for the development of a component-structural model; a констатувальний (baseline) stage of pedagogical experiment involving 120 future educators; diagnostic methods (observation, interviews, questionnaires for educators and parents). Assessment was conducted across three levels: high (creative), intermediate (reproductive), and low (passive). Scientific novelty: the concept of 'ecologically appropriate behavior of preschool children' is refined as a dynamic personal characteristic integrating environmental literacy and readiness for active environmental action; the content of its components is specified; sequential stages of formation are substantiated; the effectiveness of a set of pedagogical conditions is demonstrated. Practical significance: methodological recommendations for organizing an eco-educational environment are developed; a toolkit of effective forms and methods (ecological quests, integrated classes, project activities, Empowerment pedagogy) suitable for direct implementation in preschool settings is formed. The diagnostic findings indicate that the majority of student educators are at the intermediate readiness level, experiencing difficulties in practical application of acquired knowledge.

Keywords: ecologically appropriate behavior, preschool education, professional training of educators, sustainable development, systemic approach, pedagogical conditions, competence-based approach, environmental education.

ФОРМУВАННЯ ЕКОЛОГІЧНО ДОЦІЛЬНОЇ ПОВЕДІНКИ ДОШКІЛЬНИКІВ ТА ПРОФЕСІЙНА ПІДГОТОВКА ВИХОВАТЕЛІВ: СИСТЕМНИЙ ПІДХІД

Анотація. У статті обґрунтовано концептуальні засади формування екологічно доцільної поведінки дітей дошкільного віку як інтегрованого результату взаємодії когнітивного, емоційно-ціннісного та поведінково-діяльнісного компонентів у контексті системного підходу до професійної підготовки вихователів. Визначено зміст, охарактеризовано структурні компоненти готовності фахівця та обґрунтовано педагогічні умови реалізації відповідного процесу в освітньому середовищі закладу дошкільної освіти. Актуальність дослідження зумовлена необхідністю пошуку нових підходів до виховання особистості, здатної гармонійно співіснувати з природою в умовах глобальних екологічних викликів, виснаження природних ресурсів та погіршення стану довкілля. Особливу роль відіграє дошкільне дитинство як сенситивний період для закладення основ екологічної свідомості, ціннісних орієнтацій та відповідальних моделей поведінки.

Мета статті – обґрунтувати структуру професійної підготовки вихователів та визначити етапи формування екологічно доцільної поведінки дошкільників у їх системному взаємозв'язку.

Методи дослідження: теоретичний аналіз нормативно-правової бази та наукових праць; систематизація для розробки компонентно-структурної моделі; констатувальний етап педагогічного експерименту за участю 120 майбутніх вихователів; діагностичні методи (педагогічне спостереження, бесіди, анкетування педагогів і батьків). Оцінювання проводилось за трьома рівнями: високий (творчий), середній (репродуктивний) та низький (пасивний).

Наукова новизна: уточнено сутність поняття «екологічно доцільна поведінка дітей дошкільного віку» як динамічної характеристики особистості, що інтегрує екологічну грамотність та готовність до активної природоохоронної дії; конкретизовано змістове наповнення компонентів; обґрунтовано послідовні етапи формування; доведено ефективність сукупності педагогічних умов. Практична значущість: розроблено методичні рекомендації щодо організації еколого-розвивального середовища; сформовано кейс ефективних форм і методів (екологічні квести, інтегровані заняття, проєктна діяльність, педагогіка «Empowerment»), придатних для безпосереднього впровадження у практику ЗДО. Результати констатувального дослідження засвідчили, що більшість студентів перебуває на середньому рівні готовності, відчуваючи труднощі у практичній реалізації знань.

Ключові слова: екологічно доцільна поведінка, дошкільна освіта, професійна підготовка вихователів, сталий розвиток, системний підхід, педагогічні умови, компетентнісний підхід, екологічне виховання.

INTRODUCTION

The problem formulation. Contemporary environmental challenges related to the depletion of natural resources, environmental degradation, climate change, growing volumes of waste, and the need to establish the principles of sustainable development bring to the fore the problem of raising a personality capable of responsible interaction with the natural environment from an early age. In this context, preschool education acquires particular significance as the first level of education, at which the foundations of a child's worldview, value orientations, behavioural patterns, and attitude toward oneself, other people, and the environment are laid.

It is precisely in preschool age that primary conceptions of nature as an integral system are formed, emotional sensitivity, the capacity for empathy, imitation and moral choice develop, and the first experience of practical interaction with the natural environment is gained. Therefore, the formation of environmentally appropriate behaviour in preschool-age children should be regarded not as a narrow task of natural-science education, but as an important direction of the child's holistic personal development, one that combines cognitive, emotional-value and behavioural components. This view is consistent with contemporary scientific approaches, according to which environmentally appropriate behaviour is interpreted as an integrated process by which a child acquires experience of active, responsible and value-motivated interaction with nature (Kollmuss & Agyeman, 2002; Kopnina, 2020).

At the same time, an analysis of scholarly-pedagogical discourse and educational practice shows that, despite the undeniable importance of the problem, it requires further theoretical elaboration and methodological clarification. This concerns, above all, defining the substantive content of this process, substantiating its stage-by-stage structure, and justifying the pedagogical conditions that ensure a genuine transition from environmental knowledge to considered actions and habits in the child's daily life. In the practice of preschool education institutions, the informational component is frequently observed to prevail over the activity-based and value components, whereas effective formation of environmentally appropriate behaviour is possible only when these are united as a whole.

Analysis of recent research and publications. The problem of forming environmentally appropriate behaviour in preschool-age children is within the field of attention of Ukrainian and foreign scholars and is examined in the context of environmental education, education for sustainable development, the formation of a value-based attitude toward nature, and personality development. Scholarly discourse presents various approaches: “ecological behaviour,” “nature-appropriate behaviour,” “ecologically motivated behaviour,” and so on.

A substantial contribution to the elaboration of theoretical foundations was made by H. Bielenka (2011), Z. Plokii (2010), S. Ivanchuk (2022), and N. Lysenko et al. (2019). Their works substantiate the content, principles, forms and methods of environmental education and upbringing, and outline the age-related characteristics of the formation of children's ecological consciousness and behaviour. Among foreign studies, Kollmuss and Agyeman (2002) identified a system of psychological and social factors that determine the gap between environmental knowledge and an individual's actual behaviour. Kopnina (2020) substantiated the role of a value-oriented approach in education for sustainable development. In recent years, this line of research has continued to develop in studies indexed in leading scientometric databases, including with the participation of the present author: an international collaborative study (Shuppe et al., 2026), published in the journal Multidisciplinary Reviews (Scopus), substantiated the potential of artificial-intelligence technologies in managing environmental educational projects; the issue of professional training of preschool-education specialists for fostering the activity of preschool-age children was addressed in a study by Lazarovych (2023). Pruneau et al. (2010) examined the challenges of climate education and the significance of children's practical involvement. The application of the project method has been discussed in the works of Vereksa (2009), Levchenko (2018) and Manoilo (2017). The preparation of teachers to teach issues of sustainable development is covered in a study by Pometun (2015). The author of this article has previously investigated related aspects of educators' professional training, in particular the readiness of the future specialist to work with gifted children in the context of the updated edition of the Basic Component of Preschool Education of Ukraine (Lazarovych, Matsuk, & Zakharasevych, 2021), which testifies to the continuity of scholarly inquiry aimed at improving educators' professional readiness to carry out the diverse tasks of child development.

At the same time, despite the considerable body of research available, the problem of forming environmentally appropriate behaviour in preschool-age children requires further systemic elaboration with regard to the holistic structuring

of this process, the definition of the logic of its stage-by-stage implementation, and the substantiation of the set of pedagogical conditions that ensure an effective transition from environmental knowledge to the child's actual behaviour.

THE AIM AND RESEARCH TASKS

The aim of the article is to substantiate the structure of educators' professional training and to define the stages of forming environmentally appropriate behaviour in preschoolers in their systemic interrelation.

In accordance with the aim, five main objectives of the study were defined: to clarify the essence of the concept of "environmentally appropriate behaviour of preschool-age children" in the context of contemporary scientific approaches; to characterise the structural components of a future educator's readiness (motivational, cognitive, activity-based); to define and substantiate the stages of forming environmentally appropriate behaviour in preschoolers; to substantiate the pedagogical conditions and methodological approaches to educators' training; and to generalise effective forms, methods and technologies for implementing the process under study in the educational practice of preschool education institutions.

RESEARCH METHODS

Data sources and research base. The study is based on theoretical analysis and practical testing of results in preschool education institutions of various regions of Ukraine: the city of Ivano-Frankivsk (preschool institutions of the Kosiv and Kolomyia districts, which made it possible to investigate the influence of the natural landscape and ethno-pedagogical traditions of the Precarpathian region), the city of Ternopil, and the city of Kyiv. Vasyl Stefanyk Precarpathian National University served as the base for conducting the ascertaining experiment.

Theoretical methods: analysis of the regulatory and legal framework (the Basic Component of Preschool Education of Ukraine, the Law of Ukraine "On Preschool Education") and of the scholarly works of Ukrainian and foreign authors; systematisation and generalisation for the development of a component-structural model; comparative analysis of approaches to interpreting the concept of "environmentally appropriate behaviour."

Empirical methods: the ascertaining stage of the pedagogical study involving 120 students of the specialty A2 Preschool Education; pedagogical observation of children's activity in the natural environment; conversations with and surveys of teachers and parents; qualitative analysis of children's products of activity (drawings, observation diaries, results of labour activity in nature). The levels of formation of the readiness components were assessed on a three-point scale: high (creative) — the student independently designs and implements original eco-activities; medium (reproductive) — applies known methods with minor variation; low (passive) — requires constant guidance.

Study limitations. The work focuses on children of middle and older preschool age, since it is precisely this period that is sensitive for the transition from reproductive actions to conscious self-regulation of behaviour.

RESULTS OF THE RESEARCH

The essence of environmentally appropriate behaviour. Theoretical analysis made it possible to clarify the essence of the concept of "environmentally appropriate behaviour of preschool-age children" as a dynamic characteristic of the personality manifested in the child's ability to consciously choose ways of interacting with the environment on the basis of the integration of environmental knowledge, empathy and nature-conservation skills. Unlike related concepts ("ecological behaviour," "nature-appropriate behaviour"), which focus predominantly on the external aspect of actions, the concept of "environmentally appropriate behaviour" also encompasses the child's inner value motivation, capacity for reflection, and conscious moral choice in interacting with the living and non-living environment.

The structure of the educator's readiness. For the effective formation of environmentally appropriate behaviour in preschoolers, the educator must possess an appropriate level of readiness. We have defined the structure of a future educator's professional readiness, which includes three interrelated components (Table 1).

Table 1.

Structure of a Future Educator's Professional Readiness

Component	Indicators of Formation
Motivational	Environmental values, interest in nature-conservation activity, awareness of personal responsibility, an ethical attitude toward living beings, a striving for self-improvement in eco-education.
Cognitive	Knowledge of ecological systems and the laws of nature, methods of environmental upbringing for preschoolers, an understanding of the concept of sustainable development, orientation in contemporary eco-education technologies.
Activity-based	The ability to organise eco-projects, quests and research activity; the capacity to create an ecologically developmental environment; skills in involving parents in environmental upbringing.

Methodological approaches. The effectiveness of future educators' professional training is ensured by the implementation of a set of interrelated methodological approaches. The systemic approach ensures a holistic interconnection of all components of instruction — from aim and content to the forms and methods of assessment — and makes it possible to regard a student's readiness not as a mechanical sum of knowledge but as an integrated personal quality. The axiological approach is directed at forming environmental values, whereby nature is regarded not

as a resource but as an intrinsic value, which fundamentally changes the future teacher's inner position. The activity-based approach proceeds from the understanding that an ecological culture is formed only through the student's own activity: participation in eco-campaigns, volunteering, and the development of original projects. The competency-based approach is oriented toward the final result — the educator's ability to independently and creatively solve professional tasks under the conditions of a real educational process in a preschool education institution.

Pedagogical conditions. The pedagogical conditions that ensure the effectiveness of forming students' readiness are systematised in Table 2.

Table 2.

Pedagogical Conditions for Forming Students' Readiness

Condition	Essence and Mechanism of Implementation
Integration of content	Incorporating environmental aspects into the courses "Preschool Pedagogy," "Psychology of Early and Preschool Age Children," "Fundamentals of Natural Science with Methodology," and "Project-Research Activity of Preschool-Age Children."
Eco-educational environment	Creating a space at the university that stimulates environmentally responsible behaviour (waste sorting, digitalisation of documents, "green" initiatives of the department).
Interrelation of theory and practice	Conducting practical classes on the basis of preschool education institutions with advanced environmental experience; involvement in volunteer eco-campaigns.
Scholarly-methodological support	Using the resources of the university's Centre for the Education and Care of Early- and Preschool-Age Children as a platform for testing innovative models.

The content of future educators' training. The content of training is a multilevel structure that integrates natural-science, psycho-pedagogical and methodological knowledge and is implemented through four interrelated blocks.

1. Theoretical-informational block. Students study the interconnections within ecosystems, the laws of the biosphere, and anthropogenic impact on the environment. An important component is the study of the Concept of Sustainable Development as the ideological foundation of contemporary education. A future educator must not only know the names of plants or animals but also understand the principles of an ethical attitude toward all living things as an intrinsic value (Pometun, 2015).

2. Methodological-technological block. This stage involves mastering specific forms and methods of working with preschool-age children: the methodology of organising observations; environmental design technologies (students develop their own projects — "The Eco-Path of the Educational Institution," "A Garden on the Windowsill"); and game technologies (environmental quests, didactic and simulation games).

3. Practice-oriented activity. Teaching practice involves: creating an ecologically developmental environment (nature corners, "green classrooms"); conducting integrated classes with elements of the pedagogy of empathy; organising research-and-experimental activity (experiments with water, sand, air). This correlates with contemporary European "outdoor education" trends (Kopnina, 2020).

4. Educational and volunteer component. Students are involved in environmental volunteering: the "Greening the Planet" and "Day Without Plastic" campaigns, and waste sorting. This makes it possible to form the future teacher's own environmentally appropriate behaviour, which will subsequently serve as a living model for children.

Innovative technologies for forming behaviour in preschoolers. Among the technologies that stimulate a child's active position in interaction with nature, four complementary approaches deserve particular attention.

Project activity (Vereksa, 2009; Levchenko, 2018) allows children to immerse themselves in solving a real environmental problem — for example, the "Let's Save Water Together" project. The child sees the result of their own work, which gradually forms a sense of personal responsibility for the state of the environment. The "empowerment" technology (the pedagogy of granting agency) fundamentally shifts the emphasis of educational influence: instead of prohibitive instructions ("don't cause harm"), the child receives a positive call to action ("I can help nature"), which builds confidence in one's own abilities and gradually turns environmentally responsible behaviour into an inner need. Case-based technologies involve the analysis of problem situations ("What will happen to the forest if a campfire is left unextinguished?"), developing critical thinking and environmental empathy. Finally, research-and-inquiry activity (Manoilo, 2017) — conducting experiments with water, soil and plants — helps the child become personally convinced, through their own experience, of the fragility of natural connections and the need to treat them with care.

Effective forms and methods of forming students' environmental competence are systematised in Table 3.

Results of the ascertaining study. To identify the levels of formation of the components of readiness to form environmentally appropriate behaviour in preschoolers, an ascertaining stage of the study was conducted among 120 students of the specialty A2 Preschool Education. The results are presented in Figure 1.

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Table 3.

Forms and Methods of Forming Students' Environmental Competence

Forms of Work	Content of Activity	Result (Competence)
Problem-based lectures	Analysis of global environmental crises and ways of overcoming them in education.	Environmental awareness and critical thinking.
Empathy trainings	Exercises to develop the capacity to empathise with natural objects.	An emotional-value attitude.
Case studies	Resolving conflict situations in human–nature interaction.	Making ethical decisions.
Master classes	Making didactic materials from recycled materials (upcycling).	Technological readiness.
Eco-volunteering	Participation in the "Greening the Planet" and "Day Without Plastic" campaigns.	Personal environmental culture.

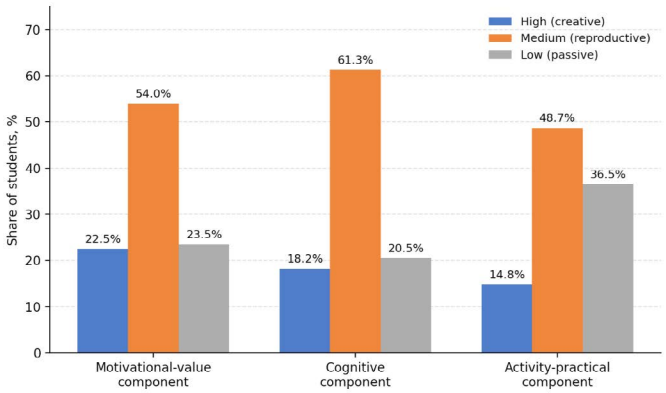


Figure 1. Levels of Formation of Students' Readiness (in %) (n = 120)

As Figure 1 shows, with regard to the motivational-value component, 22.5% of students reached a high (creative) level, 54.0% a medium (reproductive) level, and 23.5% a low (passive) level. The distribution for the cognitive component is similar: 18.2% high, 61.3% medium, and 20.5% low. The lowest indicators were recorded for the activity-practical component: only 14.8% of students showed creative initiative in independently designing eco-activities, while almost half (48.7%) remained at the reproductive level, and every third student (36.5%) required constant guidance. The chart clearly demonstrates that the greatest gap between components appears precisely in the practical dimension: whereas motivational and cognitive readiness are at approximately the same level, operational competence lags noticeably behind. This indicates the need to substantially strengthen the practical component in the training of future educators.

The data analysis shows that most students are at the medium level. They possess the necessary theoretical knowledge (the cognitive component) but experience considerable difficulties in its practical implementation. The lowest indicators were recorded in the operational sphere: students find it difficult to independently develop original eco-projects or apply complex case-based technologies. This confirms the general tendency identified in the study by Pruneau et al. (2010): even when environmental knowledge is present, an individual is not always able to transform it into a stable behavioural pattern.

A detailed analysis by criteria revealed the following: by the value criterion, students demonstrate a positive attitude toward nature, yet environmental activity is often perceived as the formal completion of academic tasks rather than as a personal need; by the informational criterion, future educators navigate classical methods well but have only superficial knowledge of the concept of sustainable development; by the methodological criterion, a need was identified to strengthen practical training, in particular the ability to create an ecologically developmental environment.

Regional specificity of the results. In the preschool education institutions of the Kosiv and Kolomyia districts, the method of using the folk traditions of nature use of the Precarpathian region proved effective, whereas in Ternopil and Kyiv priority was given to sustainable-development technologies and to solving environmental situations of the urban environment. This indicates the need for a differentiated approach to environmental upbringing depending on the regional context — a conclusion that corresponds with the ideas of Melmann and Pometun (2012).

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

The study conducted makes it possible to formulate the following conclusions. Environmentally appropriate behaviour in preschool-age children is a dynamic characteristic of the personality that integrates environmental knowledge, empathy and

nature-conservation skills. It is laid down precisely in preschool childhood and constitutes the foundation of the individual's subsequent ecological culture. Therefore, ignoring this stage, or approaching its upbringing in a situational, non-systemic manner, is an unjustifiable pedagogical miscalculation.

The professional training of future educators to form environmentally appropriate behaviour in children is a complex, multicomponent process that requires an organic combination of systemic, axiological, activity-based and competency-based approaches. None of these, taken separately, ensures the fullness of the result: only their integration creates the conditions for forming a genuine — not declarative, but effective — readiness on the part of the teacher.

The effectiveness of the educational process in preschool education institutions is ensured by combining the child's cognitive development with their emotional involvement and practical activity. Only through the systematic engagement of preschoolers in real nature-conservation practices is it possible to achieve the transformation of knowledge into stable behavioural habits. The key figure in this process remains the teacher, whose personal environmental culture serves children as a living model for imitation.

The results of the ascertaining study confirm the acute need to restructure educators' training: only 14.8% of students reached a high level of the activity-practical component of readiness, while the overwhelming majority stopped at the medium level. This indicates that the traditional, information-oriented model of instruction no longer meets contemporary educational challenges and requires a substantial strengthening of its practical and reflective components. The regional specificity identified – the difference in effective methods for preschool education institutions of the Carpathian region and of large cities – underscores the need for a differentiated approach to educators' training depending on the natural and cultural context.

Prospects for further research are associated with several priority directions. First, it is relevant to develop and validate diagnostic tools for assessing the levels of formation of student-teachers' environmental conduct. Second, it is worth investigating the potential of digital tools to support preschoolers' environmental education – VR excursions into natural environments, mobile applications for identifying plants and insects; the existing experience of implementing innovative digital technologies in the educational process of Ukrainian higher education institutions under conditions of war (Kupchyshyna et al., 2024) attests to the promise of such an approach for training pedagogical personnel in the preschool sector as well. Third, in-depth study is needed of the role of parents as equal subjects of environmental upbringing within the family environment, and of the mechanisms of their effective interaction with preschool education institutions.

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