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Anna-Maria-Iulia DUMITRU, Ruxandra CHIRCA, Andrea-Cristina STAICU

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THE ENGAGEMENT OF HIGH SCHOOL STUDENTS IN URBAN AVIFAUNA MONITORING ACTIVITIES FOR THE DEVELOPMENT OF ECOLOGICAL BEHAVIOUR

Anna-Maria-Iulia Dumitru*

"Ion Maiorescu" National College
Giurgiu, Romania
University of Bucharest
Faculty of Biology
Bucharest, Romania
p.dumitru.anna@maiorescu.ro

Ruxandra Chirca**

University of Bucharest
Faculty of Psychology and Educational Sciences
Bucharest, Romania
ruxandra.chirca@fpse.unibuc.ro

Andrea-Cristina Staicu***

University of Bucharest
Faculty of Biology
Bucharest, Romania
cristina.staicu@unibuc.ro

* Secondary School Teacher, Head of Biology-Chemistry Methodology Committee, "Ion Maiorescu" National College, Giurgiu, Romania. Master's degree, Faculty of Biology, University of Bucharest, Bucharest, Romania
** Senior lecturer, PhD, Faculty of Psychology and Educational Sciences, University of Bucharest, Bucharest, Romania.
*** Senior lecturer, PhD, Faculty of Biology, University of Bucharest, Bucharest, Romania.

Abstract
The study analyzes how urban bird monitoring assists in learning ecological behaviour amongst 121 tenth-grade high schoolers from Giurgiu. It started from the premise that direct engagement by youths in observing local biodiversity affects their attitudes toward the environment and their practices of engagement with a wildlife source. The research implies a study on ornithofauna and an educational experiment conducted in the 2024–2025 school year. The students were part of an experimental group participating in monitoring activities or of a control group. Evaluation through validated questionnaires measured ecological behaviours and environmental attitudes before and after the intervention. The results proved that despite no significant differences between groups after completing the study, there is a strong correlation between pro-ecological attitude and observed behaviour. Students may show a greater willingness to engage in basic tasks like recycling yet have little interest in activities that involve longer-term dedication. Research is limited by the short duration of the intervention and the limitations of the present educational system which do not endorse nature-based activities.
The research provides insightful thoughts on the multi-dimensionality of ecological consciousness. It suggests the need for change via a long-term comprehensive education program as a component of the curriculum. The key finding of this study is that successful ecological education does not simply involve imparting information, it requires direct and continuous experience in nature, ongoing contemplation of nature as well as taking part in conservation activities to create an environmentally caring citizen.

Keywords: ecological behaviour, environmental education, urban bird monitoring.

Rezumat
Studiul analizează modul în care monitorizarea păsărilor urbane ajută la deprinderea comportamentului ecologic în rândul a 121 de elevi de clasa a zecea din Giurgiu. Studiul a pornit de la premisa că implicarea directă a tinerilor în observarea biodiversităţii locale le influenţează atitudinile faţă de mediu şi interacţiunile cu biodiversitatea locală. Cercetarea a implicat un studiu asupra ornitofaunei şi un experiment educaţional realizat în anul şcolar 2024–2025. Elevii au făcut parte dintr-un grup experimental care a participat la activităţi de monitorizare sau dintr-un grup de control. Evaluarea prin chestionare validate a măsurat comportamentele ecologice şi atitudinile faţă de mediu înainte şi după intervenţie. Rezultatele au arătat că, deşi nu s-au constatat diferenţe semnificative între grupuri după intervenţie, există o corelaţie puternică între atitudinea pro-ecologică şi comportamentele observate. Elevii sunt mai dispuşi să adopte practici simple, cum ar fi reciclarea, dar au puţin interes pentru activităţi care necesită un angajament susţinut. Cercetarea este limitată de durata scurtă a

intervenţiei şi de constrângerile actuale ale sistemului educaţional, unde activităţile bazate pe natură nu sunt încurajate. Cercetarea oferă perspective valoroase asupra complexităţii formării conştiinţei ecologice. Acesta subliniază necesitatea transformării prin programe educaţionale pe termen lung, ca parte a curriculumului. Contribuţia centrală a studiului este sublinierea faptului că o educaţie ecologică eficientă depăşeşte simpla diseminare a informaţiilor, necesitând o experienţă directă şi susţinută în natură, o reflecţie continuă asupra naturii şi implicarea în activităţi de conservare, pentru a creşte cetăţeni grijulii faţă de mediu.

***Cuvinte-cheie**: comportament ecologic, educaţie ecologică, monitorizarea ornitofaunei.*

1. Introduction

Modern education systems should prioritize teaching young people how to behave responsibly regarding the issues and pressures affecting the world today, such as the rapidly changing global climate and the decline of biodiversity. Adolescents' genuine ecological consciousness serves as both an educational objective and a societal necessity, serving as the foundation for the sustainability of ecosystems and human communities in the future.

The objective of this study is to examine the practicability of urban ornithofauna monitoring activities in schools and to understand their role as an educational resource. Giurgiu offers a unique framework for examining the connection between urban growth and biodiversity conservation because of its biological status as part of the Danube Floodplain and the variety of its urban and peri-urban ecosystems.

The integrated model of ecological education, which focuses on an actual urban biodiversity monitoring project and analyses not only the knowledge acquisition process, but also the behavioural and attitudinal changes that can result from direct connection with nature, is what makes the research distinctive. The findings of the study provide important insights into the intricacy of the process of ecological awareness formation and what is required for educational interventions to result in long-lasting changes, even though they do not entirely support the original theories.

2. Modern approaches in teaching biology

Teaching methods have several functions: the cognitive function (teaching methods serve a cognitive purpose, as a means of acquiring knowledge), the formative-educational function (the methods used shape students' attitudes, emotions, interests, and beliefs), the motivational function (the pedagogical approach serves a motivational role, making the activity attractive and encouraging the desire to learn), the instrumental function (the method serves as a means of obtaining the desired results), the normative/optimization function (optimization of the activity involves identifying efficient combinations of teaching variables and proposing a versatile path for instructional activities).

2.1. Social constructivism

According to Piaget, knowledge is acquired through an active and sequential construction of logical schemes. The direct consequence of this is that any monitoring activity with avifauna must start from easy tasks such as recognition of common birds. Subsequently, one can move on to systematic recording of behaviour and later draw conclusions about ecology. Thus, the students can gain an appreciation of ecosystems as a whole on this basis. These implications offered evidence of constructivist education (Schrader, 2015).

At the same time, Vygotsky's socio-cultural theory indicates the social dimension of learning which becomes important in monitoring the birds collaboratively. The zone of proximal development applies directly to monitoring: students with limited experience in identifying species could improve greatly when teaching or with peers who are more experienced bird-watchers.

Dewey's principle of authentic experience education instantiates the educational value of avifauna monitoring. Whenever students stumble upon an uncertainty on the field like an unfamiliar call or contradictory identification criteria, they are prompted to systematize their observations, consult the field guides, test alternative IDs against criteria and come to a conclusion

supported by evidence. In this sense, bird monitoring exemplifies Dewey's key premise that learning involves active engagement with real things. This inquiry approach is in tune with more general constructivist contributions by Jerome Bruner, who argued that discovery learning is a basis for open-ended field investigation, with David Ausubel, whose theory of meaningful learning points students to new ornithological observations and their more general ecological knowledge.

There are two essential concepts for the notion of learning through constructivism. The first refers to the principle according to which students develop new understandings using pre-existing knowledge. Students approach new educational experiences with the help of knowledge they have acquired previously and subsequently refine the reflections they will construct based on these new learning scenarios. The second concept refers to understanding that learning constitutes an active engagement, going beyond the simple passive assimilation of information. Individuals involved in learning use existing knowledge to understand new educational contexts. If the new material differs from the knowledge with which students are already familiar, they will seek methods of adapting and improving their understanding in relation to the present circumstances.

It is necessary that, especially biology teachers, become aware of the importance of implementing exploration and discovery activities to engage students in the learning process. Moreover, not only students benefit from constructivism in learning, but also teachers, who construct their own knowledge and can become aware of the difficulties, as well as efficient ways of working (Oprea, 2007).

2.2. Experiential learning

Experiential learning in science education transitions from lecture to constructivist and student-centred pedagogy. The initiator of the hands-on learning methodology was David Kolb in 1984. It emphasizes the contribution of experience, perception, cognition, and behaviour to learning. The approach views the student activity by guiding learning in an organized manner through critical thinking, innovation, reflection, and metacognitive development.

Although implementing such changes presents challenges, including maintaining a balance between creativity and the information to be taught, the result is improving students' creative and intellectual skills.

In teaching biology, experiments significantly increase students' level of understanding and retention of scientific concepts through their active involvement in the learning process. These experiments allow students to apply theoretical knowledge in practical frameworks, drawing on their understanding and memory. The integration of applications into reality and experiential learning enriches the educational experience.

A study of a fruit juice purification experiment showed that students who engaged in hands-on activities demonstrated a deeper understanding of enzyme functions. The experiment involved connections between biological concepts and real-world applications of biotechnology, which helped students make connections between theoretical knowledge and practical scenarios. Students reported increased levels of satisfaction and enthusiasm, indicating that such experiments make learning more enjoyable and memorable (Tam & Ewe, 2018).

Another study found that learning through experiments significantly improved high school students' performance in biology compared to traditional expository teaching methods. Students taught biology using experiential learning achieved a mean score of 71.21, while those taught using expository methods achieved 50.53, indicating a substantial difference of 20.68 points. The effectiveness of this type of teaching has been demonstrated through hands-on activities, in which students engaged in tasks such as producing, sorting, and classifying mammalian bones, which led to a better understanding of locomotion, compared to teaching using lecture (Okoli & Okechukwu, 2014).

Innovative teaching methods, such as those through experimentation, increase the quality of learning experiences for students. They promote their active involvement through interactive learning means, using technology. For example, students can use mobile applications to visualize complex scientific concepts, like the food chain.

2.3. Discovery learning and environmental education

Field studies improve the understanding of ecological and social systems in several key ways. They also offer direct, practical interaction with natural environments, allowing students to observe and understand how life functions in real contexts. They help students develop multiple ways of knowing through observation, conversation, and participation in nature.

These experiences challenge students to become more independent, more curious, and more self-aware as they interact with individuals from diverse environments and encounter different perceptions of the world. Field studies also make a connection between cognitive and affective learning, leading to a deeper understanding (Fleischner et al., 2017).

Environmental education based on nature activities effectively promotes the development of ecological behaviour through two key mechanisms: improving environmental knowledge and stimulating connection with nature. When conducted outdoors, in a natural setting, this educational approach simultaneously develops children's understanding of environmental systems, while creating meaningful connections with nature (Otto & Pensini, 2017).

3. Methodology

3.1. Purpose

The purpose of this research is to identify the connections between urban ornithofauna monitoring activities, conducted with high school students, and the development of pro-ecological behaviour, enhancing research and critical thinking skills, as well as promoting responsible environmental behaviour. Birdwatching is an accessible activity that does not require expensive equipment and can be easily integrated into the school curriculum, while providing valuable data for scientific research.

3.2. Aims

The research aims to increase the level of awareness among young people using interactive methods. Monitoring birds in urban areas helps high school students learn about biodiversity and acquire ecological research skills. Involvement in monitoring allows them to understand the importance of ecological balance and biodiversity conservation. In the present research, the aim was to associate students' attitudes in relation to the surrounding environment with the assimilation of more knowledge about the environment, assessing both before and after the educational intervention. This method transforms theory into practice, encouraging critical thinking and civic responsibility.

3.3. Sample and participants

The research was conducted with the participation of 121 students enrolled in the 10th grade, during the 2024–2025 school year, thus combining the curricular objectives of school subjects with authentic learning experiences, in direct contact with nature.

The choice of the target group of 10th grade students is based on the psycho-pedagogical characteristics specific to this age, when adolescents develop advanced cognitive capacities for analysis and synthesis, show increased interest in relevant social issues and are in an essential formative stage for the development and acquisition of personal values and attitudes. Also, the school curriculum for this grade includes elements of ecology and environmental protection (Ministry of Education, 2004), facilitating the integration of research activities into the formal educational process.

The participants were organized into two groups: an experimental group (classes X-D and X-E) comprising 59 students (37 female, 22 male), and a control group (classes X-A and X-F) comprising 62 students (38 female, 24 male). The response rate was 100%. The validity of the experimental design is confirmed by the absence of significant differences between the experimental and control groups in the pre-test, both for ecological behaviours ($t_{(119)} = 0.310, p > 0.05$) and for pro-ecological attitudes ($t_{(120)} = 0.726, p > 0.05$).

3.4. Methods and Tools Used for Collecting Data

This research implied two complementary methods: the questionnaire (quantitative) and the experiment (qualitative and field-based). To compare students' environmental attitudes and behaviour before and after participation in the avifauna monitoring activities, the Ecological Behaviour Assessment was used – a Likert-scale questionnaire with items rated on a five-point scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

To compare students' environmental attitudes and behaviour before and after participation in the avifauna monitoring program, the Ecological Behaviour Assessment, a Likert-scale questionnaire was used.

This was framed in a wider pedagogical context, which included extra contextual information about bird ecology. More specifically, such information included autumn and spring bird migration patterns as well as the status and conservation importance of bird species that occupy urban and peri-urban areas. The context in which the questionnaire was placed was intentional: students were encouraged with their responses to reflect not just on their general environmental behaviours but also on the specific connection between routine human behaviours: transport methods, waste disposal, land use choices, and the effects of these behaviours on local birds and their habitats.

The attitudinal data with a quantitative character from the questionnaire and the ecological understanding in a qualitative character developed through teaching and field monitoring activities made it a multi-layered assessment of the program's impact on the students' environmental literacy and behavioural dispositions.

The attitude toward the environment was evaluated in a standard manner using a Rasch scale, through the dichotomous Rasch model (Wilson, 2005; Wolins et al., 1982).

The specific instrument that was used is an adaptation for adolescents of a well-established instrument for adults (Kaiser et al., 2007). This adaptation comprises 40 self-reported behaviours, such as "I am a member of an environmental organization" and "I collect and recycle wastepaper".

Participants responded to each item using either a 5-point Likert scale, ranging from *never* (1) to *always* (5), or a yes-no response format.

As an extension of the 40 behavioural self-reports, 15 items were added from the study by Bogner and Wiseman (1999) that effectively indicated an individual's commitment to environmental conservation. These items included personal opinions regarding environmental conservation (for example, "We must designate areas to protect endangered species"), as well as self-reports of previous environmental conservation efforts (for example, "I save water by opting for showers instead of baths"). Participants rated Bogner and Wiseman's (1999) items using a 5-point Likert scale, where 1 indicated strong disagreement and 5 indicated strong agreement.

The experimental group was given the questionnaire before the beginning of the monitoring experiment and at the end of the last monitoring session, while the control group was given the questionnaire in March and in May. In three of the four original studies, the items regarding environmental attitudes were divided into two separate sets (with some items overlapping) to shorten the length of each individual survey. These two sets were given to students prior to the educational interventions. Given the unique characteristics of Rasch models (i.e., uniform item discrimination), participants can still be quantitatively compared even if they do not respond to the same number of items or even the same items, provided that all items can be calibrated on a single scale (Kaiser et al., 2018). Consequently, Rasch scale calibrations and, therefore, estimates of involvement and attitude can be obtained even with incomplete data records that have missing values, since the estimation process is based on a maximum likelihood approach (Embretson & Reise, 2000).

Of the 55 items, 22 were negatively worded. All these negatively framed items, indicating a lack of commitment to environmental conservation, were reverse coded before the Rasch scale calibration. To apply the classic Rasch model, the 55 items had to be transformed into a dichotomous format. For this transformation, the responses *never*, *rarely*, *occasionally*, *strongly disagree*, *disagree*, and *not sure/neutral* were assigned values reflecting a lack of commitment to environmental conservation (0). In contrast, the responses *often*, *always*, *agree*, and *strongly agree* were assigned values

indicating a commitment to environmental conservation (1). Reducing the total number of response options before calibrating the scale is a well-established and rational method for minimizing unreliable measurements resulting from measurement error (Kaiser & Lange, 2021).

Environmental knowledge, like any other type of knowledge, involves a certain level of achievement, in particular, the ability to accurately answer questions about a topic. Accordingly, a common approach to investigating individual differences in student knowledge is to challenge individuals with increasingly demanding tasks or questions. Given that the Rasch model is based on this principle, it is often the preferred model in educational assessments of knowledge disparities (Wilson, 2005). Kaiser and Frick created a measure of environmental knowledge using a Rasch scale, which allowed them to differentiate between items representing knowledge about environmental systems, action-oriented knowledge, and knowledge about efficiency (Frick et al., 2004; Roczen et al., 2014).

Systemic knowledge encompasses questions about the functioning of ecosystems or awareness of environmental challenges. A common illustration is understanding the processes that contribute to global warming (Taube et al., 2021). Action knowledge refers to the knowledge of how to act, which includes awareness of behavioural choices and potential actions. Students may be well informed about microplastic pollution (i.e., system knowledge) but lack knowledge about the steps they can take to minimize their own contribution to microplastic waste. Efficiency knowledge reflects the ecological consequences (e.g., in terms of CO_2 emissions) of different behavioural choices (Frick et al., 2004).

3.5. Data Collection Procedure

The experimental group was given the questionnaire before the start of the monitoring experiment and at the end of the last monitoring, and the control group was given the questionnaire in March and May.

The experiment consisted of monitoring the ornithofauna in the Nicolae Iorga Park area (43°53’31"N 25°57’57"E, alt. 29 m) and the Clock Tower area

(43°53’25"N 25°57’53"E, alt. 27 m), together with each of the classes, during biology (October 22nd, 2024; October 23rd, 2024; January 8th, 2025; March 5th, 2025; March 7th, 2025; April 15th, 2025; April 16th, 2025).

The students used monitoring sheets while observing the birds by using their phones, later identifying them through specialized applications. They also received information about autumn and spring migration, as well as about the status and importance of birds in urban and peri-urban areas. The monitored areas were chosen as close as possible to the college, being also central areas of Giurgiu Municipality. The students were divided into five to six teams in each class.

The monitoring session lasted around 50 minutes, which was the time duration of a biology class. All observations were done on the site. At each session’s beginning, the teacher provided a brief introductory explanation contextualised to the season. The autumn sessions (October 2024) were dedicated to migratory species passing through or leaving the Giurgiu area, while the winter and spring sessions (January, March and April 2025) concerned resident species, early spring arrivals and the importance of potentially valuable urban green spaces as stopover and breeding habitats along the Danube flyway. The students recorded their observations in standardized monitoring sheets, in teams of five to six. For each bird encounter, they recorded the name of the species, where in the monitoring area it was located, the time the monitoring took place, and the weather conditions (cloud cover, wind, temperature range). Species identification was done with the help of the Merlin Bird ID app (Cornell Lab of Ornithology, n.d.), that allows not only visual identification from photographs but also audio identification through instant sound recognition. The latter option is particularly useful as it helps detect species present in crowded foliage or at a distance. If identification through the app was uncertain, students asked the teacher or checked the field guide that was provided during the sessions. At the close of every session, teams presented their records to the gathering, enabling a group discussion on the species found, their role in the ecosystem, and behaviour noted. All the data that was collected over all sessions was retained as a combined species list for the monitored areas.

An analysis of the Romanian 10th grade Biology curriculum (approved by

OMEN no. 4598/31.08.2004) reveals several content areas and competency frameworks that directly underpin and justify the educational design of the present study. Although the curriculum for this grade level is primarily structured around the anatomy and physiology of plants and animals – covering tissues, organ systems, and fundamental life functions – it also includes a dedicated content unit on ecological imbalances ("Dezechilibre ecologice: cauze, efecte, măsuri"), which explicitly addresses human-induced disruptions to natural systems and their consequences for biodiversity (Ministry of Education, 2004). This content unit provides the formal curricular anchor for introducing students to conservation issues and the ecological role of urban wildlife, including avifauna. Beyond specific content, the curriculum defines five general competencies and a set of specific competencies that are highly relevant to the monitoring approach used in this research. Specific competency 1.1 (collecting data from diverse sources for knowledge acquisition) and competency 2.1 (using investigation to reveal the structure and functions of organisms) map directly onto the field data collection tasks performed during bird monitoring sessions. Competency 2.2 (processing investigation results and formulating conclusions) is operationalized when students analyse their observation records and draw inferences about species distribution and habitat use. Competency 5.2 (explaining and applying rules for protecting one's health and the environment) and competency 5.3 (making intra-, inter-, and transdisciplinary connections) are engaged when students relate their ornithological observations to broader ecological imbalances and environmental responsibilities. The curriculum's section on Values and Attitudes is equally pertinent: it explicitly promotes "curiosity and respect for every form of life," "care for the surrounding environment," and "involvement in solving problems of global interest" – dispositions that the present intervention sought to cultivate through direct contact with urban biodiversity. Furthermore, the methodological suggestions embedded in the curriculum explicitly recommend field observation activities, ecological case studies, and project-based investigations as preferred pedagogical approaches, noting that such activities provide "opportunities for ecological education" (Ministry of Education, 2004). This curricular endorsement of experiential and nature-based learning validates the pedagogical rationale of the ornithofauna monitoring program and confirms that the intervention was not a departure from formal educational requirements, but rather a concrete realization of them.

4. Findings

In the present research, the gap between what the students declare and how they behave is identified. The average score for the pro-ecological attitudes is 3.33, which is above the neutral point of the scale whereas ecological behaviours are recorded as 2.90, which is below the neutral point. The moderate correlation found between the two dimensions ($r = 0.409$, $p < 0.01$) establishes a link, but not a strong enough one that beliefs are guaranteed to be transposed into actions. Biodiversity conservation has a high average score (3.82) with three-quarters of the students supporting the delimitation of protected areas for endangered species. On the contrary, with a score of 78, the perception of environmental problem seriousness gets the least support.

The female students have a significantly higher tendency to recycle and manage the waste. They also have a greater concern for environment and biodiversity. In contrast, male students have reported a more frequent use of sustainable transport. Both females and males possess similar anthropocentric and eco-centric tendencies.

The individual differences show that students' ecological attitudes and behaviours differ from each other. It was evident in the standard deviations lying between 1.17 and 1.46.

The data collected in the pre-test stage provides a solid basis for the subsequent evaluation of the impact of the educational intervention, allowing the precise identification of areas in which progress has been made and those that require additional or revised approaches. This initial evaluation confirms both the need and the potential of a well-structured educational intervention for the development of a deeper environmental awareness and, more importantly, for facilitating its translation into concrete environmentally friendly behaviours.

5. Discussion

First, the results post-test confirms the absence of significant differences between the experimental and control groups, both for ecological behaviours ($t_{(117)} = 0.236, p > 0.05$) and for pro-ecological attitudes ($t_{(117)} = -0.204, p > 0.05$) (Figure no. 1).

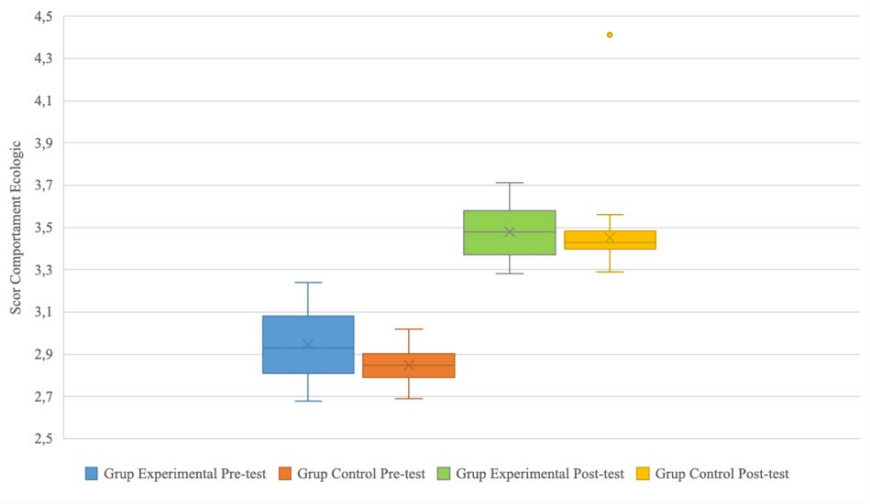

Figure no. 1. *The median, quartiles, and extreme values (n = 59 for the experimental group, n = 62 for the control group)*

A particularly relevant aspect is the persistence of coherence between attitudes and behaviours, with an almost identical mean score for ecological behaviours (M = 3.48, SD = 1.34) and pro-ecological attitudes (M = 3.46, SD = 1.29). The strong correlation identified between the two dimensions (r = 0.595, $p < 0.01$) indicates an integration of beliefs and practices, suggesting that students who have developed pro-ecological attitudes tend to translate them into concrete behaviours. Behaviours related to recycling and waste management stand out with the highest mean score of 3.70 from this study. Moreover, 85.1% students reuse shopping bags. Compared to this, Involvement and Advocacy scored lowest (M = 3.23), with only 11.6% of students being a member of an environmental organization.

Analysis of behavioural patterns highlighted considerable deviations among types of ecological acts undertaken. Over 80% of students adopted visible saving behaviours (turning off lights), while behaviours involving giving up comfort (avoiding battery-powered devices) were done by less than 25% of students.

The students' value orientations reflect an incomplete transition from the

anthropocentric view to the eco-centrist view. Almost 60% reject the view that nature is nothing more than a tool for human use, yet only 46.3% reject the view that humans are ontologically superior to other beings.

Girls reported significantly greater responsible consumption behaviours (M = 3.68, compared to M = 3.42, $p < 0.05$), with the rest of the differences showing no significant divergence. The consistency of these differences suggests that the intervention did not specifically meet the differentiated needs of the two groups.

The variation in the responses (*SDs* ranging from 0.88 to 1.45) suggests that there is still heterogeneity regarding the level of ecological awareness and practice.

6. Research limitations

This research can only be interpreted considering important methodological and contextual constraints that may have undermined the effectiveness of the intervention and the generalizability of the conclusions.

The educational intervention length is the main limitation of this research. Limited field trips over a short period of time issued through the program provide no scope to experience the exposure that can produce any change in the participants' behaviour. The lack of regularity in monitoring activities may partly be responsible for the non-appearance of effects.

Also, due to the lack of complementary methods of direct observation or objective indicators of behaviour, the ecological validity of these conclusions is limited.

The fact that the research was conducted in a high school in Giurgiu reduces generalization. The urban environment specificities of Giurgiu, the socio-economic profile of the participating students, and the organizational culture of the institution are context factors that can influence the results in ways that are not easily reproducible in other educational contexts.

The study did not include a follow-up phase to see whether any delayed impacts did occur. It is possible that the impact of the monitoring experiences

manifests itself gradually, as students process and integrate new perspectives acquired. The absence of a longitudinal evaluation prevents the identification of these potential long-term effects.

7. Conclusions

In conclusion, the study provides important insights into the complexity of the process of ecological consciousness development even though it did not show the anticipated major impacts of the intervention based on ornithofauna monitoring. It involves a fundamental rethinking of how formal education incorporates hands-on encounters with the natural world to change young people's relationship with nature. It is not easy to educate generations of environmentally conscious people who are equipped to handle the ecological issues of the twenty-first century by using comprehensive, ongoing and contextually appropriate techniques.

In summary, the research reveals critical insights into the intricate process of developing ecological consciousness, even though it did not indicate the anticipated strong effects of the intervention based on the monitoring of ornithofauna. The term ecological consciousness covers a lot of ground. It is not a unitary entity that can be triggered by some singular pedagogical provision. It is a multi-layered process. It takes place simultaneously on cognitive, affective and behavioural levels.

The study shows that they continue not to align. The students expressed somewhat favourable pro-ecological attitudes (M = 3.33 at pre-test; M = 3.46 at post-test), however, the occurrences of their ecological behaviours were below at the neutral midpoint of the scale in the pre-test (M = 2.90). This attitude-behaviour gap is a well-known phenomenon in environmental psychology and shows that just knowing about the importance of an issue does not lead to action on it. The moderate correlation between the two dimensions suggests that the relationship between values and practice is not as straightforward as one being the foundation for the other or the reverse. This relationship is mediated by other things, including habit, perceived self-efficacy, social norms and structural barriers. The rise in the correlation coefficient from pre- to post-test may signal that monitoring helped students better align their

stated values and evident behaviours, even though no statistically significant differences between the two groups were found.

Moreover, the results reveal a clear hierarchy in the ecology which varies according to the level of psychological and practical cost. Highly visible behaviours that are socially rewarded and require little sacrifice like switching off lights (which over 80% of students adopted) or reusing shopping bags (85.1%) were many more compared to those requiring an on-going personal commitment like being a member of environmental organization (only 11.6%) or not using battery-operated devices (less than 25%). The stratification of ecological behaviour suggests that ecological awareness does not develop uniformly: while students may enact basic environmental norms, they are largely passive when it comes to civic environmental actions. The educational design implication is that developing ecological awareness is more than cultivating awareness and attitude; it also involves the support of increasingly action over time.

Thirdly, the incomplete shift from anthropocentric to ecocentric worldview among the adolescents is highlighted. Nearly 60% of students rejected a purely instrumental view of nature, whereas less than half (46.3%) rejected human ontological superiority over other species. The partial character of this shift in values is precisely what makes ecological consciousness complex. Students are neither simply ignorant of the ecological ethic nor are they fully committed to an ecocentric ethic. They dwell in an ambiguous space where contrasting value structures coexist. This transitional state does respond to education, yet it cannot be changed rapidly and easily. Repeated meaningful encounters with nature, along with structured reflection on those encounters could make a change in their behaviour.

A fourth limitation is that just because the differences between the experimental and control group were statistically not significant after the intervention, does not mean the study was ineffective. It means that the study's design had limitations that required further time allocation. It is improbable that a school year's worth of activities or just a few field sessions will lead to significant change in ecological awareness – especially in behaviour and actions. Despite not translating into behaviour change at this stage, the experimental group showed desirable developments in terms of attitude–behaviour coherence and engagement with conservation items.

Considering these findings, the way formal schooling incorporates sensory experiences with the outdoors must be rethought. To develop ecologically aware citizens, isolated actions and short-lived curricular supplements are no use. The conclusion of this study is that it is not only about information transmission but also requires actual, continuous experience in nature and continuous critical reflection and participation in conservation practices. In this way, schools can play a meaningful role in raising generations of citizens who are informed but also motivated and equipped to deal with environmental problems.

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