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THE CONNECTION BETWEEN NATIVE LANGUAGE, ENVIRONMENTAL EDUCATION, AND EARTH SCIENCES: AN INNOVATIVE APPROACH TO THE INTERDISCIPLINARY CURRICULUM

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ABSTRACT

This study examines the connections among native language, environmental education, and earth sciences through an interdisciplinary approach to the educational curriculum. The main hypothesis is that using the native language in educational materials may enhance the acquisition of scientific concepts and increase engagement in learning environmental and earth science topics. The study employed a mixed-methods design, combining quantitative methods (surveys of 684 urban and rural students and teachers in Tirana, Albania) with qualitative insights from illustrative classroom activities. The data were analyzed using descriptive and inferential statistical methods with SPSS Statistics version 25. A pilot study with 50 participants was conducted to validate the instruments. The results indicate that integrating the native language into educational materials was associated with increased engagement among students and teachers in discussions about environmental and scientific topics. Additionally, contextual differences between urban and rural areas were revealed, underscoring the necessity of adapting the curriculum to local contexts. The study recommends improving educational materials and providing teachers with continuous training to effectively use the native language in instruction. It highlights the importance of an innovative approach and the need for further support for environmental education and earth sciences in the curriculum. These findings align with several Sustainable Development Goals (SDGs 4, 6, 12, 13, and 15), suggesting broader relevance of incorporating native languages into science education.

KEYWORDS: Native Language, Environmental Education, Earth Sciences, Interdisciplinary Approach, Educational Curriculum.

1. INTRODUCTION

In an era when climate change and environmental protection are central topics of discussion at all levels, it is important to consider how education can promote environmental and scientific awareness. This requires developing competencies that enable students to identify and take advantage of opportunities to achieve their professional and personal goals.

Language is a powerful tool for communication and comprehension, playing a fundamental role in this context. Using the native language to teach scientific and environmental concepts is essential to understanding complex issues and effectively transmitting knowledge about environmental protection and sustainable development. A significant study by UNESCO (2015) found that incorporating the native language into education increases student engagement, fostering a deeper understanding and facilitating the practical application of knowledge in local contexts. Moreover, incorporating scientific topics into the native language curriculum can empower students to address urgent environmental issues such as climate change, biodiversity conservation, and sustainable resource management. In this context, strengthening environmental education through the native language contributes not only to scientific literacy but also to the development of awareness and responsible behaviors relevant to sustainable agricultural practices and natural resource management.

In Albania, official educational policies emphasize the importance of adopting an interdisciplinary approach in pre-university education (Ministry of Education and Sports of Albania, 2021). This approach integrates scientific and environmental themes with the native language to cultivate a comprehensive and practical understanding of these issues. Global educational strategies, such as the Sustainable Development Goals (SDG 4), emphasize that high-quality education should be widespread, inclusive, and culturally relevant.

This study aims to examine the crucial role of the native language in expressing complex scientific ideas, especially in the interdisciplinary integration of environmental and earth sciences. Additionally, the study will examine opportunities to develop an effective curriculum that bridges these two fields and equips students with the knowledge and skills needed to address global environmental challenges.

2. THEORETICAL FRAMEWORK

The integration of the native language into scientific subjects plays a crucial role in student engagement and fosters the development of critical and creative thinking. It also serves as a bridge that facilitates the understanding of complex concepts by connecting them to everyday experiences (Idris et al., 2018). Additionally, the importance of language learning is emphasized, highlighting the role of curriculum and schools in children's linguistic development (Tahiri & Hadaj, 2022). Tahiri and Hadaj (2022) further argue that structured projects conducted in the native language enhance student engagement by making students active participants in the learning process. These approaches not only deepen scientific understanding but also establish an emotional connection between students and their surrounding environment.

Albanian regulatory frameworks also support this perspective. The Pre-University Education System of the Republic of Albania underscores the significance of the native language in education. According to the legal framework and strategic documents, such as the National Strategy 2021–2026 (Ministria e Arsimit, 2021), the Pre-University Curriculum Framework ASCAP (2025), Law No. 69, dated 21.06.2012 on Pre-University Education, and the teaching plans (AMU & AML) developed by the Ministry of Education and Sports, native language is recognized as a key medium for knowledge transmission and for strengthening the connection between students and their environment. These national policies are further complemented by international initiatives that prioritize plurilingualism and cultural diversity in education as essential components for fostering an open and cohesive society (Council of Europe, 2020).

Interdisciplinary approaches that integrate the native language with earth sciences and environmental education align curricula with global themes such as biodiversity, climate change, and the protection of natural resources. The learning process takes place both inside and outside the classroom, engaging the community and nature, thus fostering an integrative perspective. Teachers play a central role in implementing interactive methods and creating an environment in which students are at the center of the educational process. Teachers also serve as role models and directly influence the development of students' competencies (Tahiri, 2021). The use of language games, simulations, and practical projects (Radi, 2008; Wongchantra & Bunnaen, 2021; Tahiri & Hadaj, 2022; Tahiri et al., 2023) facilitates the connection between theoretical concepts and their practical applications. In this context, the integration of technology in teaching further strengthens the development of creativity

and critical thinking, positioning the teacher as a facilitator of innovative learning processes (Tahiri, 2025c). Moreover, structured environmental education can have a long-term impact on pro-conservation behavior and contribute to greater social awareness (Charlie et al., 2021).

At the cognitive level, the native language serves as a tool that enables students to internalize new knowledge through dialogue and reflection, fostering analytical skills that connect science with everyday life (Vygotsky, 1978; Duka, 2015). This is particularly essential in environmental education, where a shift in mindset is required for issues such as recycling (Papert, 1993). Expanding on this, Papert (1993/2020) highlights the importance of technology in teaching, emphasizing its role in bridging theory and practice.

Plurilingual policies and multicultural initiatives (Council of Europe, 2020) advocate for an education system that respects linguistic and cultural diversity, incorporating local languages and traditions. This approach not only promotes national identity but also fosters a shared sense of responsibility toward the environment (Tahiri & Shegani, 2017). Recent studies further emphasize that the integration of the native language into environmental and earth science curricula strengthens learners' critical and creative thinking while promoting sustainable educational practices (Tahiri & Hadaj, 2025; Tahiri, 2025a; Tahiri, 2025b).

An illustrative example comes from the Philippines, where bilingual programs in primary education have improved student performance in science and environmental awareness. This demonstrates that the use of the native language does not hinder but rather reinforces the acquisition of foreign languages and scientific knowledge (Radi, 2008).

Ultimately, the synthesis of the native language, earth sciences, and environmental education creates a dynamic curriculum that prepares students to be both academically competent and environmentally conscious. This approach is not merely methodological but also philosophical, integrating scientific knowledge with cultural and ethical values (Council of Europe, 2020; Suralin, 2023).

3. INTERDISCIPLINARY MODELS

Interdisciplinary models are a crucial tool for overcoming traditional disciplinary divisions, enabling a deeper, more integrated understanding of complex global challenges, such as climate change and biodiversity conservation. Through these models, students acquire interconnected knowledge and develop the essential skills needed to address real-world problems, thereby transforming themselves into conscious, proactive citizens.

In this study, we present an interdisciplinary project model that illustrates how linguistic activities in interactive learning settings facilitate the integration of scientific concepts through interdisciplinary approaches. This model strengthens the competencies that students acquire. Through this project, students will develop an awareness of global challenges and establish a logical connection between quality education (SDG 4) and critical fields such as health and nutrition (SDG 6) and environmental protection (SDG 13).

The project is designed as an extracurricular educational hub for sustainable development. It will incorporate inclusive activities that link these objectives. Students will participate in hands-on, collaborative activities that foster problem-solving skills and contribute to building a more sustainable future. The project proposes a series of hands-on activities to illustrate these principles, including:

3.1 Game: The cut-out photo exercise

This activity begins with dividing the class into groups of three or four students. Each group receives a cut-out portion of a photograph illustrating an environmental issue, such as deforestation. Students paste their portion onto a sheet of paper and write their emotional reactions, questions, and reflections about the image around it. Next, the groups use their imagination to sketch the missing part of the photograph and discuss how to reconstruct the full scene. Finally, the teacher distributes the original, complete photograph, allowing the groups to compare their drawing with the actual image. This step encourages discussion of discrepancies and analysis of the root causes of environmental issues.

This activity enhances critical thinking through problem analysis, creativity through sketching missing elements, and collaboration through teamwork. It also directly connects to two of the United Nations' Sustainable Development Goals (SDGs): SDG 13 (Climate Action) and SDG 15 (Life on Land). This is achieved by raising awareness of the impact of human activities on ecosystem degradation.

3.2 Guided imagination: essay – "The journey of a water droplet."

In this activity, students imagine the journey of a water droplet through the hydrological cycle. Starting with evaporation by the sun, the droplet forms clouds, falls as precipitation, flows into rivers,

infiltrates the soil, and finally reaches the ocean (Figure 1).

Through this mental journey, students reflect on the crucial role of water in sustaining ecosystems and the interdependence of natural elements.

Figure 1. The water cycle in nature.

Following this reflection, students will write an essay describing how human activities, such as pollution and the overuse of water resources, disrupt or destroy this cycle. They will also analyze the consequences for biodiversity and planetary health.

This activity fosters ecological empathy by encouraging students to "identify" with the role of water and to use creative writing to explain complex environmental impacts. Furthermore, it directly links to SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action), emphasizing the importance of conserving water and reducing pollution as fundamental steps toward a sustainable future.

3.3 The "Golden Circle" technique

In this activity, students sit in a circle to discuss critical topics, such as the impact of deforestation on biodiversity and the consequences of industrial pollution on environmental health.

First, each student takes on a specific role, such as teacher, parent, or politician, and proposes solutions to the discussed issues, analyzing the problems from different perspectives.

The activity then transitions into a creative exercise. Students read a short text excerpt and generate words or questions based on it to create a flow of ideas. For example, one student might start with the word "tree," and then another student might suggest solutions for its protection. Each participant contributes by forming a sentence or suggesting a sustainable practice, such as recycling used water. Then, there is a discussion on the feasibility of these solutions.

This technique improves communication by encouraging equal participation in idea exchange and promotes systematic thinking by connecting solutions to real-world contexts. The activity aligns with SDG4 (Quality Education) by fostering critical dialogue. It also aligns with SDG6 (Clean Water and Sanitation) and SDG13 (Climate Action) by emphasizing collective action for a sustainable future.

3.4 The reporter's game

In this activity, students take on the role of journalists specializing in environmental issues. First, they research the WWF Living Planet Report, a reliable source that analyzes the global state of biodiversity and habitat destruction trends (Living Planet Report, 2024). By extracting key information from this report (e.g., species population decline and pollution impact), students prepare a "News bulletin" in which they creatively present the current state of ecosystems, including statistics, imaginary interviews with experts, and recommendations for nature conservation.

This activity improves research skills by using verified sources and critical analysis by interpreting complex data. It also raises students' awareness of the importance of biodiversity. The game directly links to SDG 13 (Climate Action) and SDG 15 (Life on Land), emphasizing the importance of protecting ecosystems and threatened species to maintain the planet's balance.

3.5 The author's chair

This activity begins with students watching the animated film "The Drop of Water" or reading excerpts from Naum Prifti's literary work of the same title. Through this, students explore the symbolic journey of a water droplet through the water cycle. Then, they write an essay titled "The journey of a water droplet through the water cycle," taking on the roles of both an "author" reflecting on the interdependence between humanity and nature and a "reader" analyzing and commenting on these reflections. This approach enables students to articulate the physical process of the water cycle and examine its impact on this delicate system, including the effects of human activities such as pollution and the overexploitation of water resources.

The activity fosters critical reflection through the analysis of human-nature interactions and artistic expression through the creation of an essay incorporating metaphorical elements. Aligning with SDG4 (Quality Education), it promotes deep and innovative learning. Aligning with SDG13 (Climate Action), it highlights the role of ecological awareness in building a sustainable future.

3.6 Role-playing: Ecosystems in Dialogue

The Ecosystems in Dialogue activity involves role-playing, where students are divided into groups,

with each group assigned a specific ecosystem (forest, ocean, meadow). The groups then prepare a theatrical performance in which the ecosystems "speak" about their roles in nature, the challenges they face, such as pollution, deforestation, and habitat destruction, and the impact of human activities on the natural equilibrium.

Following the performance, students engage in individual reflection by writing an essay on the topic How can humans destroy or preserve nature's balance?, critically analyzing human actions ranging from resource overexploitation to sustainable initiatives.

This activity develops teamwork and creativity (through the creation of scenes and collaborative work), ecological empathy (through role identification with ecosystems), and analytical writing (through reflection on humanity's role in environmental conservation). It directly supports SDG13 (Climate action), SDG15 (Life on land), and SDG12 (Responsible consumption and production), emphasizing the necessity of balanced practices that respect planetary boundaries.

This interdisciplinary model promotes scientific knowledge and fosters the values of active citizenship. Students develop essential skills, such as critical thinking, communication, and global awareness. They can develop the potential to act as agents of change in environmental protection, promoting sustainable practices and constructing a more ecologically conscious society. Through these activities, students learn to analyze issues from multiple perspectives, propose innovative solutions, and take concrete steps toward a more sustainable future.

3.7 A structured interdisciplinary learning situation model

Based on the activities presented above, the following section introduces a structured model of a learning situation that synthesizes the proposed interdisciplinary approach and makes it applicable in classroom practice (see Table 1). This model, grounded in competency-based teaching, highlights the importance of interdisciplinary learning in addressing complex global challenges, while emphasizing the role of the native language in shaping and acquiring scientific concepts. In this way, the teaching process becomes clearer, more closely connected to real-life contexts, and oriented toward the development of competencies.

The model below is derived from the activities presented above and provides a structured framework for their practical implementation in classroom settings.

Table 1. Model of an interdisciplinary lesson.

Element	Description
Learning situation / Topic	Speaking and writing in an environmental context: *Water and human impact on the environment*
Learning outcomes	The student actively participates in discussions on environmental issues; analyzes situations related to human–environment interaction through texts, images, or videos; and expresses ideas and attitudes orally and in writing regarding human impact on the environment.
Competencies developed	Communication in the native language; critical thinking; environmental awareness; collaboration; digital competence.
Achievement of competencies	The student engages in discussions on real environmental situations; analyzes visual and textual materials related to pollution and environmental protection; produces reflective writing (essay or learning diary) on the human–environment relationship; presents and argues ideas in class.
Bloom's taxonomy and learning actions	Remembering: recalling personal experiences; Understanding: explaining environmental phenomena; Applying: describing real-life situations; Analyzing: comparing positive and negative human impacts; Evaluating: making critical judgments about environmental behavior; Creating: writing an essay "How can we protect the environment?".

Concrete activities	Brainstorming, role-playing, discussion, mind mapping, storytelling, and reflective diary writing. Creative activity: "The journey of a water droplet" (reflective writing); presentation of students' ideas and solutions; individual reflection in the diary ("What did I learn? How does this affect my life?").
Resources	Textbooks; visual materials on environmental issues; videos on the water cycle and pollution; digital resources; students' prior experiences; excerpts from diaries or narratives.
Assessment	Continuous assessment through observation and participation in discussions; self-assessment through the learning diary; peer assessment; and teacher evaluation using a rubric focusing on clarity, content, argumentation, and critical reflection. Students also reflect through short guiding questions, while peers provide feedback on presentations.
Keywords	Native language, environment, communication, critical thinking, reflection, and ecological awareness.
Time	90 minutes
Notes	The reflective diary is used as a tool to monitor students' progress and to connect personal experience with scientific concepts. It also serves as a reflective instrument for the teacher, enabling evaluation of lesson implementation and identification of areas for improvement. Activities can be adapted to the local context and students' level.

This model strengthens the interdisciplinary approach of the study and demonstrates how theoretical content can be transformed into practical and applicable classroom practices, integrating the native language with environmental education and earth science concepts in support of competency development and ecological awareness.

4. METHODOLOGY

This study used a mixed-methods approach, combining quantitative and qualitative techniques, to examine the role of the native language in environmental and earth science education. Data were collected through structured questionnaires administered in urban and rural schools in Tirana, Albania. The sample included 684 students and teachers representing various age groups, grade levels, and school contexts. Additionally, preliminary teacher feedback and a brief review of the educational materials were used to design the questionnaire and select the illustrative activities.

The questionnaire was designed in line with educational curricula and relevant literature. It contained closed-ended items organized on 2-, 3-, and 5-point Likert-type scales, as well as open-ended questions for qualitative feedback. The closed-ended questions assessed participants' views on the usefulness and effectiveness of using the native language, its role in comprehension and raising awareness, and their willingness to engage in environmental activities. The open-ended questions allowed participants to provide suggestions and reflections on how to improve the curriculum. A pilot study with 50 participants was conducted before the main survey to test the clarity and reliability of the items, leading to minor adjustments in wording and structure.

The data analysis was carried out in two stages. First, descriptive statistics such as means, standard deviations, and ranges were calculated to identify general trends in the responses. Second, inferential statistics were applied. ANOVA was used to test for differences between students and teachers, and a correlation analysis was conducted to explore the relationship between the perceived importance of the native language and willingness to engage in environmental activities. All statistical analyses were performed using SPSS Statistics, version 25.

In addition to the survey, the study incorporated six structured illustrative activities designed to investigate how the native language facilitates the learning of environmental and earth science concepts. These included: (1) the Cut-out photo exercise, focusing on deforestation; (2) the Guided Imagination essay "The journey of a water droplet," illustrating the hydrological cycle; (3) the Golden

circle technique, fostering multi-perspective debates; (4) the Reporter's game, based on interpreting the WWF Living Planet Report; (5) the Author's chair, combining literature and ecological reflection; and (6) the Ecosystems in dialogue role-play, encouraging students to personify natural systems. The activities were carried out in selected school contexts as pedagogical interventions and qualitative tools, enabling the observation of how students develop competencies, values, and ecological awareness through the use of their native language.

5. RESULTS AND DISCUSSION

5.1 Participant profile

The study sample included 684 participants, consisting of students and teachers from urban and rural schools in Tirana (see Table 2). Of these participants, 72% were students (n = 493), and 28% were teachers (n = 191). The student group included different grade levels of lower and upper secondary education (ages 12–18), providing a range of perspectives on the adolescent learning experience. The group of teacher participants included primary-level educators, as well as science and language teachers, with professional experience ranging from early-career to highly experienced. This variety provided a balanced view of how the native language supports environmental and scientific learning from learners' and educators' perspectives. In terms of school location, 56% of respondents were from urban schools (n = 384), and 44% were from rural schools (n = 300). This distribution was chosen intentionally to capture potential differences in contextual factors, such as access to resources, extracurricular initiatives, and professional development opportunities, between urban and rural areas. This balance highlights disparities in curriculum implementation and the role of the native language in different educational environments.

Table 2. Distribution of participants by role and school location.

Category	Urban (n, %)	Rural (n, %)	Total (n, %)
Students	285 (58%)	208 (42%)	493 (72%)
Teachers	99 (52%)	92 (48%)	191 (28%)
Total	384 (56%)	300 (44%)	684 (100%)

Source: Author's elaboration.

This participant profile provided valuable insights into how contextual factors such as infrastructure, teaching resources, and professional development opportunities affect the role of the native language in environmental and earth science education.

5.2 Survey results of students and teachers

The descriptive analysis was based on Likert-type scales, in which higher values indicated stronger agreement or greater perceived importance (see Table 3). The usefulness of the native language in teaching earth sciences received the maximum possible score of 5.00 on a 5-point scale. This consensus suggests that teachers and students generally perceive the native language as highly important for effectively learning scientific subjects. Similarly, the effectiveness of the native language compared to other languages received a high rating, with an average score of 2.95 ± 0.21 on a 3-point scale. This result shows that the majority of respondents agree that environmental and scientific concepts are easier to learn in their native language.

A consistent trend was observed regarding comprehension facilitation, with an average score of 1.91 ± 0.29 on a 2-point scale. This indicates that most respondents reported that understanding scientific concepts is easier in their native language. Respondents also unanimously recognized the role of environmental education in raising awareness (mean = 2.00 ± 0.00), as well as their willingness to participate in environmental activities conducted in their native language (mean = 2.00 ± 0.00). These results suggest that the native language may improve understanding and encourage motivation and engagement in ecological initiatives.

In contrast, opinions about the current curriculum were more varied. With a mean of 1.86 ± 0.64 on a 3-point scale, some respondents acknowledged the integration of native language and environmental topics, while others deemed it insufficient or were uncertain. This variation highlights a gap between curriculum frameworks and classroom practice. Although the survey revealed a strong overall consensus, some contextual differences between urban and rural schools were also evident. Respondents from urban schools tended to view the curriculum as more effective at integrating environmental and linguistic elements. They often cited access to updated materials and extracurricular initiatives as the reason for their opinion. In contrast, teachers and students in rural schools emphasized larger discrepancies, citing the limited inclusion of environmental topics in practice and the lack of supporting resources for teachers. These discrepancies likely stem from unequal infrastructure and fewer professional development opportunities. These differences highlight the

importance of adapting the curriculum to different contexts to ensure rural schools can equally foster environmental competencies and ecological awareness through the native language.

Finally, the importance of the native language for learning environmental and earth sciences received near-unanimous agreement, with an average rating of 4.71 ± 0.49 on a 5-point scale. Most participants rated it as "very important," underscoring a strong collective recognition that the native language is vital not only for comprehension but also for fostering values and long-term commitment to environmental issues.

Table 3. Summary of descriptive statistics and statistical tests.

Parameter	Range	Mean ± SD	ANOVA (p)	Main correlation
Usefulness	5 – 5	5.00 ± 0.00	ns	-
Effectiveness	2 – 3	2.95 ± 0.21	ns	-
Facilitation	1 – 2	1.91 ± 0.29	ns	-
Awareness	2 – 2	2.00 ± 0.00	ns	-
Willingness	2 – 2	2.00 ± 0.00	ns	-
Curriculum	1 – 3	1.86 ± 0.64	ns	-
Importance	4 – 5	4.71 ± 0.49	ns	-

ns = not significant (p > 0.05)

Source: Author's elaboration.

The statistical tests reinforce these descriptive tendencies and provide further insight into the consistency of the responses (see Table 3). An ANOVA test comparing students' and teachers' evaluations of the usefulness of the native language did not reveal any statistically significant differences ($p > 0.05$). This indicates that both groups share similar views and consistently rate the native language as highly useful. Similarly, the correlation analysis between the perceived importance of the native language and willingness to engage in environmental activities did not reach significance. The absence of statistically significant differences and correlations does not indicate a lack of relationship, but rather reflects the high level of uniformity in the responses. This uniformity is a strong finding that highlights a broad consensus across groups that the native language is essential for environmental and scientific education. With a more diverse distribution of responses in larger-scale applications, these relationships may emerge with greater statistical clarity.

The results align with international literature (e.g., UNESCO, 2015; Council of Europe, 2020) and national strategic documents, which collectively highlight the significance of the native language in fostering scientific and environmental competencies. The findings suggest that using the native language may facilitate comprehension of complex concepts and may motivate students and teachers to participate in environmental education and sustainable development initiatives. The consensus across groups reinforces the argument for strengthening the role of the native language in the curriculum and turning it into a tool for developing critical thinking skills, ecological awareness, and the ability to address global challenges, such as climate change and biodiversity loss. The strong consensus observed in the survey is reflected in practical activities where students demonstrated not only comprehension, but also motivation and values aligned with sustainability.

5.3 Results of illustrative activities

The results indicate that students developed knowledge and transferable skills, while also fostering values related to ecological responsibility and social engagement. Conducting these activities in the students' native language appears to have allowed them to express themselves more freely, internalize complex concepts, and link them with personal and community experiences.

The cut-out photo exercise enabled students to analyze environmental issues by piecing together fragmented images of deforestation. The immediate outcome was an increased ability to identify the root causes of ecological problems and propose solutions during group discussions. This activity fostered critical observation, teamwork, and empathy while raising awareness of the impact of human actions on ecosystems in alignment with SDG 13 (Climate Action) and SDG 15 (Life on Land).

The guided imagination essay "The journey of a water droplet" helped students understand the hydrological cycle and how human activity disrupts it. Students articulated in their native language how pollution and resource exploitation threaten biodiversity. This exercise improved their scientific comprehension, ecological empathy, and creative writing skills. The exercise made abstract processes tangible and highlighted links to SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action).

Through the Golden Circle discussions, students practiced debating environmental issues while adopting different societal roles. They gained a deeper understanding of multiple perspectives and

learned to construct balanced arguments. This activity fostered systematic thinking, civic responsibility, and communication skills, which align with SDG 4 (Quality Education) and SDG 13 (Climate Action).

The Reporter's Game produced measurable results in terms of both research and communication. Students extracted data from the WWF Living Planet Report, interpreted the decline of biodiversity, and presented their findings in the form of news bulletins. This improved their ability to transform complex information into accessible messages, fostering analytical thinking, data literacy, and media competence. The activity reinforced SDGs 13 (Climate Action) and 15 (Life on Land) by encouraging a fact-based understanding of ecological crises.

The Author's Chair encouraged students to reflect on literature and film while writing essays about the journey of a water droplet. The main outcome was the integration of metaphorical thinking with scientific accuracy, fostering critical thinking, creativity, and ecological awareness. Students emphasized the moral responsibility of humans toward nature, thus supporting SDG 4 (Quality Education) and SDG 13 (Climate Action).

The Ecosystems in dialogue role-play had strong transformative outcomes. By taking on the roles of forests, oceans, and meadows, students developed ecological empathy, improved their collaborative performance skills, and became more environmentally responsible. Post-activity essays revealed a shift in their thinking; many expressed concern about the overexploitation of resources by humans and proposed sustainable practices. The activity is directly aligned with SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land).

Overall, the activities suggest that students developed competencies such as critical and creative thinking, collaboration, problem-solving, and global awareness. Furthermore, they embraced values such as ecological sensitivity, social responsibility, and active citizenship. The native language appears to have played an important role in this process because it made scientific terminology accessible, allowed for the nuanced expression of emotions and ideas, and strengthened the connection between local cultural identity and global sustainability challenges.

Beyond acquiring competencies, the activities revealed a strong value dimension that reinforced ecological sensitivity, social responsibility, and active citizenship. Implementing these activities suggests that the native language is more than just a means of communication and may act as a catalyst for deeper learning and transformation. Allowing students to express scientific concepts within a familiar linguistic and cultural framework enhances comprehension, strengthens emotional engagement, and encourages long-term commitment to environmental responsibility.

These outcomes provide support for the study's main hypothesis that integrating the native language into environmental and earth science education may enhance knowledge acquisition and student engagement. More broadly, the activities illustrate how an interdisciplinary model can help bridge the gap between local identity and global sustainability challenges. By using their native language, students were able to connect scientific knowledge with personal experience, cultural values, and collective responsibility, suggesting that education rooted in linguistic and cultural relevance may be better positioned to prepare the next generation for the complexities of climate change, biodiversity loss, and sustainable resource management. The competencies and values developed through these activities contribute to achieving the Sustainable Development Goals (SDGs), particularly SDGs 4, 6, 12, 13, and 15, suggesting the broader relevance of integrating native languages into education.

While the results are promising, certain limitations should be acknowledged. The outcomes presented here primarily reflect the Albanian educational context, in which the role of the native language is deeply integrated into cultural and curricular frameworks. This specificity may affect the extent to which the findings can be applied to other contexts with different linguistic or educational dynamics. Additionally, the study evaluated the immediate outcomes of activities and surveys, but it did not incorporate longitudinal measurements to assess the long-term sustainability of the observed competencies and values. Therefore, future research could expand the scope by applying similar interdisciplinary models across different countries and monitoring the persistence of impacts over time.

6. CONCLUSIONS AND RECOMMENDATIONS

This study suggests that the integration of the native language into environmental and earth science education is not only a pedagogical choice but may be considered a potentially transformative approach that strengthens learning, fosters ecological awareness, and cultivates civic responsibility. The findings indicate that teaching scientific concepts in the native language may contribute to a deeper

understanding, help students develop transferable skills such as critical and creative thinking, collaboration, and problem-solving, and encourage them to embrace values of ecological sensitivity and social responsibility. Illustrative activities suggest that the native language can serve as a bridge between cultural identity and global sustainability challenges, empowering students to connect knowledge with personal experience and collective responsibility.

By positioning the native language at the core of interdisciplinary education, this model may provide a useful framework for preparing future generations to address climate change, biodiversity loss, and sustainable resource management. While rooted in the Albanian context, the approach has broader implications and may inform curriculum development in other educational contexts seeking to link cultural relevance with global sustainability goals. Furthermore, the findings highlight the potential of integrating native language-based interdisciplinary approaches to support environmental awareness that is essential for sustainable agriculture and the responsible use of natural resources. Ultimately, this study suggests that the integration of the native language in environmental and earth science education is not only a matter of cultural identity but may represent a valuable pathway to supporting sustainable development and preparing globally responsible citizens.

Based on these findings, the study recommends two key measures to strengthen the integration of the native language in environmental and earth science curricula: (1) the development of educational materials that combine scientific accuracy with cultural and linguistic relevance; and (2) continuous professional training for teachers to effectively use the native language as a pedagogical tool in interdisciplinary contexts. These steps would help support and further develop the observed benefits, deeper comprehension, stronger engagement, and the cultivation of sustainability-oriented values, which are consolidated and expanded across the educational system.

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