

Predictors of Preschool Teachers' Environmental Activities in Kindergarten: A Path to a Sustainable Future

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In line with the priorities of the United Nations 2030 Agenda and the growing emphasis on competencies for sustainable development in education, early childhood and preschool education are increasingly recognized as critical stages for fostering environmental awareness and designing sustainable curricula. As key educational agents, preschool teachers play a central role in implementing environmental initiatives in kindergartens and nurturing environmentally responsible attitudes and behaviours in young children. This paper presents findings from a study examining the predictors of preschool teachers' engagement in environmental activities, with a focus on selected personal and sociodemographic variables: years of service, education level, teaching group, and the development of environmental competencies. The study involved a sample of 101 preschool teachers from four administrative districts in Serbia. Data were collected using two instruments: one measuring the development of environmental competencies and another assessing the frequency of environmental activities implemented in kindergartens. The results indicate that teachers' environmental competencies have a direct and moderately positive influence on their engagement in environmental practices. Strengthening these competencies increases the likelihood of preschool teachers' involvement in environmentally sustainable practices. Other examined variables did not emerge as significant predictors of participation in environmental initiatives. The multiple regression analysis accounted for approximately 31% of the variance in the frequency of environmental activities, highlighting the need for future research to explore additional predictive factors. Based on the findings, the development and implementation of targeted training and professional development programmes are recommended to further enhance preschool teachers' environmental competencies.

Keywords: sustainable development, environmental education, environmental well-being, environmental skills, preschool teachers



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Introduction

Investigating the frequency and diversity of environmental activities in kindergartens, along with their correlates and predictors, is gaining importance in light of strategic priorities set globally (United Nations, n. d.; UNESCO, 2012; 2017) and nationally (Strategy for the Development of Education by 2030, 2021; National Strategy for Sustainable Development, 2008; Youth Strategy of the Republic of Serbia 2023–2030, 2023). Global challenges such as poverty, social inequality, climate change, and the depletion of natural resources have positioned education for sustainable development as a key instrument for fostering environmentally responsible and sustainable societies (United Nations, n. d.). Education is thus recognized as a central factor in raising awareness among current and future generations about global issues in the domains of the economy, society, and the environment (Vukić, 2020, p. 93), as well as in promoting critical thinking, ethical reflection, and civic engagement (Sánchez-Santamaría & Manzanares-Moya, 2017).

As Trifunović (2011, p. 213) notes, 'In the attempts to overcome, or at least reduce, environmental, technological and financial risks, the modern man cannot ignore the importance of the educational process, especially its ability to shape a person's worldview.' Given its transformative potential, education for sustainable development provides the foundation for equipping new generations with the knowledge and skills needed to address twenty-first-century environmental challenges. In this context, it also offers an ethical framework for responsible action amid global change.

Early childhood is widely recognized as a formative period for developing fundamental attitudes, values, and behaviours, making it particularly suitable for fostering environmental awareness (Ferreira et al., 2016; Chawla, 2020). At this stage, children display natural curiosity and emotional receptiveness toward the natural world. Direct interaction with nature – through play, exploration, and caring for plants and animals – enhances both emotional and cognitive connectedness to the environment, while also nurturing empathy for other living beings (Åström et al., 2020; Chawla, 2020; Ernst & Burcak, 2019; Meier & Sisk-Hilton, 2007). These findings highlight the unique potential of early childhood environmental education to build a foundation for long-term environmental responsibility.

Although international and national strategic documents – such as the 2030 Agenda (United Nations, n. d.) and the National Strategy for Sustainable Development (2008) – emphasize the importance of early childhood education in achieving a sustainable future, preschool practice reveals numerous

challenges that teachers encounter in implementing these values (Türkoğlu, 2019). Particularly critical are issues related to preschool teachers' competencies for carrying out environmental activities (Mitranić Marinković et al., 2019; Višnjić-Jevtić et al., 2022) and the identification of factors that influence their engagement in education for sustainable development. Research indicates that while preservice preschool teachers show basic predispositions toward sustainable behaviour, these are insufficient without systemic education and a reflective pedagogical approach (Šindić et al., 2021).

This paper aims to investigate the predictors of preschool teachers' engagement in environmental activities within kindergartens, with particular attention to variables such as years of service, level of education, teaching group, and the degree of development of their environmental competencies. Understanding these factors is essential for designing effective professional development strategies and support mechanisms that can enhance preschool teachers' capacities, ultimately improving the quality and increasing the frequency of environmental activities in early childhood education.

Preschool Teachers' Competencies for Implementing Environmental Education and Education for Sustainable Development Programmes

In the context of increasingly complex environmental, social, and economic challenges, preschool teachers hold a pivotal role, as they have the unique opportunity to shape children's values of sustainability and foster a sense of responsibility toward the environment and society through real-life and learning experiences. Their role extends beyond merely conveying information to actively creating learning environments that promote critical thinking, exploration, and emotional connectedness to nature (Kahriman-Öztürk, 2010; Ernst & Burcak, 2019). UNESCO's Target 4.7 highlights the necessity for preschool teachers to be proficient in integrating values of sustainability, social responsibility, ecological balance, and social justice into their teaching practices (UNESCO, 2017). This competence encompasses not only a thorough understanding of environmental concepts but also the ability to enhance children's awareness of the cause-and-effect relationships between human actions and environmental outcomes, as well as to encourage children's willingness to respond to environmental injustices and degradation.

However, despite increasing consensus on the importance of education for sustainable development, its practical implementation continues to pose significant challenges. Research indicates that while preschool teachers generally hold positive attitudes toward incorporating environmental topics into their daily work with children, they often express insecurity regarding their

own knowledge and report a lack of institutional support (Torquati et al., 2013).

Preschool teachers often face institutional constraints, including the lack of clear guidelines and adequate support for implementing sustainability principles in their practice (Višnjić-Jevtić et al., 2022). A significant challenge is that sustainability is frequently treated as an add-on to existing educational practices rather than as a fundamental transformation of the pedagogical approach. Although *Education for Sustainable Development: Learning Objectives* (UNESCO, 2017) provides recommendations on content and methods, there is a risk that such frameworks may be applied uncritically, without sufficient regard to specific educational contexts and purposes. Biesta (2010) and Sterling (2001) highlight the need to redefine the relationship between knowledge and education, arguing that the educational system cannot effectively address complex modern challenges unless it undergoes fundamental transformation. Accordingly, preschool teachers' competencies should be understood as a dynamic integration of knowledge, values, emotions, and skills necessary for reflective and ethical action. Competent preschool teachers grasp core environmental principles and actively engage children in addressing concrete problems and conserving resources (López-Alcarria et al., 2021). Meier and Sisk-Hilton (2017) emphasize that such teachers carefully observe children, recognize their interests, and create environments that foster exploration, dialogue, and emotional connectedness to nature. In this process, teachers act as guides and collaborators in children's learning and discovery. Research further indicates that preschool teachers derive personal satisfaction and creative fulfilment from implementing environmental activities (Kahriman-Öztürk, 2010).

Regarding the institutional framework in Serbia, a dual approach is evident. On the one hand, documents such as the National Strategy for Sustainable Development (2008) and the Strategy for the Development of Education by 2030 (2021) adopt a functionalist perspective, emphasizing education's role in meeting labour market demands and valuing it primarily for its »efficiency«. On the other hand, preschool education policies – such as the Preschool Curriculum Framework: Years of Ascent (*Osnove programa predškolskog vaspitanja i obrazovanja*, 2018) and the Rulebook on the Standards of Competencies for the Preschool Teacher Profession and Their Professional Development (2018) – conceptualize education as a transformative process. Preschool teachers are recognized as agents of change, and education is increasingly understood through values such as collaboration, care for others, and social responsibility, reflecting a broader conception of education for sustainable development as a culture that fosters change and

action (Mitranić Marinković et al., 2019). Notably, Flogaitis et al. (2005) distinguish between two types of preschool teachers: technocentric – those who adhere strictly to existing guidelines; and ecocentric – those who initiate innovative practices. In their recent study, Lepičnik Vodopivec and Šindić (2025) emphasize that key outcomes of environmental programmes in kindergartens include experiential learning, children's active participation in decision-making, and the cultivation of a personal sense of responsibility toward the community and nature. These findings reinforce the argument that holistic approaches, integrating both institutional culture and participatory practices, are crucial for the effective implementation of sustainability in preschool education.

Methodology

The aim of this research was to identify predictors of the frequency of environmental activity implementation in kindergartens, with particular emphasis on the personal and sociodemographic characteristics of preschool teachers. Specifically, the study examined the predictive contribution of the following variables: years of service, level of education, teaching group, and the degree of development of preschool teachers' environmental competencies. Grounded in the theoretical framework and aligned with this research aim, the following hypotheses were formulated:

- H1 There is a statistically significant positive correlation between the degree of development of preschool teachers' environmental competencies and the frequency of environmental activity implementation in kindergartens.
- H2 Preschool teachers with higher levels of formal education implement environmental activities more frequently than those with lower levels of education.
- H3 Greater professional experience among preschool teachers is positively associated with an increased frequency of conducting environmental activities.
- H4 There are statistically significant differences in the frequency of environmental activity implementation based on the teaching group (younger, middle, older, preschool, or mixed-age groups).

Sample Characteristics

The study was conducted on a convenience sample of 101 preschool teachers from four administrative districts in the Republic of Serbia. The sample was purposefully selected to ensure diversity in sociodemographic backgrounds,

Table 1 Sociodemographic Characteristics of the Sample

Variable	Category	<i>f</i>	<i>f</i> (%)
Years of service	1–10 years	23	22.8
	11–20 years	51	50.5
	21–30 years	10	9.9
	More than 30 years	17	16.8
Education level	Higher vocational qualification	39	38.6
	Undergraduate degree	32	31.7
	Master's degree	30	29.7
Teaching group	Younger group (2.5 to 3.5)	14	13.9
	Middle group (3.5 to 4.5)	24	23.8
	Older group (4.5 to 5.5)	21	20.8
	Preschool preparatory group (5.5 to 6.5)	36	35.6
	Mixed-age group (2.5 to 6.5)	6	5.9

Notes *N* = 101.

enabling a comprehensive analysis of variables influencing the implementation of environmental education. Data collection occurred between April and May 2023, during the active school year. Prior to participation, all respondents were informed about the research objectives and the voluntary nature of their involvement, and provided informed consent. The demographic characteristics of the participants are presented in Table 1.

Instruments

For the purposes of this research and data collection, two instruments were developed and applied: (a) the Questionnaire for Assessing the Development of Environmental Skills and (b) the Environmental Activity Scale.

The Questionnaire for Assessing the Development of Environmental Skills was designed to evaluate preschool teachers' competencies in implementing environmental activities, as well as their attitudes and knowledge regarding environmental issues. The instrument comprises 15 items addressing a variety of environmentally responsible behaviours, including rational resource use, recycling, care for the natural environment, and sustainable daily practices. Participants responded on a 3-point scale, where 1 indicates the behaviour is never practiced, 2 denotes occasional practice, and 3 signifies frequent practice. Sample items include: 'I use electricity rationally (e.g. turning off devices when not in use, using energy-saving light bulbs)', 'I consciously choose environmentally friendly products and reduce the use of plastic and harmful chemicals', and 'I responsibly select and maintain eco-friendly materials and

plants in both professional and personal environments.' The internal consistency of the scale was evaluated using Cronbach's alpha, yielding acceptable reliability for this sample with $\alpha = 0.71$.

The Environmental Activity Scale measures the frequency and diversity of environmental activities conducted by preschool teachers with children in early childhood settings. The instrument comprises 56 items encompassing various domains of environmental practice, including organizing thematic discussions about nature and environmental preservation, engaging in hands-on activities such as planting, collecting natural materials, maintaining a nature corner, and preparing healthy drinks and meals. It also covers children's involvement in creating seed collections, photo albums, birdhouses, and in feeding animals. Beyond daily practices, the scale assesses preschool teachers' participation in broader community and inter-institutional initiatives, such as commemorating important environmental dates, participating in local clean-up campaigns, organizing environmental workshops, and collaborating with other preschool institutions. Additionally, it captures activities related to environmental awareness and advocacy, including submitting eco-reports, publishing in journals, and engaging in media appearances. Participants rated the frequency of each activity using a three-point scale: 1 – never implemented, 2 – occasionally implemented, and 3 – frequently implemented. The scale demonstrated high reliability in this sample, with a Cronbach's alpha coefficient of $\alpha = 0.86$.

Data Collection Procedure

Data were collected during regular kindergarten activities. All participants were fully informed about the purpose of the research, and strict measures were taken to ensure the anonymity and confidentiality of the data. Participation was voluntary, thereby upholding the ethical standards of the data collection process.

Data Processing and Analysis

Descriptive statistics, correlation analysis, and standard multiple regression analysis were employed to process the collected data. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to characterize the sample and identify general trends in the data. Pearson's correlation coefficient was applied to examine the relationships between the development of environmental competencies and the frequency of environmental activity implementation, as well as other relevant variables. Standard multiple regression analysis was conducted to identify significant predictors

Table 2 Descriptive Indicators for Preschool Teachers' Environmental Activities and Environmental Skills

Scale	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Environmental activities	115.98	13.39	56– 168	116.00	124	56	0.030	–0.332
Environmental skills	35.30	3.09	15–45	35.00	34	15	–0.247	–0.876

Notes Column headings are as follows: (1) mean score, (2) standard deviation, (3) theoretical range, (4) median, (5) mode, (6) number of items, (7) skewness, (8) kurtosis.

of environmental activity frequency. A linear model was specified, with the frequency of environmental activity implementation as the criterion variable, and the level of development of environmental competencies, years of service, level of education, and teaching group as predictor variables. A significance level of $p \leq 0.05$ was set for hypothesis testing. To assess differences in the frequency of environmental activity implementation across groups defined by years of service, education level, and teaching group, an ANOVA test was applied, with statistical significance likewise set at $p \leq 0.05$.

Results

Table 2 presents an overview of the descriptive statistics for the composite scores of environmental competencies and environmental activities, including mean values, measures of variability, and data distribution characteristics.

The mean score of 115.98 (within a possible range of 56–168) indicates that preschool teachers, on average, report implementing environmental activities at a level above the neutral midpoint. The median and mode further support the consistency of responses among participants, while the standard deviation and the theoretical range point to notable variability in the frequency of implementation. Skewness and kurtosis values suggest that the distribution of scores is approximately symmetrical and that the data are concentrated around the mean.

An analysis of item-level means and standard deviations provides more detailed insight into the frequency and types of environmental activities implemented by preschool teachers in kindergartens. The majority of the mean values range from 2.0 to 2.9, suggesting that these activities are carried out occasionally. The results indicate that activities involving verbal methods of teaching and fostering emotional awareness about nature and animals are most frequently implemented ($2.8 < M < 2.9$). Specifically, the activities most commonly reported include *telling children about the importance of nature*

conservation ($M = 2.93$, $SD = 0.29$), *informing them about the consequences of environmental neglect* ($M = 2.93$, $SD = 0.32$), *encouraging humane treatment of animals* ($M = 2.93$, $SD = 0.29$), and *teaching children how to care for plants* ($M = 2.88$, $SD = 0.32$). These activities typically require minimal resources or organizational effort, which likely facilitates their integration into daily practice. A moderate level of implementation is observed in the activities involving children's direct participation in environmental tasks ($2.4 < M < 2.7$), such as *organizing interior spaces* ($M = 2.73$, $SD = 0.44$), *maintaining cleanliness in learning areas* ($M = 2.65$, $SD = 0.49$), and *caring for plants* ($M = 2.75$, $SD = 0.47$). These activities support the development of responsibility, work habits, and environmental awareness in children by engaging them in hands-on experiences. In contrast, creative activities and workshops that involve the use of natural materials – such as creating collections and albums, preparing healthy drinks, or expressing creativity through artistic means (e.g. painting with natural dyes) – are reported as somewhat less frequently implemented, with mean values ranging from 2.0 to 2.3. The lower frequency of these activities may be attributed to logistical challenges, including the need for additional materials, preparation time, and organizational effort. Particularly noteworthy is the finding that activities involving collaboration with the broader social context – such as engagement with local institutions, the community, media, and professional organizations – are the least frequently implemented ($M < 1.8$). The least frequently implemented activities include: *collaboration with journals and reviews* ($M = 1.22$; $SD = 0.54$), *participation in environmental education shows* ($M = 1.14$; $SD = 0.37$), *visits to the botanic garden* ($M = 1.31$; $SD = 0.57$) and *collaboration with faculties* ($M = 1.25$; $SD = 0.60$). The infrequent implementation of these activities may be attributed to their complexity, the lack of institutional support, and limited opportunities for preschool teachers to initiate and sustain such forms of collaboration. These findings are consistent with previous research (Semiz, 2020), which highlights institutional support, professional education, and access to resources as key factors influencing both the quality and frequency of environmental activity implementation in preschool education.

Considering the theoretical range (15–45) presented in Table 2, the mean score of 35.30 suggests that preschool teachers rate their environmental competencies above the neutral midpoint. The median and mode further confirm consistency in responses, while the standard deviation and observed range indicate relatively low variability among participants. Skewness and kurtosis values suggest that the distribution is slightly negatively skewed, with scores clustered closely around the mean.

Based on the descriptive indicators for the individual items, a clear distinction emerges between everyday environmental habits and more complex, participatory forms of environmental engagement. The highest mean values were recorded for the following statements: 'I actively use and maintain natural and recycled materials' ($M = 3.00$, $SD = 0.20$), 'I regularly air the rooms to ensure a healthy indoor climate' ($M = 2.96$, $SD = 0.38$), 'I consciously choose environmentally friendly products and reduce the use of plastic and harmful chemicals' ($M = 2.97$, $SD = 0.17$), 'I use water rationally (e. g. I do not leave taps running, I use water sparingly during activities)' ($M = 2.85$, $SD = 0.38$), and 'I use electricity wisely (e. g. unplugging appliances when not in use, using energy-efficient light bulbs)' ($M = 2.73$, $SD = 0.47$). These findings suggest that behaviours directly related to personal health, hygiene, and the immediate environment are the most consistently integrated into preschool teachers' everyday practice. A moderate level of implementation was observed for items related to active involvement in nature and flora conservation. These include: 'I responsibly select and maintain eco-friendly materials and plants in my professional and personal spaces' ($M = 2.58$, $SD = 0.57$), 'I regularly spend time in nature, take walks, and explore environmental phenomena' ($M = 2.57$, $SD = 0.58$), and 'I regularly recycle paper, plastic, glass, and other everyday materials' ($M = 2.23$, $SD = 0.61$). In contrast, the least frequently practiced activities are those requiring a higher level of engagement and institutional support. These include: 'I follow and record changes and phenomena that threaten the natural environment, such as pollution, deforestation, and climate change' ($M = 1.62$, $SD = 0.78$), 'I use environmentally friendly means of transport (bicycle, public transportation, carpooling)' ($M = 1.70$, $SD = 0.78$), and 'I take part in collective environmental initiatives such as cleaning up natural spaces, planting trees, and participating in educational campaigns' ($M = 1.99$, $SD = 0.70$).

The aim of this study was to identify key predictors influencing the frequency of environmental activity implementation in kindergartens by examining the effects of four independent variables: the degree of development of preschool teachers' environmental competencies, years of service, education level, and teaching group. The results of correlation (Table 3) and regression analyses (Tables 4, 5, and 6) offer insights into the relationships and intercorrelations among these variables.

The correlation analysis revealed a statistically significant and moderately strong positive relationship between the degree of development of preschool teachers' environmental competencies and the frequency of environmental activity implementation in kindergartens ($r = 0.540$, $p < 0.001$).

Table 3 Pearson Correlation Matrix for Criterion and Predictor Variables

Items	(1)	(2)	(3)	(4)	(5)
(1) Environmental activities	1.000	0.540**	-0.092	0.158	-0.030
(2) Environmental skills		1.000	0.089	0.077	-0.229*
(3) Years of service			1.000	-0.310**	-0.036
(4) Education level				1.000	0.181*
(5) Teaching group					1.000

Notes *Significant at $p < 0.05$, ** $p < 0.001$.

These findings align with previous studies (e.g. Türkoğlu, 2019; Ernst, 2007), which suggest that preschool teachers with greater environmental knowledge and more developed attitudes are more likely to integrate environmental content and promote sustainable behaviours among children. The pivotal role of preschool teachers is underscored by evidence that their personal competencies directly shape the educational environment in terms of sustainable development (Ferreira et al., 2007). This association supports the hypothesis that preschool teachers who engage more actively in environmental practices perceive themselves as more competent, consistent with the conception of competence as a dynamic interplay of knowledge, skills, values, and actions (UNESCO, 2017). These results reinforce the view that competencies for sustainable development manifest through everyday practice and active community involvement.

The correlation between preschool teachers' education level and the frequency of implementing environmental activities demonstrated marginal significance, indicating a weak but potentially meaningful influence of formal education on the frequency of such activities. This relationship may be attributed to variations in curricula across different education levels, as well as differences between initial formal education and ongoing professional development or training programmes. While higher formal education may encourage greater engagement in environmental practices, the quality and nature of continuous professional development are also critical factors shaping teachers' environmental behaviours. Given the variability in preschool teacher education programmes concerning sustainability (Kundačina & Visković, 2016), this relationship warrants further investigation in future research.

The analysis revealed no significant correlation between the teaching group variable and the frequency of environmental activity implementation ($r = -0.030$, $p = 0.384$), indicating that the age composition of the teaching group is not a key factor influencing teachers' engagement in environ-

Table 4 Model Summary for Regression Analysis

<i>R</i>	<i>R</i> ²	Adj. <i>R</i> ²	Std. Error of the Estimate
0.569	0.313	0.295	11.24125

Notes Predictors: (constant), environmental skills, education level, years of service, teaching group. Dependent variable: environmental activities.

Table 5 ANOVA Results for Regression Analysis

Item	(1)	(2)	(3)	(4)	(5)
Regression	5794.854	4	1448.713	11.464	0.000
Residual	12131.107	96	126.366		
Total	17925.960	100			

Notes Cphumn headings are as follows: (1) sum of squares, (2) degrees of freedom, (3) mean square, (4) *F*, (5) significance. Predictors: (constant), environmental skills, education level, years of service, teaching group. Dependent variable: environmental activities.

mental activities. Preschool teachers demonstrate comparable levels of involvement regardless of whether they work with younger or older children. However, a negative correlation was found between the teaching group and self-assessed environmental competencies, suggesting that teachers working with younger children perceive their environmental skills as less developed. This finding aligns with previous research highlighting challenges in integrating sustainability into early childhood education and the need for specially tailored models for the youngest learners (Davis, 2015). It may also reflect variations in personal motivation that transcend formal educational contexts, reinforcing the notion that sustainability competencies are largely transversal and do not solely depend on institutional factors.

The results of the multiple linear regression analysis provide further insight into the contributions of individual predictors (Table 4). The overall model was statistically significant ($F(4, 96) = 11.464, p < 0.001$), with a coefficient of determination of $R^2 = 0.313$, indicating that the independent variables collectively explain 31.3% of the variance in the frequency of environmental activity implementation. The adjusted R^2 value (Adjusted $R^2 = 0.295$) suggests that the model maintains a good fit even after accounting for the number of predictors, while the standard error of the estimate (11.24) reflects an acceptable level of accuracy (see Table 4).

The degree of development of preschool teachers' environmental skills emerged as the most significant individual predictor, exhibiting a strong standardized beta coefficient ($\beta = 0.565, p < 0.001$), thereby confirming its substantial contribution to the model (Table 6). This variable exerts the great-

Table 6 Coefficients Table for Predictors of Environmental Activities

Item	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Constant)	19.345	15.869		1.219	0.226		
Factor 1	37.541	5.823	0.565	6.447	0.000	0.919	1.089
Factor 2	1.690	2.487	0.062	0.680	0.498	0.854	1.171
Factor 3	-1.630	1.213	-0.120	-1.344	0.182	0.889	1.125
Factor 4	0.951	0.999	0.084	0.952	0.344	0.906	1.104

Notes Unstandardized coefficients: (1) B , (2) standard error; standardized coefficient: (3) β ; (4) t , (5) significance; collinearity statistics: (6) tolerance, (7) VIF. Dependent variable: environmental activities.

est influence on the dependent variable, even after controlling for all other factors included in the model. These findings underscore the critical importance of the quality of preschool teachers' professional competencies for the effective integration of education for sustainable development in kindergarten settings.

It is also important to emphasize that all variables in the model exhibited low variance inflation factor (*VIF*) values (<1.2) and satisfactory tolerance coefficients (>0.85), indicating the absence of multicollinearity among the predictors. This further reinforces the validity and reliability of the regression model.

Discussion

The research findings are discussed in relation to the initial hypotheses and the underlying theoretical frameworks. The first hypothesis posited a significant positive correlation between the degree of development of preschool teachers' environmental skills and the frequency of environmental activity implementation. This hypothesis was confirmed ($r = 0.540$, $p < 0.001$), and further supported by the results of the regression analysis, which identified environmental skills as the strongest predictor of implementation frequency ($\beta = 0.565$, $p < 0.001$). These findings are consistent with those of Türkoğlu (2019), who emphasized that preschool teachers' professional competencies – particularly in the domains of environmental literacy and sustainable pedagogical practice – play a direct role in shaping the extent to which environmental content is integrated into daily educational activities with children.

Hypothesis 2, which proposed a relationship between education level and the frequency of implementation of environmental activities, was not supported by the data. Although a moderate positive correlation was observed ($r = 0.158$, $p = 0.058$), it did not reach the threshold for statistical significance. Furthermore, education level did not emerge as a significant predictor in the

regression model ($\beta = 0.062, p = 0.498$). This finding partially contrasts with earlier studies (Ernst, 2007; Ferreira et al., 2007), which suggest that higher levels of formal education may enhance understanding of education for sustainable development. However, this discrepancy may be explained by the fact that formal education does not necessarily ensure the development of specific environmental competencies. Such skills are often acquired through experiential learning, hands-on practice, targeted training, and ongoing professional development.

Hypothesis 3, concerning the correlation between years of service and the frequency of implementation of environmental activities, has not been confirmed ($r = -0.092, p = 0.181$); the years of service variable also failed to reach statistical significance in the regression model ($\beta = -0.120, p = 0.182$). This result may suggest that years of service per se do not predict a higher level of preschool teachers' involvement in environmental activities, but rather that the quality of professional development and education for sustainable development is more important, which also supports the findings of Tilbury (2011) and Kadji-Beltrán (2024).

Hypothesis 4, which assumes that there are significant differences in the frequency of implementation of environmental activities in relation to the teaching group the preschool teacher is in charge of, was not confirmed ($r = -0.030, p = 0.384$). This variable also failed to reach statistical significance in the regression model ($\beta = 0.084, p = 0.344$). Research studies such as the one by Elliott and Davis (2009) confirm that environment-related topics can be successfully incorporated in work with all age groups, provided that preschool teachers are adequately educated.

Despite the commitments outlined in strategic, normative, and competency documents (United Nations, n.d.; UNESCO, 2012, 2017; *Preschool curriculum framework: Years of ascent*, 2018; Rulebook on the standards of competencies for the preschool teacher profession and their professional development, 2018), the research findings reveal a gap between the proclaimed transformative goals of education for sustainable development and its actual implementation in kindergarten practice. Although national documents promote a holistic understanding of education for sustainable development, positioning preschool teachers as ethically oriented practitioners, this study has shown that environmental activities are often implemented only occasionally and, to a great extent, symbolically. Activities such as energy conservation, plant cultivation, or care for the natural environment are still predominantly carried out through theme days or as additional content, rather than being integrated into the actual curriculum and everyday situations.

Although there is formal alignment with the competencies defined by UNESCO (2012; 2017) – such as critical thinking, collaboration, normative orientation, and reflexivity – these competencies have not yet been fully developed in practice to support continuous, reflective, and systemic action. This gap can partly be attributed to insufficient institutional support for building such competencies through professional education, ongoing training, mentorship, and reflective practice.

Additionally, broader educational policies often reduce competencies to a set of technical skills, stripping them of their ethical and value-based dimensions (Biesta, 2010). Education for sustainable development cannot achieve genuine transformation if preschool teachers are merely seen as implementers of predefined programmes. For this reason, competencies must be understood as dynamic, context-dependent, and rooted in everyday interactions and professional judgments (Pavlović Breneselović, 2014; UNESCO, 2017). The current frequency and nature of environmental activities in kindergartens underscore the need to strengthen teachers' capacities through both policy measures and practices that promote professional autonomy, reflexivity, and ethical engagement.

Conclusion

The aim of this paper was to explore the key factors influencing the frequency of preschool teachers' implementation of environmental activities in kindergartens. Within this framework, several potential predictors of teachers' engagement in environmental initiatives were analysed. The findings offer a valuable foundation for designing and implementing professional development programmes aimed at enhancing teachers' environmental competencies and promoting environmentally responsible educational practices. While the results highlight the significant impact of environmental skills on teaching practices, they also underscore the need for further research to identify additional factors that may support more effective implementation of sustainability-based education. A deeper understanding of these factors can inform educational policies and programmes that empower preschool teachers to act as true agents of change in environmental and sustainability education in Serbia.

The overall research findings indicate that preschool teachers demonstrate a high level of awareness regarding the importance of environmental education, particularly through verbal and emotional approaches to fostering environmental awareness in children. However, there remains considerable room for improvement in the implementation of interactive, practical,

and collaborative activities involving the wider community. Expanding such practices requires stronger institutional support, improved intersectoral collaboration, and additional professional training to equip preschool teachers with the skills necessary to plan and implement more complex environmental activities.

Based on the research findings, the following practical recommendations are proposed: (a) providing additional training for preschool teachers to enhance the implementation of creative and exploratory environmental activities; (b) strengthening collaboration and developing partnerships with organizations, media, educational, and research institutions; and (c) ensuring adequate resources and time are allocated for the execution of more complex environmental initiatives. By increasing resource availability, empowering preschool teachers, and fostering a supportive environment, it is possible to significantly broaden the scope and improve the quality of environmental activities accessible to children from an early age.

Notwithstanding its significant insights, this study has several limitations that should be carefully considered in future research: (a) the sampling method used reduces the possibility of generalizing the results to the larger population of preschool teachers in Serbia; (b) the instruments relied on preschool teachers' self-assessment, which may lead to socially desirable responses; and (c) institutional and contextual factors, such as management support, preschool teacher leadership, and preschool programmes, were not considered as correlates or predictors of the frequency of environmental activity implementation. Considering these limitations, further research, including longitudinal and qualitative studies, should be conducted to gain deeper insight into the factors influencing preschool teachers' environmental activity frequency.

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Napovedniki okoljskih dejavnosti vzgojiteljev v vrtcu: pot do trajnostne prihodnosti

V skladu s prednostnimi nalogami Agende 2030 Združenih narodov in z vse večjim poudarkom na kompetencah za trajnostni razvoj v izobraževanju se vzgoja v zgodnjem otroštvu in predšolska vzgoja vse bolj prepoznavata kot ključni fazi za spodbujanje okoljske ozaveščenosti ter oblikovanje trajnostnih učnih načrtov. Vzgojitelji v predšolski vzgoji kot ključni izobraževalni akterji igrajo osrednjo vlogo pri izvajanju okoljskih pobud v vrtcih ter spodbujanju okoljsko odgovornega odnosa in vedenja pri majhnih otrocih. Pričujoči prispevek predstavlja ugotovitve raziskave, ki preučuje napovedne dejavnike vključenosti vzgojiteljev v predšolske dejavnosti, s poudarkom na izbranih osebnih in socialno-demografskih spremenljivkah: delovni dobi, izobrazbi, učiteljski skupini in razvoju okoljskih kompetenc. V raziskavo je bil vključen vzorec 101 vzgojitelja predšolskih otrok iz štirih upravnih okrožij v Srbiji. Podatki so bili zbrani z dvema instrumentoma: z enim smo merili razvoj okoljskih kompetenc, z drugim pa ocenili pogostost okoljskih dejavnosti, ki se izvajajo v vrtcih. Rezultati kažejo, da imajo okoljske kompetence vzgojiteljev neposreden in zmerno pozitiven vpliv na njihovo angažiranost v okoljskih praksah. Krepitev teh kompetenc povečuje verjetnost angažiranosti vzgojiteljev predšolskih otrok v okoljsko trajnostnih praksah. Druge preučene spremenljivke se niso izkazale kot pomembni napovedovalci sodelovanja v okoljskih pobudah. Multipla regresijska analiza je pojasnila približno 31 % variance v pogostosti okoljskih dejavnosti, kar poudarja potrebo po prihodnjih raziskavah za raziskovanje dodatnih napovednih dejavnikov. Na podlagi ugotovitev se priporoča razvoj in izvajanje ciljno usmerjenih programov usposabljanja ter strokovnega razvoja za nadaljnje izboljšanje okoljskih kompetenc vzgojiteljev predšolskih otrok.

Ključne besede: trajnostni razvoj, okoljska vzgoja, dobrobit okolja, okoljske veščine, vzgojitelji predšolskih otrok