



SUSTAINABILITY EDUCATION AND ENVIRONMENTAL ATTITUDES IN MINORITY TEACHER TRAINING: A CASE FROM SERBIA

Rita Horak, Lenke Major, Szabolcs Halasi, Eva Vukov Raffai,
Janos Samu, Valeria Pinter Krekic

University of Novi Sad, Serbia

E-mail: rita.horak@magister.uns.ac.rs, major.lenke@magister.uns.ac.rs,
sabolc.halasi@magister.uns.ac.rs, eva.vraffai@magister.uns.ac.rs,
j.samu@magister.uns.ac.rs, valeria.krekic@magister.uns.ac.rs

Abstract

Integrating sustainability education into teacher training remains a key challenge, particularly in minority language contexts where environmental and cultural dimensions intersect. This study examines how education about sustainability can be effectively integrated into teacher training in such a setting. Specifically, it examines the effects of three elective environmental education courses – introduced during the 2020 curricular accreditation – on the environmental attitudes of students enrolled in Hungarian-language teacher training in Serbia.

The research involved a sample of 150 students over three academic years (2022–2025) and employed a quantitative design using three validated psychometric instruments (RevNEP, ENV, and CHEAKS) to assess ecological worldviews, environmental values, emotions, and behavioural intentions. Data were analysed through descriptive and inferential statistics, revealing statistically significant positive changes in students' environmental attitudes: RevNEP indicated stronger ecological worldviews, ENV showed growth in pro-environmental values, and CHEAKS demonstrated the development of affective and behavioural dimensions.

The results suggest that the substantive characteristics of the specialization itself, and the students' motivations have a greater influence on attitude formation than the academic year itself. The study underscores the dual function of minority teacher education: fostering sustainability-oriented awareness while preserving cultural identity. These findings, based on multi-year quantitative evidence, strengthen the empirical understanding of attitude formation in sustainability education and hold direct implications for curriculum development and international discourse on teacher training.

Keywords: attitude formation, education for sustainable development, environmental education, quantitative longitudinal research, teacher training

Introduction

Sustainability challenges are becoming increasingly important in teacher education, as the attitudes of future teachers and preschool educators shape the perspectives of the next generations. Integrating environmental education into higher education not only influences students' views but also has long-term effects on public education quality and societal sustainability.

The research focuses on students enrolled at the Hungarian Teacher Training Faculty of the University of Novi Sad, located in Subotica, Serbia. The institution is situated in the Autonomous Province of Vojvodina, a northern region of Serbia inhabited by a significant Hungarian minority. It is the only higher education institution in the country where teacher and

preschool teacher education is conducted entirely in Hungarian, while also playing a key role in preserving the cultural identity of the Hungarian minority community. Locally trained teachers ensure the continuity of mother-tongue education and thereby contribute to the cultural survival of the community.

In this context, sustainability has a dual meaning: the protection of environmental systems and environmentally conscious lifestyles, and the preservation of minority identity and cultural heritage. Examining the students' environmental attitudes is thus highly relevant because they mediate both perspectives as future teachers. Empirical research on these attitudes has been ongoing at the institution for over a decade, where initial results signalled the real effects of an intensive environmental program (Major, 2017), and a later longitudinal study (Major et al., 2017) confirmed the positive effects of elective green courses. These findings led to the introduction of three electives, Environmental Protection, Ecology, and Zoopedagogy, in the 2020–2027 curriculum.

The present study examined the role and effects of curriculum-integrated sustainability education on students' environmental attitudes across three academic years (2022–2025), using three validated instruments – RevNEP, ENV, and CHEAKS – that measured ecological worldviews, environmental values, and behaviour-related attitudes.

Basic Concepts and Historical Roots

The concept of sustainable development entered the centre of international discourse with the Brundtland Report (WCED, 1987), which defined it as meeting the needs of the present without compromising the ability of future generations to meet their own needs. At the same time, the interpretation of sustainability has varied across scientific disciplines (Scott, 2015).

Environmental education itself, however, appeared even earlier and gradually became integrated into the pedagogy of sustainability. It does not merely involve the unidirectional transmission of knowledge, but also contributes to addressing environmental issues by shaping attitudes, values, and knowledge, as well as developing the capacity for taking action (Ardoin, Bowers, & Gaillard, 2020). At the international level, the Tbilisi Declaration is considered to have been a milestone (UNESCO, 1978), defining environmental education as a process that fosters the knowledge, skills, attitudes, and commitment necessary to solve environmental problems.

Pedagogical and Methodological Dimensions

The pedagogy of sustainability is systemic and interdisciplinary, requiring the interaction of natural, cultural, and social factors (Hofman, 2015; Fountain, Koppen, & Leemans, 2011). Parry and Metzger (2023) have pointed out that teachers are often faced with the absence of multidisciplinary educational frameworks, the persistence of subject silos, and insufficient opportunities for professional development, all of which limit a holistic approach to the dimensions of sustainability. To address these shortcomings, sustainability pedagogy emphasises experiential learning, reflective thinking, and active citizenship (Major, 2017). Recent research highlights that modern environmental education is grounded in interdisciplinarity, participatory and outdoor learning forms, as well as the development of critical thinking (Kerr, 2020; Zhang, Wang, & Chen, 2025). Husin et al. (2025) have stressed that the future of school-based environmental education lies in integrating sustainability with hope, while Spiegelaar (2022) has called for the incorporation of psychological and analytical approaches to foster deeper engagement.

In the context of higher education, the development of sustainability competencies often takes place through community-based and project-oriented approaches (Saari, Poulton-Busler,

& Vladimirova, 2024). Leal Filho et al. (2025) have argued that the effects of sustainability education programs should be assessed in a multidimensional way, as linking practice to theory strengthens student commitment. Sohaee and Farsad (2025), on the other hand, have presented innovative pedagogical methods that support the internalization of sustainability goals through experiential and community-based learning elements.

Educational Policy Frameworks and Content Models

This paradigm shift is also supported by international educational policy frameworks: the Decade of Education for Sustainable Development (2005–2014) and the Sustainable Development Goals (2015–2030) both emphasise the integration of economic, social, and environmental dimensions (UNESCO, 2005). Recent literature has confirmed that policy guidelines play a key role in shaping the global framework of sustainability education (Leicht, Heiss, & Byun, 2018). The principles articulated in documents of global education policies are also reflected at the level of content models. One of the fundamental approaches to environmental education can be characterized by three primary frameworks: education *about* the environment, focusing on developing knowledge and understanding; education *for* the environment, which emphasises responsibility and care; and education *in* the environment, whose goal is to strengthen learning through experience and action (Palmer, 1998).

This approach is built upon lifelong learning, collaboration, and systems thinking. Its aim is to educate responsible citizens who recognize environmental challenges and actively participate in their resolution (Ardoin et al., 2020).

Environmental Attitudes and Their Role in Education

The realization of the goals of environmental education cannot be limited to the transmission of knowledge; the shaping of attitudes, values, and emotional relations is equally fundamental (Kalaycı Alas & Korutürk, 2024; Portus et al., 2024). Individuals who practice environmentally conscious lifestyles not only understand environmental problems and related action strategies but also believe in the significance of their own actions, show commitment to taking initiative, and possess experience in independent efforts (van de Wetering et al., 2022).

In social-psychological terms, the concept of attitude is one of the dynamic components of human personality: it is an evaluative orientation that determines reactions to environmental phenomena (Baierl, Kaiser, & Bogner, 2024). Attitudes are always directed toward a specific object or phenomenon and can be positive, negative, or neutral. In environmental education, attitudes integrate actions, habits, emotions, and knowledge, and play a key role in developing positive emotional connections to nature (Neurohr et al., 2024). Familiarizing learners with nature and fostering affection toward it serves as the foundation for the desire to protect the environment; therefore, one of the most important tasks for educators is the development of attitudes (Masalimova et al., 2023; Portus et al., 2024).

Environmental attitudes are commonly characterized by three main components: the cognitive dimension, which encompasses knowledge; the affective element, which reflects positive or negative emotions; and the behavioural component, which captures actual environmentally conscious habits and actions. Together, these determine how individuals relate to environmental challenges and the extent to which they are willing to assume responsibility. Thus, the conscious shaping of attitudes is a key area of sustainability education — without it, purely cognitive knowledge rarely leads to lasting behavioural change (van de Wetering et al., 2022).

Environmental Education and Sustainability Competencies in Teacher Education

Teacher education plays a crucial role in transmitting the perspectives of environmental education between generations, because future educators will not only influence their own attitudes but also the evolving value systems of their own students. Recent studies have confirmed that teacher training is a key arena for transferring sustainability values and practices, since students, or rather future teachers, wield a multiplier effect (Imran & Almusharraf, 2024; Khazen et al., 2025). The available literature also emphasises that the mission of teacher education goes beyond the simple transmission of knowledge: shaping students' attitudes, values, and environmentally conscious behaviours is an equally important aspect (Bulut & Oksuzoglu, 2025; Corres, Ruiz-Mallén, & Rieckmann, 2024).

It is particularly important to incorporate the content and methods of environmental education in regions where minority-language education also fulfils identity-preserving and community-sustaining functions. International examples have shown that teacher training institutions—including the Hungarian Teacher Training Faculty in Subotica—implement the pedagogy of sustainability not only through curricular content, but also through shaping students' personal attitudes (Lendák-Kabók, 2024; Major et al., 2017).

Overall, the effectiveness of teacher education serves a dual purpose: it contributes to shaping students' mindsets, while also ensuring that future generations encounter teachers who can model sustainability in practice. This process is especially significant in Central and Eastern European contexts, where social, economic, and cultural factors also influence environmental attitudes and practices (Imran et al., 2024).

Sustainability Competencies

Among the United Nations Sustainable Development Goals (SDGs), Goal 4 addresses quality education. Specifically, SDG 4.7 highlights that education should contribute to learners acquiring the knowledge, skills, and values necessary to support sustainable development (UNESCO, 2017). In addition, the European Union's GreenComp framework (Bianchi, Pisiotis, & Cabrera Giraldez, 2022) identifies four main areas of competence: systems thinking, futures literacy, values-based action, and collaboration for sustainability.

Teacher education plays a crucial role, as students—future educators—directly influence the environmental awareness of the next generations through their own attitudes and behavioural patterns (Saari et al., 2024). According to Rodríguez Pérez, Azcárate Goded, and García-González (2024), teacher education should not be limited to just the transmission of knowledge; rather, it must foster environmental literacy as a core competence in future teachers. Yadav and Kalyani (2024) likewise have emphasised that the integration of environmental education into teacher training curricula is indispensable for the systematic transfer of sustainability values. Husin et al. (2025) have further pointed out that teachers are key actors who, through environmental education, transmit not only knowledge to society but also hope and confidence in a sustainable future.

Theoretical Foundations of Measuring Environmental Attitudes

When studying environmental attitudes, it is not sufficient to only measure declared opinions, as positive attitudes do not always correspond with actual pro-environmental behaviour. This phenomenon is often referred to in the literature as the attitude–behaviour gap, for which various models offer explanations. One of the most prominent is Ajzen's Theory of Planned Behaviour (TPB), which emphasises that behavioural intention is shaped not only by attitudes but also by social expectations and perceptions of control over action (Ajzen, 1991;

Monroe, Crandall, & Maynard, 2021). Actual behaviour is directly determined by intention, which is composed of attitudes, subjective norms, and perceived control of behaviour. Recent research has confirmed that TPB remains a strong predictor of pro-environmental behavioural intentions (Pai et al., 2024; Puiu et al., 2025), however, its frequent criticism points out the persistence of the intention–behaviour gap, while newer studies have highlighted that the theory can be further expanded with additional elements, such as emotions, which directly influence decisions and may reduce the discrepancy between intention and behaviour (Ho et al., 2024).

For this reason, the present study employed multiple measurement instruments (RevNEP, ENV, CHEAKS), as each captures different aspects: environmental worldview, attitudes, and everyday practices. The parallel use of these three questionnaires allows for a more nuanced picture of students' environmental attitudes. A detailed presentation of the measurement scales is provided in the instruments section (see subsection Measurement instruments).

In summary, the theoretical and empirical literature highlight the complexity of environmental attitudes and their decisive role in sustainability education. Building on these theoretical foundations, the next section outlines the specific research problem and objectives addressed in this study.

Research Problem

Although previous research at the Faculty would indicate the importance of environmental education and its potential to shape students' attitudes, no empirical evidence has yet verified the effectiveness of the newly introduced sustainability-oriented elective courses in teacher education. The problem addressed in this study is the lack of data confirming whether these courses—Environmental Protection, Ecology, and Zoopedagogy—lead to measurable changes in students' environmental attitudes.

This question is particularly relevant as the subjects were integrated into the teacher-training curriculum based on earlier research and are now approaching a new accreditation cycle. Demonstrating their effectiveness is therefore essential both for the improvement of education and for maintaining these courses in the forthcoming curriculum.

In Serbia's higher education, curriculum development that's directly aligned with the concept of sustainability has so far been absent, especially in teacher and preschool teacher training. The Hungarian Teacher Training Faculty of the University of Novi Sad has taken a pioneering role by aligning its institutional strategy with the vision of a “sustainable university.” This research series, launched within that framework, monitors how sustainability becomes a planned, consistent, and measurable component of the curriculum rather than an isolated influence. The three elective courses examined in this study, represent this innovative model.

Beyond its institutional scope, the study also has regional and international relevance. Minority-language teacher training programs operate in several neighbouring countries (Romania, Slovakia, Ukraine, and Croatia), and the Hungarian Teacher Training Faculty of the University of Novi Sad maintains active cooperation with many of them. The model and results presented here may serve as a transferable good practice and a basis for future collaborative initiatives in sustainability education across Central and Eastern Europe.

Research Focus

To provide a clear framework for the research, this section outlines the elective courses that served as the basis for empirical investigation. In the teacher and early childhood educator training programs of the Teacher Training Faculty in question, three elective courses support the development of sustainability-oriented perspectives: Environmental Protection, Ecology, and Zoopedagogy. Together, they provide both theoretical knowledge and practical experience in environmental education.

Environmental Protection fosters environmentally friendly thinking, emphasizing global issues and their local solutions. Students study sources of pollution, water and soil, waste management, and human ecology. Practical elements include field studies and “curriculum greening,” linking theory to direct experiences.

Ecology develops ecological awareness, enabling students to assess environmental conditions and apply knowledge in practice. The topics of the course include ecosystems, the biosphere, urbanization, and sustainability pedagogy. Fieldwork includes visits to protected areas and wastewater treatment plants, as well as identifying local problems. The course is closely linked to Environmental Protection, ensuring systemic integration.

Zoopedagogy focuses on the pedagogical potential of zoos, raises awareness of species and habitat protection, and promotes harmony between humans and nature. The theoretical content covers methods and international practices, while practical training takes place at the Palić Zoo.

Together, the three courses promote comprehensive development: Environmental Protection raises problem awareness, Ecology strengthens systems thinking, and Zoopedagogy emphasises experiential learning. Collectively, they prepare future educators to authentically convey sustainability values and foster environmental awareness among children. These courses therefore form the pedagogical and empirical foundation of the present study, enabling the analysis of how curriculum-integrated sustainability education contributes to the development of environmental attitudes among teacher training students.

Research Aim and Research Questions

The aim of this research is to examine how the sustainability-oriented courses introduced at the chosen teacher training faculty (Environmental Protection, Ecology, and Zoopedagogy) influence students’ environmental attitudes. The study was conducted over three academic years (2022–2025), with a total of 150 students participating. A total of 50 students participated in the three elective courses in each of the three academic years examined.

The research objectives were to explore whether these courses contribute to sustainability-oriented perspectives; to examine whether students’ environmental attitudes reach a level that enables them, as future teachers, to provide environmentally conscious education; and to provide a scientific basis for justifying the relevance of these courses in the upcoming curriculum reaccreditation.

The significance of this research is twofold: it provides an empirical evaluation of the courses’ effects and serves as support for an upcoming institutional decision. In Serbia, there have been no teacher-training courses purposefully aligned with the pedagogical goals of sustainability education; if these findings confirm their effectiveness, their reaccreditation will formally acknowledge that such courses work in practice. This recognition would be especially meaningful as it comes from a small, minority-language faculty, providing the first regional model for integrating sustainability education into teacher-training curricula, and contributing to the international discourse on sustainability in education. Thus, the study is valuable both scientifically and institutionally. In order to achieve these aims, the research was guided by the following core questions, which focus on the effects of the sustainability-oriented courses and the influencing factors behind students’ environmental attitudes.

Research Questions

(RQ1) How do the sustainability-oriented courses (Environmental Protection, Ecology, and Zoopedagogy) influence the development of students’ environmental attitudes?

(RQ2) How closely and to what extent are the differences in students' environmental attitudes associated with sociodemographic factors and self-reported environmental awareness?

(RQ3) How do the attitudinal effects of the three courses compare across different academic years and fields (early childhood educator and primary school teacher training)?

Research Methodology

Design

The study employed a quantitative, longitudinal research design, combining cross-sectional comparisons with repeated measurements over three academic years (2022–2025). The research focused on the impact of three elective environmental education courses integrated into teacher training. Data were collected through standardized instruments (RevNEP, ENV, and CHEAKS), administered at the beginning and end of each academic year. Statistical analyses examined both within-group changes and between-group differences based on academic year and field (early childhood vs. primary school education).

Sample

The sample of the study consisted of students from the Hungarian Teacher Training Faculty of the University of Novi Sad, who are a core community in higher education for the Hungarian minority in Vojvodina. Located in Subotica, this Faculty is the only higher education institution in Serbia with education conducted entirely in Hungarian.

The study covered three consecutive academic years (2022–2025), during which data were gathered from students enrolled in the available sustainability courses. Although the courses in question were launched in 2020/2021, the COVID-19 pandemic and building renovations required online instruction, which did not allow proper measurement. Therefore, the effect assessment of the newly introduced courses – that is, the evaluation of their effects on students' environmental attitudes – could only begin in the spring semester of 2022/2023.

Each year, a fixed number of students participated: 15 in Environmental Protection, 15 in Ecology, and 20 in Zoopedagogy. Altogether, the three-year cumulative sample included 150 students (Table 1). The sample reflects the target population and ensures that findings can inform institutional curricular decisions. Given the institutional and minority-language context, the study applied a purposive institutional sampling procedure. The sample included all students who completed the sustainability-focused courses during three consecutive academic years. This approach ensured full coverage of the target population and was appropriate for the purpose of a course-level effect assessment.

Table 1

Distribution of Participants by Course and Year (Preschool / Primary Teacher Training)

Course	Total (3 years)	2022	2023	2024
Environmental Protection (2nd year)	45 (24 / 21)	15 (8 / 7)	15 (7 / 8)	15 (9 / 6)
Ecology (4th year)	45 (22 / 23)	15 (6 / 9)	15 (9 / 6)	15 (7 / 8)
Zoopedagogy (4th year)	60 (33 / 27)	20 (11 / 9)	20 (10 / 10)	20 (12 / 8)
Total ^a	150 (79 / 71) ^a	50 (25 / 25)	50 (26 / 24)	50 (28 / 22)

Note 1. The table shows the number of students by year of study and program (preschool teacher training and primary school teacher training). ^aThe total number of respondents was $N = 150$.

Note 2. M = mean; SD = standard deviation

The gender distribution of the sample reflects the characteristics of teacher education, with the overwhelming majority of participants being female, which made analysing gender differences not possible within the present study. Age distribution was homogeneous, as most students were between 20 and 22 years old.

Moreover, the following additional background variables were also considered within the sample: field of study (primary school teacher vs. early childhood educator training), year of study (2nd and 4th year), place of residence (settlement size), parents' educational attainment, and financial situation—all of which may contribute to a deeper understanding of changes in attitudes.

Hypotheses

To provide measurable verification of the research questions, the following hypotheses were formulated, which guided the statistical testing of relationships between the variables.

(H1) Attitude change: The environmental attitudes of students participating in environmental education courses are expected to change significantly in a positive direction after completing the courses, as measured by the RevNEP, ENV, and CHEAKS scales.

(H2) Effect of courses: The three courses (Environmental Protection, Ecology, Zoopedagogy) contribute to the development of students' environmental attitudes to varying degrees, but all three foster the formation of environmentally conscious perspectives.

(H3) Comparison by year and field of study: Fourth-year students will demonstrate higher levels of environmental attitudes compared to second-year students, reflecting the cumulative effect of experiences gained during their studies. In addition, differences in environmental attitudes are expected between early childhood education and primary school teacher training students, attributable to the distinct curricular and professional characteristics of the two programs.

(H4) Relationship between self-reported environmentally conscious lifestyle and environmental attitudes: Students who perceive their own lifestyle as environmentally conscious will achieve higher environmental attitude scores on the RevNEP, ENV, and CHEAKS scales.

(H5) Relationship between perceived importance of training and attitudes: Students who consider the inclusion of environmental awareness in teacher training important, and those who perceive their own lifestyle as environmentally conscious, will demonstrate higher environmental attitude scores.

(H6) Effect of background variables: Students' environmental attitudes can be associated with certain sociodemographic factors: type of residence, parents' educational attainment, and financial situation may influence the development of sustainability-oriented perspectives.

Instrument and Procedures

This study examined students' environmental attitudes using three internationally validated instruments: the Revised New Ecological Paradigm Scale (RevNEP), the Environmental Attitudes Scale (ENV), and the Children's Environmental Attitudes and Knowledge Scale (CHEAKS). These instruments cover different perspectives, and their combined application provides a comprehensive picture of students' environmental attitudes.

The RevNEP scale (Dunlap et al., 2000; Hungarian adaptation: Gulyás, 2004) measures environmental worldview, particularly the relationship between ecological orientation and anthropocentric attitudes. It enables a nuanced interpretation of concepts of nature and is frequently used in sustainability education research.

The ENV scale (Bogner & Wiseman, 1999; Hungarian adaptation: Gulyás, 2004) examines environmental attitudes along two spectrums: utilization and preservation. It captures both value orientations toward the environment and willingness to act.

The CHEAKS scale (Leeming et al., 1995; Hungarian adaptation: Varga, 2004) was originally designed for children but has proven reliable for young adults as well. The test consists of six subscales, each containing four items: two assess emotions toward the given topic and two assess behavioural dispositions. CHEAKS captures both the emotional foundations of environmental attitudes and willingness to act, crucial in teacher education.

Using the above mentioned three scales has allowed the research to go beyond simply mapping knowledge or general attitudes, offering a detailed representation of students' views, emotional orientations, and readiness for action in relation to sustainability. While CHEAKS and ENV focus more directly on behaviour, RevNEP primarily assesses general orientations, thereby reducing the influence of social desirability bias, more present in the other two (Gulyás, 2004). Since social desirability decreases with age, this effect is less significant among the 18–22-year-old participants than it would be in younger children (Gulyás & Varga, 2006, cited in Major et al., 2017).

The overall reliability of the 59-item scale was high (Cronbach's $\alpha = .93$), indicating good internal consistency.

It is important to note that RevNEP, ENV, and CHEAKS have also been applied in previous studies of teacher training students' environmental attitudes (Major, 2017; Major et al., 2017). In those studies, the instruments have proved reliable and valid, supporting their application in the present research. Although this study does not aim to provide a direct comparison with earlier results, the repeated use of the same instruments ensures continuity and provides a foundation for future longitudinal analyses.

Data Analysis

When it comes to analysing the collected data, in order to summarise the responses for all three scales, descriptive statistics were applied, followed by comparative analyses (ANOVA and t-tests) that would identify significant differences between programs and academic years. The reliability of the instruments was confirmed through Cronbach's α coefficients exceeding the accepted threshold ($\alpha > .70$). The results were interpreted with a focus on developmental tendencies and the consistency of changes across the three measurement instruments. The analysis of the data was conducted in line with the hypotheses established for this study, guiding the order of the analyses and the presentation of the results.

Research Results

Attitude Change

The initial hypothesis stated that the environmental attitudes of students participating in environmental education courses would change significantly in a positive direction after completing the selected courses, as measured by the RevNEP, ENV, and CHEAKS scales.

On all subscales of the RevNEP, a continuous positive change was observed across the three academic years examined, while mean values were consistently above the neutral level and increased year by year (Table 2). The subscale results provide a detailed picture of changes in specific aspects of students' environmental worldviews, while the hypothesis testing was based on the overall RevNEP scale values.

Table 2
Attitude Values Measured by the RevNEP Scale

Sub-Scales	2022/2023		2023/2024		2024/2025		Neutral Value ^{a b}
	M	SD	M	SD	M	SD	
Limits to Growth	9.6	1.4	10.22	1.7	10.4	1.9	9
Anti-anthropocentrism	11.1	2.4	12.3	2.2	12.8	2.4	
Fragility of Nature's Balance	10.36	2.1	12.1	2.3	12.7	2.2	
Rejection of Human Exceptionalism	9.34	1.4	10.04	1.9	10.8	1.9	
Possibility of an Ecological Crisis	11.08	2	12.06	2.1	12.9	2.1	
Total RevNEP scale	51.48	7.3	56.72	7.8	59.7	8.2	45

Note. The RevNEP scale is based on a 5-point Likert scale, where the neutral value for each item is 3. ^aSince each subscale consists of 3 items, their neutral value is 9. ^bThe full 15-item scale has a neutral level of 45, against which the students' average scores can be interpreted.

Among the subscales, the largest increase was observed in the item measuring the fragility of nature's balance, but pro-environmental attitudes strengthened in all dimensions. The total RevNEP mean score increased from 51.48 to 59.7, which significantly exceeded the neutral level (45). According to the results of the one-way ANOVA, the mean environmental attitude scores measured on the full RevNEP scale differed significantly among the three student groups, $F(2, 147) = 14.34, p < .001$. Tukey B post hoc tests showed that the mean score for the first year was significantly lower than for the second and third years, while no notable difference was found between the two later years: $[2022/2023] < [2023/2024; 2024/2025]$.

Overall, the results indicate that environmental attitudes measured on the full RevNEP scale systematically strengthened, particularly between the first and second measurements, and then remained consistently high in the third year. This supports the hypothesis that environmental education courses contributed to positive attitude change among students.

The results of the ENV scale indicate that students' environmental attitudes gradually strengthened over the three academic years (Table 3).

Table 3
Attitude Values Measured by the ENV Scale

Sub-Scales	2022/2023		2023/2024		2024/2025		Neutral Value ^{a b c}
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Utilization factor	26.52	4.7	27.8	4.4	29.44	4.5	24
1. Altering nature	12.4	2.6	13.03	2.9	13.46	2.8	12
2. Human dominance	14.04	2.7	14.8	2.3	15.98	2.4	
Preservation factor	43.64	6.6	43.18	6.9	46.44	7.4	36
3. Intent of support	12.12	2.7	10.76	3.2	11.76	3.6	12
4. Enjoyment of nature	16.3	3.1	17.14	2.9	18.14	2.5	
5. Care with nat. resources	15.18	2.6	15.3	2.8	16.54	2.8	
Total ENV-scale	70.16	9.3	71	9.6	75.88	9.4	60

Note. The ENV scale is based on a 5-point Likert scale, with each subscale consisting of 4 items. ^aThe utilization factor consists of two 4-item subscales (neutral value = 24). ^bThe preservation factor consists of three 4-item subscales (neutral value = 36). ^cThe full 20-item scale has a neutral level of 60 points.

The mean score of the full scale exceeded the neutral level (60 points) in every year and increased to 75.88 by the 2024/2025 academic year. Both the utilization and preservation factors showed growth, particularly in terms of enjoyment of nature and careful use of natural resources. On the other hand, fluctuations in the intent of support subscale (12.12 → 10.76 → 11.76) suggest that intentions of taking action were less stable than attitudinal commitment. Overall, the results reflect strengthened positive environmental attitudes, although the willingness to engage in concrete action appeared to be less consistent (Table 4). The results of the one-way ANOVA confirmed that mean environmental attitudes measured on the full ENV scale differed significantly among the three student groups, $F(2, 147) = 5.38, p = .006$. Tukey B post hoc tests showed that the mean score of the third year (2024/2025) was significantly higher than in the first two years, while no substantial difference was found between the 2022/2023 and 2023/2024 groups: $[2022/2023; 2023/2024] < [2024/2025]$.

Overall, the environmental attitudes measured by the ENV scale showed continuous strengthening over the three academic years and reached a considerably higher level in the third measurement. The results indicate that the environmental education courses contributed to positive changes in the students' attitudes.

The results of the CHEAKS scale show that students' environmental attitudes developed positively in both the emotional and behavioural dimensions across the three academic years studied.

Table 4
Attitude Values Measured by the CHEAKS Scale

Sub-Scales	2022/2023		2023/2024		2024/2025		Neutral Value ^{a b}
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
General	14.3	3.3	13.36	2.7	14.28	3.13	12
Animals	15.1	3.7	15.72	3.2	16.52	3.4	
Plants	16.6	2.7	17.08	2.4	17.96	2.5	
Water	15.32	2.6	16.84	3.02	16.94	3.1	
Waste	14.86	2.7	15.76	2.7	16.48	2.8	
Energy	15.3	3.1	15.74	3.1	16.46	2.9	
Emotion sub-scale	46.38	8.5	49.04	8.6	50.54	8.9	36
Behaviour sub-scale	44.96	7.2	45.46	5.5	48.1	6.8	
Total CHEAKS scale	91.28	14.9	94.5	13.5	98.64	15.1	72

Note. The CHEAKS scale is based on a 5-point Likert scale. Each 4-item subscale has a neutral value of 12.

^aThe scale comprises two main factors (emotional and behavioral), each with 12 items, resulting in a neutral value of 36 points. ^bThe full 24-item scale has a neutral level of 72 points, against which students' average scores can be interpreted.

Among the subscales, the strongest increases were observed in attitudes toward plants (16.6 → 17.96), animals (15.1 → 16.52), and water (15.32 → 16.94), which consistently strengthened and exceeded the neutral level of 12 points. Similarly positive trends were found in approaches to waste management (14.86 → 16.48) and energy conservation (15.3 → 16.46). The mean scores of the emotional factor rose from 46.38 to 50.54, while the behavioural factor increased from 44.96 to 48.1, with both remaining well above the neutral level (36 points). The total CHEAKS scale scores (91.28 → 98.64) showed systematic and gradual growth and significantly exceeded the neutral level of 72 points in all years of measurement. This indicates that students demonstrated increasingly strong pro-environmental orientations, not only in emotional attachment but also in behavioural intentions. The results of the one-way ANOVA showed that mean environmental attitudes measured on the full CHEAKS scale differed significantly among the three academic year groups, $F(2, 146) = 3.17, p = .045$. Tukey B post hoc tests confirmed that attitudes increased steadily: the 2023/2024 mean was notably higher than 2022/2023, while the 2024/2025 mean discernibly exceeded both earlier years: $[2022/2023] < [2023/2024] < [2024/2025]$.

In summary, the CHEAKS scale data support the initial hypothesis: environmental education courses have contributed to significant positive changes in students' environmental attitudes and have manifested in both emotional identification and behavioural intentions. Across all three scales, the results showed significant and continuous positive change, clearly confirming the initial assumption that environmental education courses strengthen students' environmental attitudes.

Effect of Courses

As the next step of the analysis, the extent to which the three courses contributed to the development of students' environmental attitudes was examined. For this purpose, the data of all students across the three academic years were analysed in aggregate, and one-way ANOVA was used to compare the mean scores of the course groups on the full RevNEP, ENV, and CHEAKS scales. This method made it possible to determine whether statistically significant differences could be identified between the courses in terms of attitude values.

Based on the ANOVA results, no such differences were found among the three courses (Environmental Protection, Ecology, and Zoopedagogy) on any of the full scales: RevNEP, $F(2, 147) = 0.09$, $p = .914$; ENV, $F(2, 147) = 1.31$, $p = .272$; CHEAKS, $F(2, 146) = 1.06$, $p = .351$ (Table 5).

Table 5
Environmental Attitudes by Subject on the Total Scales

Subjects	Total RevNEP Scale		Total ENV Scale		Total CHEAKS Scale	
	M	Neutral Value	M	Neutral Value	M	Neutral Value
Environmental protection	55.80	45	70.80	60	92.93	72
Ecology	56.42		74.09		97.36	
Zoopedagogy	55.76		72.20		94.33	

The results indicate that although all three courses contributed positively to the development of students' environmental attitudes, there were no statistically verifiable differences in the extent of their effects. Therefore, the first part of Hypothesis 2, claiming that all courses contribute to shaping attitudes, was confirmed; while the second part, which stated that the effects would differ in magnitude, was not supported.

Comparison by Year of Study and Field of Training

Hypothesis 3 stated that fourth-year students would demonstrate higher levels of environmental attitudes than second-year students, as cumulative study experiences may play a role in changing mindsets toward sustainability. In addition, differences were expected to be found between preschool and primary school teacher training students due to distinct curricular emphases. Independent-samples t-tests compared the mean scores of year groups (2nd vs. 4th year) and study programs (preschool vs. primary school) on the full RevNEP, ENV, and CHEAKS scales. Results showed that fourth-year students achieved slightly higher means on all three scales compared to second-year students; however, the differences were not statistically significant (RevNEP: $t(148) = -0.16$, $p = .870$; ENV: $t(70.94) = -1.19$, $p = .239$; CHEAKS: $t(147) = -1.02$, $p = .311$). This indicates that although attitudes tend to strengthen with progression, the difference was not statistically noteworthy. Thus, Hypothesis 3—predicting notably higher attitudes among fourth-year students—was not supported. In contrast, the comparison of the study programs revealed considerable differences on all three scales: RevNEP: $t(148) = 2.07$, $p = .040$; ENV: $t(148) = 3.21$, $p = .002$; CHEAKS: $t(147) = 3.12$, $p = .002$. Primary school teacher training students scored higher, suggesting that attitudes may vary depending on the field of study.

These findings suggest that the shaping of environmental attitudes may depend less on academic progression and more on curricular emphases and program-specific experiences.

Relationship Between Self-Reported Environmentally Conscious Lifestyle and Environmental Attitudes

The next phase of the analysis examined the relationship between the students' self-assessed environmental consciousness in their lifestyles and their measured levels of environmental attitudes. The initial assumption was that students with higher levels of self-perceived environmental awareness would score higher on the different attitude scales.

Pearson's correlation analysis was conducted to examine relationships between self-reported lifestyle and scores on the RevNEP, ENV, and CHEAKS scales. The results showed that a self-reported environmentally conscious lifestyle was not extensively related to the total RevNEP scale, $r(150) = .12, p = .141$. This may be explained by the fact that RevNEP primarily captures general ecological worldview, and therefore less directly reflects practical, everyday lifestyle factors. In contrast, notable positive correlations were found with the ENV scale, $r(150) = .37, p < .001$, and the CHEAKS scale, $r(151) = .29, p < .001$, which more specifically measure attitudes related to pro-environmental behaviour and emotional identification.

Analysis of the subscales revealed that self-reported environmental consciousness was particularly associated with the ENV preservation factor ($r = .37, p < .001$), as well as the CHEAKS emotional ($r = .29, p < .001$) and behavioural ($r = .26, p = .001$) dimensions. This suggests that students who evaluate their own lifestyle as more environmentally conscious consistently score higher in areas measuring pro-environmental behaviour and emotional attachment.

In summary, Hypothesis 4 was confirmed: there is a significant positive relationship between students' self-reported environmentally conscious lifestyle and their measured environmental attitudes.

Perceived Importance of Environmental Education and Its Relationship with Attitudes

In the next stage of the analysis, students' environmental attitudes were examined in relation to how important they considered the inclusion of such awareness in teacher education and how they evaluated the eco-consciousness of their own lifestyle. The hypothesis stated that students who rated both factors higher would consistently achieve higher scores on the RevNEP, ENV, and CHEAKS scales. To test this, Pearson's correlation analysis was applied, which allowed for exploration of the relationships between the two background variables and the full scales, as well as their subscales. The results of the Pearson correlations showed that the perceived importance of environmental education was significantly and positively related to all three full scales: RevNEP, $r(150) = .30, p < .001$; ENV, $r(150) = .51, p < .001$; CHEAKS, $r(149) = .41, p < .001$.

Consistently positive correlations were also found at the subscale level: the ENV utilization ($r = .42, p < .001$) and preservation ($r = .41, p < .001$) factors, as well as the CHEAKS behavioural ($r = .39, p < .001$) and emotional ($r = .40, p < .001$) dimensions, all showed considerable correlation with students' responses. This indicates that those who attribute greater significance to environmental education also score higher in both attitudinal aspects and in the dimensions of pro-ecological behaviour and emotional attachment.

Overall, the results have supported Hypothesis 5: acknowledging the importance of environmental education content is strongly associated with more positive environmental attitudes among students.

Effect of Background Variables

The development of environmental attitudes can be influenced not only by studies and training experiences but also by students' sociodemographic backgrounds. International research has highlighted that family background, social status, and residential environment play important roles in shaping ecological values and sustainability orientations. Based on this, the present study hypothesized that students' environmental attitudes would be related to certain sociodemographic factors: type of residence, parents' educational attainment, and financial situation were assumed to potentially influence the development of sustainability perspectives (H6).

To test these relationships, Pearson's correlation analysis was applied, which allowed for the exploration of the connections between the environmental attitude scales and the chosen background variables. The results showed that none of the examined background variables had a significant relationship with environmental attitudes measured on the full RevNEP, ENV, or CHEAKS scales ($p > .05$ in all cases), which indicates that students' attitudes have not been substantially influenced by their type of residence, parents' level of education, financial situation, or even the method of financing their studies.

Overall, Hypothesis 6 was not supported: the examined sociodemographic factors did not show detectable associations with environmental attitudes. One possible explanation is that the sustainability education courses within teacher training exert a unifying effect: regardless of students' social backgrounds, all participants have similar opportunities to shape and develop their ecological perspectives. This may offset the differences that, in other contexts, could be attributed to parental background, social status, or type of residence.

Discussion

The results of the present study confirmed that structured environmental education courses have a measurable positive impact on students' environmental attitudes in teacher and preschool teacher training. This aligns with previous studies (Husin et al., 2025; Grishaeva et al., 2020) that have indicated that systematic sustainability education contributes to the development of environmental sensitivity. Consistent increases were observed across all three applied scales (RevNEP, ENV, CHEAKS), signalling strengthened environmentally conscious perspectives.

However, contrary to some studies reporting substantial behavioural change following intensive sustainability programs (Imran and Almusharraf, 2024), the present research revealed more moderate attitudinal development. This pattern suggests that while students' attitudinal commitment strengthened, their behavioural intentions remained less stable. This pattern implies that while students possess adequate theoretical knowledge, practical ecologically conscious actions may lag, possibly due to social influences, limited opportunities, and insufficient practical training. It is therefore recommended to include additional activities and reflective, practice-based learning situations to foster growth in these dimensions.

The first hypothesis was confirmed: participation in environmental education courses positively affects students' environmental attitudes. This is consistent with research that has shown that structured programs such as learning stations and preparatory presentations can enhance environmental awareness and waste collection practices (Gerçek & Özcan, 2016). Due to this survey having focused solely on attitudes, further studies should assess the practical application of these attitudes, given that the internalisation of environmental values typically precedes observable behavioural change.

In the case of the second hypothesis, all three courses contributed to shaping attitudes, although the differences were not statistically significant, which may reflect that either the courses' contents were too similar, or the window for detection of larger effects was too short. These findings are in line with Husin et al. (2025), who have noted that the continuity and structure of sustainability education exert greater influence on attitude formation than course-specific content.

The third hypothesis, which predicted significantly higher attitudes among fourth-year students, was not confirmed. This suggests that the level of study alone does not determine attitudinal development; rather, the presence and quality of programs influence attitude formation. Imran and Almusharraf (2024) have also emphasised that program structure plays a key role. These findings underline that curriculum design and teaching methods are more important than the length of one's studies. Future research should therefore identify which

educational contents and learning methods most effectively foster pro-environmental attitudes and which external factors shape students' ecological perspectives.

The fourth hypothesis was confirmed, proving the existence of a positive relationship between students' self-reported environmentally conscious lifestyles and their measured attitudes. This supports the view that personal behaviour and environmental attitudes mutually reinforce each other, consistent with Gerçek and Özcan (2016), who have argued that lived experiences strengthen both cognitive and affective dimensions of environmental awareness. Because self-reports can be biased, future studies should include observation-based behavioural measures.

The fifth hypothesis, which linked recognition of the importance of sustainability education content with more positive attitudes, was also successfully confirmed, which aligns with Ardoin et al. (2020), who have emphasised that acknowledging the value of environmental education acts as a catalyst for the development of eco-conscious values. The perceived relevance and usefulness of curriculum content may therefore motivate deeper engagement and internalisation, calling attention to the critical role of curriculum design in effective environmental education.

The sixth hypothesis, proposing relationships between sociodemographic factors (residential type, parental education, financial status) and environmental attitudes, was not confirmed. This suggests that the contents of an educational program and student motivation are more influential than demographic variables. Although other studies have drawn different conclusions (e.g., Patel et al., 2017; Zhang et al., 2021), and while international research has highlighted the roles of family background, social status, and residential environment in shaping ecological values (Vrselja et al., 2024), no such sociodemographic effects emerged in the present study. These discrepancies may indicate that pedagogical experiences and program structure can override demographic influences, showcasing the equalising role of education. Structured, interactive and culturally sensitive programs significantly enhance attitudes (Husin et al., 2025; Gerçek & Özcan, 2016), while instructional quality and motivation appear more influential than sociodemographic factors (Whitmarsh & O'Neill, 2010).

This finding is consistent with Asano (2011), who has demonstrated that early engagement with sustainability education promotes environmental awareness and responsible behaviour. The results of this study further indicate that teacher education can serve as the foundation of developing long-term pro-environmental commitment, as young educators are likely to continue embodying these values in their future professional roles.

Overall, the results underscore the decisive role of curriculum quality and pedagogical design in shaping environmental attitudes in preschool and primary school teacher training. They also illustrate the attitudinal stage of sustainability competence development, representing the foundation of forming a pro-environmental professional identity that can later translate into classroom practice.

Conclusions and Implications

The results of the present study confirm that well-structured, practice-oriented environmental education courses can result in lasting transformative effects within teacher education, establishing an effective model for the pedagogical implementation of sustainability that also offers an adaptable framework for other teacher training systems.

Analyses using validated instruments (RevNEP, ENV, and CHEAKS) have demonstrated measurable improvement in students' cognitive, affective, and behavioural dimensions, underlining the crucial role of curriculum quality and pedagogical design in developing sustainability competences.

These findings provide strong empirical support for integrating environmental education into teacher training curricula and illustrate the importance of curriculum-embedded, dedicated subjects that serve as examples and models for the deliberate, positive development of environmental attitudes in teacher education.

Future research could explore how these attitudinal changes evolve into long-term professional commitment and environmentally conscious actions that are integrated into everyday educational practice.

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References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. *Biological Conservation*, 241, Article 108224. <https://doi.org/10.1016/j.biocon.2019.108224>
- Asano, Y. (2011). The comparative study of education for sustainable development in early childhood in Sweden and Japan: Through “The environmental epistemological model of 5 aspects.” *Problems of Education in the 21st Century*, 32, 23–32. <https://doi.org/10.33225/pec/11.32.23>
- Baierl, T.-M., Kaiser, F. G., & Bogner, F. X. (2024). The role of attitude toward nature in learning about environmental issues. *Frontiers in Psychology*, 15, Article 1471026. <https://doi.org/10.3389/fpsyg.2024.1471026>
- Bianchi, G., Pisiotis, U., & Cabrera Giraldez, M. (2022). *GreenComp: The European sustainability competence framework*. Publications Office of the European Union. <https://doi.org/10.2760/13286>
- Bulut, B., & Öksüzöğlü, İ. E. (2025). Teachers’ beliefs about education for sustainable development: Challenges and opportunities. *Sustainability*, 17(16), Article 7552. <https://doi.org/10.3390/su17167552>
- Corres, A., Ruiz-Mallén, I., & Rieckmann, M. (2024). Educators’ competences, motivations, and teaching challenges faced in education for sustainable development: What are the interlinkages? *Cogent Education*, 11(1), Article 2302408. <https://doi.org/10.1080/2331186X.2024.2302408>
- Fountain, K., Koppen, K., & Leemans, R. (2011). The value of conceptual models in coping with complexity and interdisciplinarity in environmental sciences education. *BioScience*, 61(10), 802–814. <https://doi.org/10.1525/bio.2011.61.10.10>
- Gerçek, C., & Özcan, Ö. (2016). Determining the students’ views towards the learning stations developed for environmental education. *Problems of Education in the 21st Century*, 67(3), 65–78. <https://doi.org/10.33225/pec/16.69.29>
- Grishaeva, S. A., Anisimova, T. I., & Trofimova, G. N. (2020). Ethnic and pedagogical foundations of the development of ecological culture in the multicultural educational environment. *European Proceedings of Social and Behavioural Sciences*, 86, 482–489. <https://doi.org/10.1051/e3sconf/202126507003>
- Gulyás, M. (2004). *A környezeti nevelés és a személyiségtényezők hatása a környezeti attitűdre* [Environmental education and the impact of personality factors on environmental attitudes] [Unpublished undergraduate thesis, Eötvös Loránd University, Faculty of Education and Psychology, Institute of Psychology].
- Gulyás, M., & Varga, A. (2009, June 17). *A környezeti attitűdtől a minőségi kritériumokig* [From environmental attitudes to quality criteria]. Oktatókutatató és Fejlesztő Intézet [Institute for Educational Research and Development]. <https://ofi.oh.gov.hu/kornyezeti-attitudtol-minosegi-kriteriumokig>

- Ho, S. S., Chang, C., & Chen, L. (2024). Assessing immediate emotions in the theory of planned behavior. *Frontiers in Climate*, 6, Article 1344899. <https://doi.org/10.3389/fclim.2024.1344899>
- Hofman, M. (2015). What is an education for sustainable development supposed to achieve—A question of what, how and why. *Journal of Education for Sustainable Development*, 9(2), 213–228. <https://doi.org/10.1177/0973408215588255>
- Husin, A., Helmi, H., Nengsih, Y. K., & Rendana, M. (2025). Environmental education in schools: Sustainability and hope. *Discover Sustainability*, 6(1), Article 17. <https://doi.org/10.1007/s43621-025-00837-2>
- Imran, M., & Almusharraf, N. (2024). Shaping a sustainable future: A study of teachers' perspectives on environmental education awareness. *Cogent Education*, 11(1), Article 2422223. <https://doi.org/10.1080/2331186X.2024.2422223>
- Kalaycı Alas, D., & Korutürk, K. (2024). Exploring the impact of values education on sustainable environmental awareness and behavior among eighth-grade students. *Sustainability*, 16(21), Article 9302. <https://doi.org/10.3390/su16219302>
- Kerr, K. (2020). Teacher development through co-teaching outdoor science and environmental education across the elementary–middle school transition. *The Journal of Environmental Education*, 51(1), 29–43. <https://doi.org/10.1080/00958964.2019.1604482>
- Khazen, M., Asli, S., Basheer, A., & Hugerat, M. (2025). The impact of a sustainability education initiative on pre-service teachers: Changes in environmental attitudes, willingness to act, and ecological footprint. *Sustainability*, 17(12), Article 5621. <https://doi.org/10.3390/su17125621>
- Leal Filho, W., et al. (2025). Assessing the impacts of sustainability teaching at higher education institutions. *Discover Sustainability*, 6, Article 227. <https://doi.org/10.1007/s43621-025-01024-z>
- Leicht, A., Heiss, J., & Byun, W. J. (Eds.). (2018). *Issues and trends in education for sustainable development*. UNESCO Publishing. <https://doi.org/10.54675/YELO2332>
- Lendák-Kabók, K. (2024). Impact of language ideologies on educational choices in intermarriages. *Ethnicities*, 24(5), 907–929. <https://doi.org/10.1177/14687968241234063>
- Major, L. (2017). *Egy környezeti nevelési program beillesztésének kísérlete a szerbiai alsó tagozatos oktatásba, tanítóképzés hallgatók bevonásával* [An attempt to integrate an environmental education program into lower primary education in Serbia with the involvement of teacher training students] [PhD dissertation, University of Szeged]. Szeged. [URL removed for blind review]
- Major, L., Namestovski, Ž., Horák, R., Bagány, Á., & Pintér Krekić, V. (2017). Teach it to sustain it! Environmental attitudes of Hungarian teacher training students in Serbia. *Journal of Cleaner Production*, 154, 255–268. <https://doi.org/10.1016/j.jclepro.2017.03.163>
- Masalimova, A. R., et al. (2023). Trends in environmental education: A systematic review. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(2), Article em2228. <https://doi.org/10.29333/ejmste/12952>
- Monroe, M. C., Crandall, C., & Maynard, L. (2021). Conservation behavior can defy traditional predictors. *The Journal of Environmental Education*, 52(3), 149–161. <https://doi.org/10.1080/00958964.2021.1899108>
- Neurohr, A.-L., Pasch, N., Bergmann-Gering, A., & Möller, A. (2024). Linking students' interest in nature to their self-reported pro-environmental behavior ... *The Journal of Environmental Education*, 55(6), 460–479. <https://doi.org/10.1080/00958964.2024.2364182>
- Pai, C.-J., LePage, B. A., Ng, E., & Fang, W.-T. (2024). Using the theory of planned behavior to examine the environmental behavior of roadrunners in Taiwan. *Discover Sustainability*, 5, Article 535. <https://doi.org/10.1007/s43621-024-00731-3>
- Palmer, J. A. (1998). *Environmental education in the 21st century: Theory, practice, progress and promise*. Routledge.
- Parry, S., & Metzger, E. (2023). Barriers to learning for sustainability: A teacher perspective. *Sustainable Earth Reviews*, 6, Article 2. <https://doi.org/10.1186/s42055-022-00050-3>
- Patel, J. D., Modi, A., & Paul, J. (2017). Pro-environmental behavior and socio-demographic factors in an emerging market. *Asian Journal of Business Ethics*, 6(2), 177–194. <https://doi.org/10.1007/s13520-016-0071-5>
- Portus, R., et al. (2024). Exploring environmental value-action gap and education research: A semi-systematic literature review. *Environmental Education Research*, 30(6), 833–863. <https://doi.org/10.1080/13504622.2024.2314060>

- Puiu, S., et al. (2025). The expanded theory of planned behavior for energy saving among academics in Romania, Bulgaria, Turkey, and Slovakia. *Scientific Reports*, 15, Article 2772. <https://doi.org/10.1038/s41598-025-86795-1>
- Rodríguez Pérez, L., Azcárate Goded, M. de P., & García-González, E. (2024). Environmental literacy in initial teacher training: Pre-service teachers' perceptions of the socio-environmental impact of food. *Education Sciences*, 14(8), Article 912. <https://doi.org/10.3390/educsci14080912>
- Saari, M. H., Poulton-Busler, R., & Vladimirova, A. (2024). Does sustainability really start with teachers? *The Journal of Environmental Education*, 55(6), 494–508. <https://doi.org/10.1080/00958964.2024.2375210>
- Scott, W. (2015). Public understanding of sustainable development: Some implications for education. *International Journal of Environmental & Science Education*, 10(2), 235–246. <https://doi.org/10.12973/ijese.2015.243a>
- Sohaee, N., & Farsad, R. (2025). Innovative pedagogies for sustainability education. In W. Leal Filho et al. (Eds.), *Competence building in sustainable development* (pp. 123–145). Springer. https://doi.org/10.1007/978-3-031-80380-2_11
- Spiegelhaar, N. (2022). Sustainability pedagogy: Understanding, exploring and internalizing nature's complexity and coherence. *Frontiers in Psychology*, 13, Article 922275. <https://doi.org/10.3389/fpsyg.2022.922275>
- UNESCO. (1978). *Final report: Intergovernmental Conference on Environmental Education ...* <https://unesdoc.unesco.org/ark:/48223/pf0000032763>
- UNESCO. (2005). *United Nations Decade of Education for Sustainable Development, 2005–2014: International Implementation Scheme*. <https://unesdoc.unesco.org/ark:/48223/pf0000141629>
- UNESCO. (2017). *Education for Sustainable Development Goals: Learning objectives*. <https://unesdoc.unesco.org/ark:/48223/pf0000247444>
- van de Wetering, J., Leijten, P., Spitzer, J., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. *Journal of Environmental Psychology*, 81, Article 101782. <https://doi.org/10.1016/j.jenvp.2022.101782>
- Vrselja, I., Perasović, B., & Levačić, Z. (2024). Relationship between socioeconomic status and pro-environmental behavior. *Social Sciences*, 13(5), Article 273. <https://doi.org/10.3390/socsci13050273>
- Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology*, 30(3), 305–314.
- World Commission on Environment and Development. (1987). *Our common future: Report of the World Commission on Environment and Development*. Oxford University Press. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Yadav, N., & Kalyani, L. K. (2024). Ensuring sustainability: Embedding environmental education in teacher training. *Journal of Natural Sciences*, 15(86), 80901–80906.
- Zhang, L., Wang, J., & Chen, Y. (2025). Environmental education teaching practices: A systematic review. *Sustainability*, 17(19), Article 8561. <https://doi.org/10.3390/su17198561>
- Zhang, X., Kumar, A., & Singh, R. (2021). The role of socio-demographic factors on consumers' pro-environmental behavior in an emerging market: Evidence from India. *Journal of Cleaner Production*, 320, Article 128876. <https://doi.org/10.1016/j.jclepro.2021.128876>
- Zuyeu, U. (2007). Formation of ecological culture of the specialists of an economic profile. *Problems of Education in the 21st Century*, 1, 125–134.

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Rita Horak	PhD (Biology), Associate Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: rita.horak@magister.uns.ac.rs ORCID: https://orcid.org/0000-0002-1526-4098
Lenke Major (Corresponding author)	PhD (Educational Sciences and Andragogy), Associate Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: major.lenke@magister.uns.ac.rs Website: https://magister.uns.ac.rs ORCID: https://orcid.org/0000-0003-0795-3456
Szabolcs Halasi	PhD (Physical Education and Sport Sciences), Associate Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: sabolc.halasi@magister.uns.ac.rs ORCID: https://orcid.org/0000-0002-4135-9293
Eva Vukov Raffai	PhD (Philology – Linguistics and Methodology), Associate Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: eva.vraffai@magister.uns.ac.rs ORCID: https://orcid.org/0000-0001-8393-1748
Janos Samu	PhD (Literary Studies), Associate Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: j.samu@magister.uns.ac.rs ORCID: https://orcid.org/0000-0002-0998-4216
Valeria Pinter Krekic	PhD (Didactics – Methodology of Mathematics Teaching), Full Professor, University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, Serbia, Strossmayer Street 11, 24000 Subotica, Serbia E-mail: valeria.krekic@magister.uns.ac.rs ORCID: https://orcid.org/0000-0003-1530-3170