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Environmental and landscape education to support the Natura 2000 Network

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Abstract

The dissemination of environmental knowledge through education is crucial for fostering awareness of landscape conservation and development. This research investigates the impact of environmental and landscape education on enhancing engagement with the European Natura 2000 Network and the principles of biodiversity conservation. Focusing on young learners, the study assesses an innovative educational approach implemented across seven Italian regions as part of the LIFE "Sic2Sic" project. More than a thousand students were involved, and an analysis of the collected works was conducted, aimed at deepening their understanding and connection to critical environmental issues.
The analysis has demonstrated the educational format's efficacy, with the majority of participants completing their assignments to a high standard, displaying significant comprehension, emotional engagement and a profound personal connection to the natural world. Notably, the students' works has reflected a clear grasp of key concepts related to physical landscapes, biodiversity and ecological networks, underscoring the educational approach effectiveness in communicating core messages. The study also highlights the adaptability of this innovative education format across diverse settings, providing to be a valuable resource for sustainability education and transformative change among future generations.

Keywords: Awareness, Biodiversity, Creative Writing, Ecological Networks, Environmental and Landscape Education, Landscape Ecology, Natura 2000 Network, Sustainability

1. Introduction

The simultaneous action of nature and human beings (Turri, 2003) and the way in which people live and perceive their environment (Heidegger, 1976; Ingold, 2001; Luginbühl, 2012) is embedded in the continuous interaction between natural and cultural landscapes (Makhzoumi and Pungetti, 1999; Grove and Rackham, 2003). The relationship between landscape and nature has been discussed in several environmental, geographical, and

architectural studies, which have described landscape as the visible representation of a territory reflected in their surrounding nature. Landscapes, in addition, have been considered living systems subject to constant changes (Hoskins, 1954; Rackham, 1986; Cosgrove, 1998) turning with time into multifunctional multiscale systems which combine mind (Bateson, 1984), territory and scenery (Antrop et al., 2013; Antrop and Van Eetvelde, 2019).

Understanding the relationship between landscape and nature, however, requires an understanding of the ongoing interaction between natural and cultural processes (Pungetti, 2013; Peng, 2020). In this interplay landscape becomes a multidisciplinary subject that involves various fields, including physical and human geography, ecology, landscape design, planning and policy. Collaboration in these fields is necessary to facilitate the above understanding, which in turn requires stronger efforts than those at present.

Research on ecological issues has further delved into the connection between landscape and nature, viewing landscape as an indicator of ecological integrity and ecosystem health. By examining abiotic and biotic landscape features such as natural habitat presence, biodiversity, soil and water quality, it becomes possible to gauge the vitality of local ecosystems. Moreover, landscape planning can have a significant impact on biodiversity conservation and environmental sustainability (Termorshuizen, Opdam and Vanden Brink, 2007). Therefore, thoughtful landscape planning and policies can aid in establishing protected areas, enhancing habitat connectivity, and promoting sustainable practices for natural resource management.

Another integral part of the relationship between landscape and nature is their aesthetic character. Natural and cultural landscapes (European Commission, 2019a) with significant aesthetic value play a crucial role in shaping identities and fostering a sense of place. The aesthetics of landscape and nature can influence the psychological well-being of individuals and their sense of belonging to a place. People, indeed, perceive and appreciate the beauty and harmony of nature, finding inspiration and

comfort in contemplating it, thus turning nature into landscape. This is outlined by the European Landscape Convention (ELC), which over 20 years ago stated that landscape is "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe, 2000, p. 2). ELC, it is known, promotes the protection, management and sustainable planning of landscapes, recognising their importance for the quality of life, cultural identity and people's well-being.

On the other hand, the European Union (EU) has addressed the relationship between landscape and nature through various initiatives and policies aimed at promoting the conservation, sustainable management and valorisation of natural and cultural landscapes. However, lots of work still needs to be implemented at lower levels to reach this aim.

The EU has specifically developed policies and programs for the conservation and sustainable management of natural landscapes. Natura 2000 Network (NN2000) for example, is a wide ecological network spread over the entire territory of the European Union (European Commission, 2008), a political instrument for the largest coordinated environmental protection network in the world. Its aim is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive (79/409/EEC amended in 2009/147/EC) and the Habitats Directive (92/43/EEC). The current 790,213 terrestrial Natura 2000 sites of the 27 European Union countries cover 18.8% of the EU surface, protecting about 8,500 birds, more than 3,300 habitats and over 8,000 animal and plant species. The network is so far the most effective European tool for nature conservation management both on land and at sea. NN2000 includes Sites of Community Importance (SCIs) and Special Protection Areas (SPAs) designated under the European directives on nature conservation above mentioned. The Network contributes to the protection of valuable natural landscapes and provides opportunities for sustainable development for local communities.

In order to implement this vision, the EU encourages cooperation and knowledge sharing

among member states through networks and platforms such as the Information Platform of the Information System on the Council of Europe Landscape Convention (Council of Europe, 2021).

The EU supports also projects and initiatives that promote the valorisation and sustainable use of landscapes (European Commission, 2019a) with funding programs such as LIFE and Horizon Europe. Such projects endorse the participation of local communities, environmental education, awareness-raising and sustainable tourism, recognising the economic, cultural and social importance of European landscapes. One of these projects is the LIFE "Sic2Sic" illustrated in this article, aimed at raising awareness of this issue through environmental and landscape education. The research developed in this direction by the project seeks to facilitate the understanding of the ongoing interaction between natural and human processes in the landscape of ecological networks (Jongman and Pungetti, 2004).

2. Raising awareness: the role of education

Education, clearly, plays a fundamental role in addressing issues related to nature and landscape, as it can contribute to raising awareness about the importance of conserving and sustainably managing our natural environment (Ardoin et al., 2020; European Commission, 2021). Indeed, "nature-based environmental education, which combines the acquisition of environmental knowledge with the promotion of an intrinsic driver, namely connectedness to nature, is a necessary prerequisite to ecological behaviour" (Otto and Pensini, 2017, p. 88).

At international level, the field of education references the notion of Global Understanding and the International Year of Global Understanding (IYGU) program[1] Working toward a new geographical imagination of the world, it addresses the ways people live the

transformation of nature from the perspective of sustainability. The program, geographical education can help "teachers to see their class as a community of learners who take up vital and pressing social issues of our day" (van der Schee and Béneker, 2018, p. 80) and can provide students with a critical way of thinking about their relationship with the environment.

Additionally, education can promote a responsible attitude towards landscape, encouraging people to actively participate in the planning and management of land and local landscapes (Bianchi et al., 2022). Education and training are therefore crucial in fostering landscape awareness, which is based on knowledge, understanding, and public engagement (Council of Europe, 2000).

Environmental education is one of the sustainability pillars (UNESCO, 1997) in which formal, non-formal and informal education are integrated with a view to lifelong learning (Commission of the European Communities, 2000; UNESCO, 2017). Everyone has therefore something to learn from others without a clear demarcation between teacher and learner (Comitato interministeriale di indirizzo e coordinamento, 1997).

In our interconnected world, geography education has often been linked with environmental education (Tani, 2017), and can demonstrate how people interrelationships with the environment shape places and landscapes (Karkdijk et al., 2021; International Geographical Union, 2016).

In this context, geographical education is a crucial tool in rising promoting responsible behavior[2] towards nature and the landscape. This promotes not only geographical knowledge, but also the ability to understand the impact of human activities on natural ecosystems to better manage the territory (Maude, 2022; Haubrich et al., 2007; Rakuase and Latue, 2023).

At national level, the Italian law 92/2019 "Introduction of civic education teaching in schools" includes environmental education and

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[1] IYGU (2016). International year of global understanding (http://www.global-understanding.info).

[2] Specifically with regard to the geo-capabilities of making personal choices for sustainability, see: Solem et al., 2013.

eco-sustainable development education, providing that educators should have multidisciplinary skills to be implemented through a holistic approach. In the Italian public schools, nevertheless, non-formal environmental education is still not so widespread (Aminrad et al., 2013; CEDEFOP, 2016). The interdisciplinary nature of this kind of education and the difficulties in finding suitable teachers among the school staff have led to frequent use of external organisations and experts.

Landscape education, conversely, is characterised by a combination of different practices, developed in areas outside the scholastic field and carried out by subjects who may not be part of the formal education (Kopreinig Guzzi, 2013; Cisani and Castiglioni, 2019; De Luca, 2019). In some European countries, however, landscape education is scarcely advanced also in the sector of territorial sustainability, where it should instead be central.

The guiding principle of Environmental Education for Sustainability (EES) is the transmission of a "systemic" vision of the environment by disseminating the knowledge and skills necessary to promote sustainable development through the involvement of young learners not only on a cognitive, but also on an emotional and behavioural level (UNESCO, 2017). This allows individuals to become actors in the change processes contained in the 2030 Agenda for Sustainable Development (United Nations, 2015). According to Article 12 of the UNCRC (United Nations Convention on the rights of the child, geographical education can support children's participation in the planning process (Usher, 2023) and grants them the right to have their views heard and act accordingly.

The Agenda's goal 4 focusses on education. In particular, goal 4.7 deals with the skills necessary to promote sustainable development, with skills meaning not only knowledge but also "know-how" (Tamburini, 2002). The goal is to ensure by 2030 that learners acquire the necessary skills (knowledge) to promote sustainable development (know-how). Education for sustainable development and lifestyles is here central in supporting human rights, gender equality, peace and non-violence, global citizenship, cultural diversity, and contribution to sustainable development.

EES, moreover, calls for a new relationship between teaching and learning through a transformative action-oriented pedagogy (Mezirow, 1990; Lotz-Sisitka et al., 2015; Mezirow, 2016), which supports self-learning, participation and collaboration through games (Maso, 2010; Winnicott, 2001), field experiences and creativity (Jacobson et al., 2007). It is therefore necessary to foster a synergy between the school and the extra-curricular world, aiming at creating a strong link with the territory (Borgarello, 2017). It is possible to do so by involving researchers and associations in the education process to deepen environmental protection, management of natural resources, biological and landscape diversity, among the other key issues related to sustainable development.

Within the LIFE Programme, therefore, the actions of the "Sic2Sic" project have tried to identify teaching and learning gaps and needs from which to build an education format for a conscious use of the Natura 2000 sites. Building from previous research (Gurevitz, 2000; Jacobson et al., 2015), and from the Agenda for Sustainable Development mentioned above, the project meant to advance personal and community growth in terms not just of knowledge but also of know-how, reflecting on our actions and how they impact on the environment at global and local level. In this way, young learners have been involved in the project with participatory learning and empathy, considering that "a high degree of empathy in a relationship is probably the most powerful factor in making transformation and learning" (Rogers, 2012, p. 121).

The actions and results aimed at environmental and landscape education obtained through the "Sic2Sic" project are here illustrated.

3. Cycling through the Italian Natura 2000 Network

As discussed before, communication and education are pivotal in advocating for landscape and nature conservation while actively involving local people. Nonetheless, even in Europe, there is a gap in people awareness towards the environmental significance of their territory. A prominent illustration of this is the NN2000. According to the 2018 Eurobarometer, which assesses trends within the EU, 70% of EU citizens are unfamiliar with NN2000, and a mere 11% have both heard of it and understand the issue (European Commission, 2019b).

To address the knowledge gap concerning environment and biodiversity, the European Commission (EC) has financed various funding programmes. Notably, the LIFE Programme includes a specific initiative for the NN2000. In 2016, this program co-funded the "Sic2Sic – Cycling through the Natura 2000 Network" project[3], coordinated by ISPRA, the Italian National Institute for Environmental Protection and Research. Taking place from 2017 to 2020, the project engaged three associate partners: Ares 2.0 (a communication agency), Enne3 (an innovative start-up incubator), and FIAB (a cycling association).

With the objective of enhancing public comprehension of NN2000 and biodiversity, as well as promoting participatory learning, the project executed targeted actions involving citizens and students. Additionally, the project leveraged the bicycle as an innovative communication tool to exemplify soft mobility and sustainable tourism. Over the course of three years, a panel of experts on environment, landscape, cycling, sustainable tourism and communication, cycled across Italy. They organized cycling days open to citizens in Natura 2000 sites and collaborated with local authorities and schools.

Key topics of the "Sic2Sic" project were environmental and landscape values, biodiversity preservation and the role of the NN2000 in Italian and European ecological connectivity. Notably, the project targeted a diverse audience, particularly focusing on young people. Activities and meetings with these young learners served to underscore the importance of responsible coexistence between humanity and nature for habitat conservation.

Throughout the project's timeframe, experts visited 387 Natura 2000 sites, traversing seven Italian regions and 915 municipalities. They engaged with over 200 local administrators and hosted 20 cycling days for citizens in the related Natura 2000 sites. The project also involved 4,200 students along with 161 school operators[4] (Figure 1). Comprehensive information regarding the cycling routes can be found on the website[5].

In September 2016, when the project proposal was presented, the Italian NN2000 covered an area of 5,824,436 hectares, equal to 19.3% of national territory. Due to Italy's unique geographic configuration, it spans three terrestrial Biogeographical Regions: Alpine, Continental, and Mediterranean. To disseminate knowledge efficiently across this wide array of environments, while adhering to muscle-powered transportation and the need to liaise with administrative contacts at various levels (municipal and regional authorities), a selection was necessary. Out of Italy's 22 administrative regions, seven were selected to meet both the project objectives and ensure environmental representation: Friuli Venice Julia, Piedmont, Lazio, Umbria, Apulia, Sardinia, and Sicily.

These regions are distributed across the entire Italian territory, providing broad geographical representation: Piedmont (Northwest), Friuli Venice Julia (Northeast), Lazio and Umbria (Central), Apulia (South), and Sardinia and Sicily (Islands). Additionally, all three Italian biogeographical regions are represented within these areas.

The validity of this selection was confirmed through both quantitative and qualitative analyses, taking into account:

• The surface of Natura 2000 in the selected regions, covering a total of 3,202,158

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[3] https://lifesic2sic.eu/.

[4] https://lifesic2sic.eu/wp-content/uploads/2021/11/life16-gie-it-000700_final-report.pdf.
[5] https://lifesic2sic.eu/, section "I percorsi".

hectares, equivalent to 58% of the national territory.

- The range of Naturalistic-Cultural values in these regions based on the Carta della Natura Information System (CNIS)[6] by ISPRA (Figure 2).

Specifically, the Naturalistic-Cultural Map of Italy, an application of the CNIS, uses the physiographic boundaries from the Map of Italian Landscape Units (Capogrossi et al., 2017). This system identifies five grades (Very High, High, Medium, Low, and Very Low) of Naturalistic-Cultural Values. This tool has been applied to identify Natura 2000 sites with potential for enhancing the local economy in line with the objectives of the LIFE "Sic2Sic" project, promoting dialogue with institutions, and supporting actions aimed at increasing awareness of natural, cultural and economic capacities.

4. Developing of a format for the school: from Gestalt to Caviardage®

Although children were one of the main targets of the "Sic2Sic" campaign, according to the intense daily schedule the time available for the meeting at schools was very short, about an hour and a half. To this end, experts from ISPRA developed an education format for the schools, adopting *Gestalt* experiences cycle called also "contact cycle" (Perls et al., 1997).

The education format consists of 4 phases (Figure 3):

1 Pre-Contact: experts introduce themselves and start the brainstorming on biodiversity and NN2000 and young learners write words on a blackboard related to the topics.

2 Contact: A project video was presented, highlighting the importance of NN2000 and the local environment.

3 Full Contact: young learners engaged in creative activities using the Caviardage® technique (Festa, 2015). This involved:

- Receiving printed text and other material.

- Selecting 7-10 meaningful words and composing short poems or prose.

- Highlighting selected words and erasing the rest to form a visual drawing. (referred to as "creative erasing"); finally, giving a title to their work.

- Adding a red thread to indicate the reading path.

- Presenting their works as gifts to the experts. (Mauss, 2002; Provasi, 2014).

4 Post Contact: This phase included feedback, diploma distribution, and group photos.

The texts used in the Caviardage® method were carefully chosen to reflect environmental themesor or incorporating words relating to the environment (22 texts in total available on the project website[7]).

The *Caviardage®* is a poetic writing technique and creative erasure systematized by Tina Festa (2015). The term derives from the French verb *caviarder* and symbolizes the act of deleting a passage with black colour, akin to the colour of caviar. It was initially associated with the censorship technique during the Tsarist period, where texts hostile to the regime were erased with black ink.

Caviardage® can be understood as a conceptual bridge between text and landscape, serving as a tool to explore the inner landscape through text. The combination of drawing and poetry facilitates the expression of inner imagery in an external form. In a similar way, landscape can be interpreted as a form of text in a semiotic sense, extending beyond written language to include figurative art (Lotman, 2006) and the entire physical world, which can be seen as a vast text to be read and understood (Volli, 2003).

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[6] https://www.isprambiente.gov.it/en/databases/data-base-collection/biodiversity.
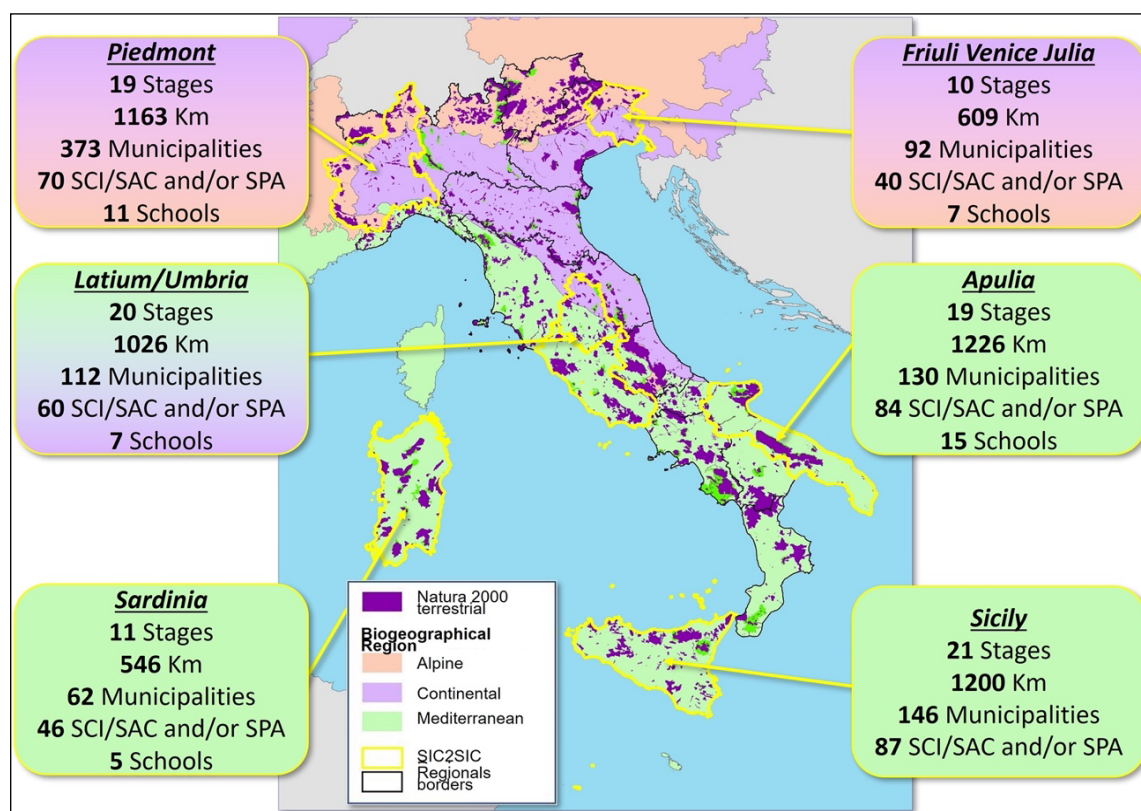
[7] https://lifesic2sic.eu/scuole/.

Figure 1. Biogeographic Regions in Italy and the Italian Natura 2000 Sites. The seven regions involved in the "Sic2Sic" tour are highlighted and the numbers of the respective tours are reported. Authors' elaboration.
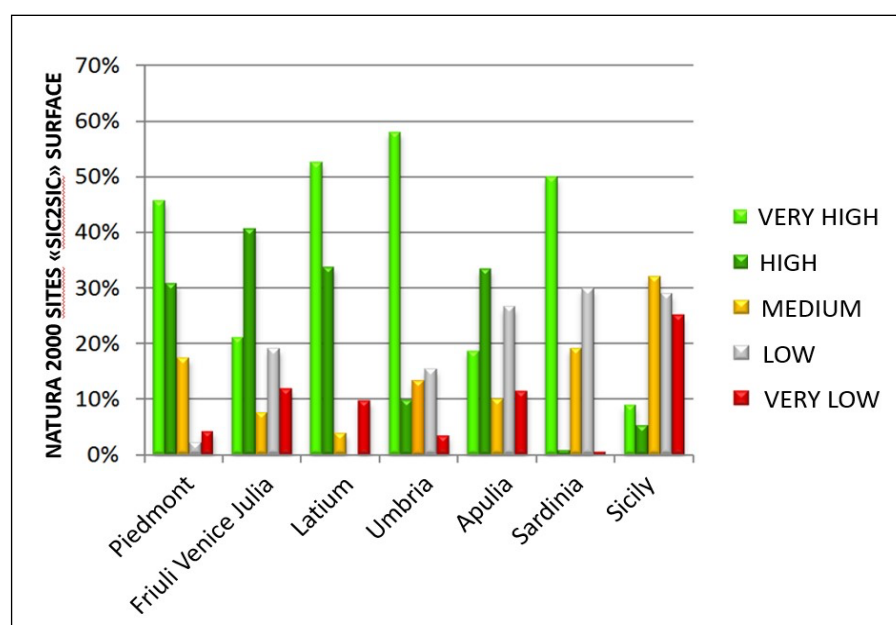

Figure 2. Naturalistic-Cultural range of the seven Italian regions crossed by the "Sic2Sic" tour. Authors' elaboration based on ISPRA Carta della Natura Information System.

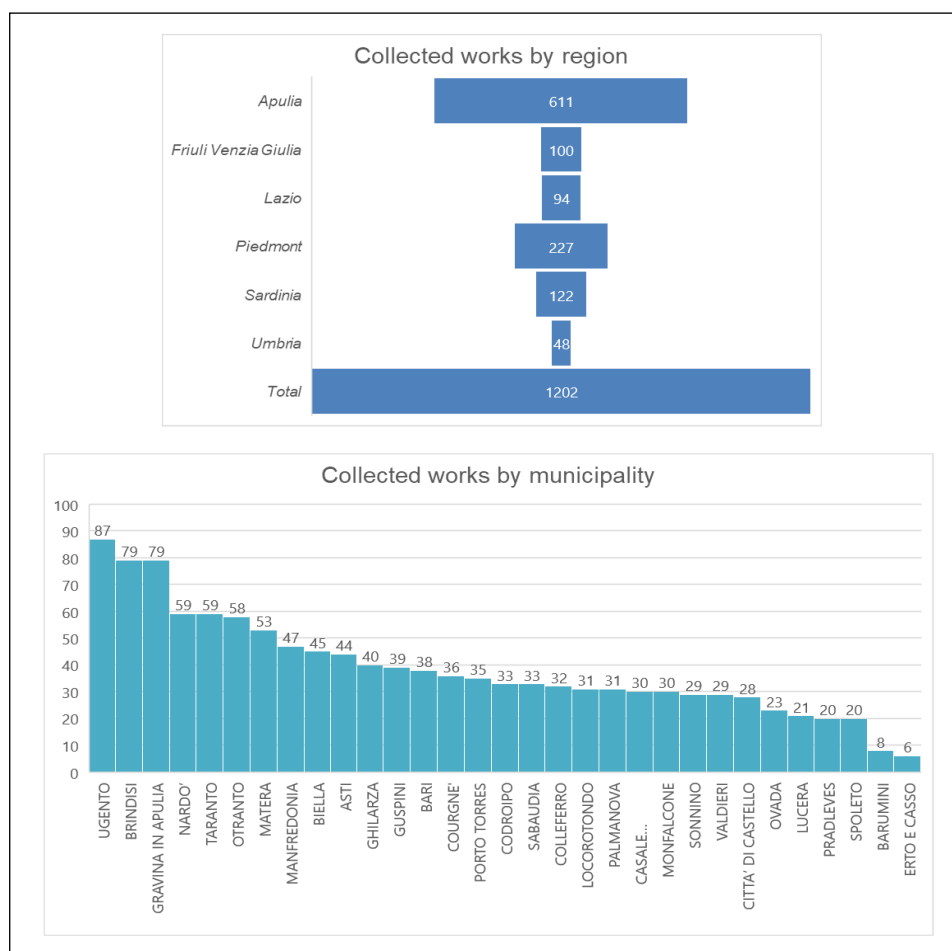Figure 3. The four phases of the Gestalt cycle. Authors' elaboration.

Figure 4. Number of collected works, by region and by municipality. Authors' elaboration.

5. Results and analysis

The education format has been applied in the project works, which have been collected during school meetings and are here illustrated as tangible evidence of the educational experience undergone by children in their specific context. The works can be regarded as a window into their inner landscape, where the selected and circled words resonate with, and reflect, their individuality. Through this technique, as per the *Gestalt* theory, it is possible to focalise "the figure", i.e., what stands out against a "background", just like an artist does in painting a landscape picture. This method not only represents a poetic and artistic form of creative writing, but also functions as an expressive counselling tool aimed at enhancing self-awareness and understanding of personal inner states.

Throughout the project, school meetings were proposed to all primary schools within the municipality (a total of 80) where each step of the tour began. This format was implemented in 45 schools across six regions in Italy, engaging over 2,100 primary school students. In 2020, the final year of the project, it was not possible to conduct in-person activities in Sicily due to the Covid-19 pandemic.

Initially the young learners' works were not systematically collected, as they were considered gifts. Despite this, at the end of the project there were a total of 1,202 works from 31 of the 45 primary schools visited. Figure 4 illustrates the regional distribution of the schools and collected works.

Notably, the number of collected works varies considerably from school to school, with an average of 39 works per school, depending on the number of students present at the meeting. Particularly, the number of collected works increased between the first and second year of activity, rising from 364 in 2018 to 838 in 2019, with an average of 28 and 47 respectively. This increase was partly due to our improved organizational capabilities, which enabled us to manage much larger groups and thus to meet the requests of the schools to involve all classes in the meeting.

The analysis of the works, to assess the effectiveness of the developed education format, has focused on three points:

- Understanding of the task, through the number of works that presented circled words in the text (the first expected result of *Caviardage®*).

- Verifying the young learners' perception of the main messages and goals of the "Sic2Sic" project; through the presence of key words in the works (nature, landscape, etc.).

- Evaluating the young learners' emotional involvement, called "Inner landscape"; through the identification in the works of words or drawings that reflect more an emotional, rather than a physical, dimension.

Effectiveness of the developed education format

The results of the analysis of the works obtained applying the *Caviardage®* method are summarized in Figure 5.

Out of the 1,202 collected works, 1,167 present selected words (referred to as "Circled words"), according to the second step of the *Caviardage®* method. Among the 35 works without circled words, 19 were from primary school students who faced difficulty in reading and writing within the limited allocated time for this activity. However, many of these students actively participated by colouring the sheets and creating abstract drawings. An important finding is that almost all young learners (95.6%) successfully completed step 2 by developing a text (referred to as "Composition"). Experts and teachers provided support to ensure inclusivity during the process, and interestingly the children requiring assistance often displayed higher engagement in the activities. Therefore, 534 works, representing 45% of the total, indicated the learners' time and interest in adding a creative image related to their works. Including a drawing, finally, assured inclusivity of the format for those students who had problems with reading and writing.

The use of circled words in the texts was quantified, revealing that out of the 1,144 works contained both circled words and compositions. Specifically, in only 13 cases none of the circled words were used to elaborate the final composition; in 64 cases, at least 1 circled word was used; in 200 cases at least 2 circled words were used. In the remaining 867 works, 3 or more circled words were used. It was also observed that the young learners often chose not to restrict themselves solely to circled words, thereby going beyond the assigned task.

Perception of the project key messages

To assess the young learners' perception of the messages conveyed by the experts, the contents of works (circled words, composition, or drawings) were analysed for the presence of abiotic factors related to the landscape ("Physical landscape"), which were found in 46.8% of the works. We also searched for the presence of biotic factors like nature and biodiversity ("Nature"), present in 55.5% of the works. Interestingly, the "Bicycle" – the human factor and a key element of the project – appeared in only 9.8% of the works.

Another significant aspect to consider is that students' texts often evoked elements such as memories, thoughts or emotions related to the selected words and composition. This factor, referred to as the "Inner landscape", was evident in many works (65.2%). It is important to note that while most factors could be objectively analysed, the assessment of the inner landscape is more subjective and could be influenced by the interpreter's biases. Only 44 works referenced all key words (Inner and Physical landscape, Nature, and Bicycle). Results are summarized in Figure 6.

Lastly, attention was directed to the frequencies of circled words to identify correlations between these and the core of our key message. Out of the 1,167 works containing circled words, we found 937 unique words appearing 10,238 times. The most frequent word was "Landscape" (355 times), followed by "Land" (191 times). Among the top 50 most frequent words shown in Figure 7, words closely associated with nature and landscape were identified, as well as significant words related to emotions and poetry. This analysis suggests that the main message of project meetings has been effectively conveyed.

Evaluation of the emotional involvement

Focus then shifted to the 144 works that included both the "Physical" and "Inner" landscape, along with a drawing. Subsequently, the analysis focused on the drawings: tangible expressions of young learners' creativity, feedback from interactions, original products of exchange relationships, even gifts to experts or educators. In order to avoid subjective comments on emotional and immaterial aspects, some pictures of drawings and compositions are presented as material and symbolic traces, representing the potential to create a shared vision of the landscape, "Our landscape". This landscape emerges from diverse perspectives, contributing to plural ways of living, representing and experiencing the landscape.

The collected compositions are tangible yet symbolic traces of the potential to create an exchange between "text as an inner landscape" and "landscape as a text", aiding self-discovery and landscape comprehension.
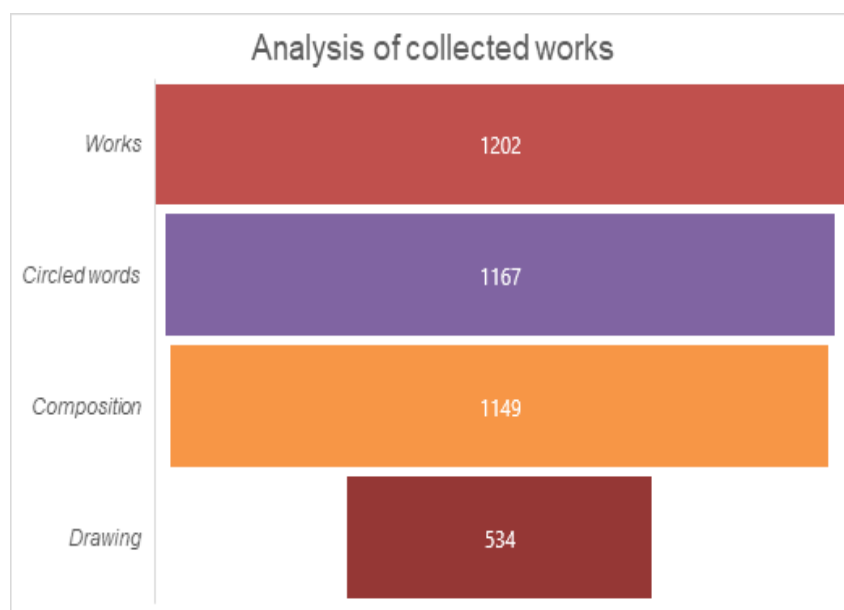
Figure 5. Analysis of collected works, in relation to the assessment of the education format effectiveness. Authors' elaboration.
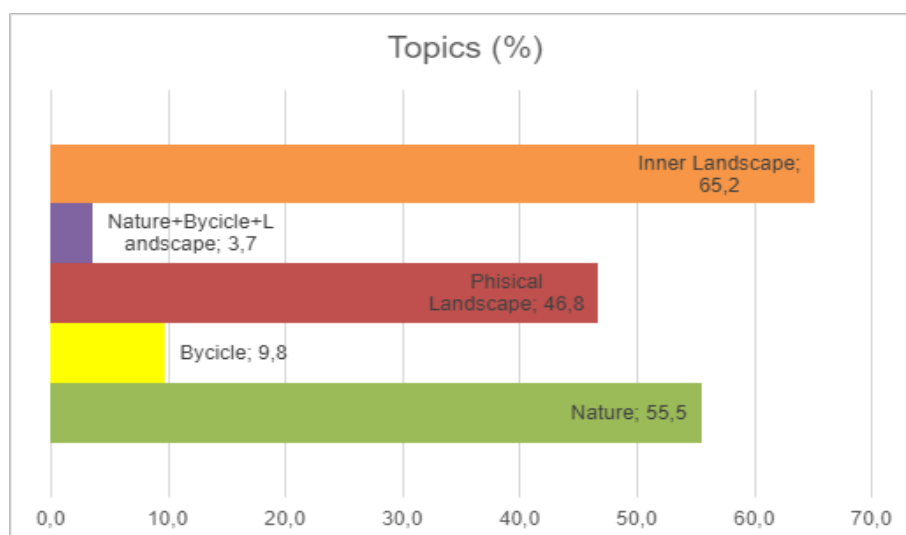

Figure 6. Analysis of collected works, in relation to the perception of the key messages of the "Sic2Sic" project (values expressed in percentage). Authors' elaboration.
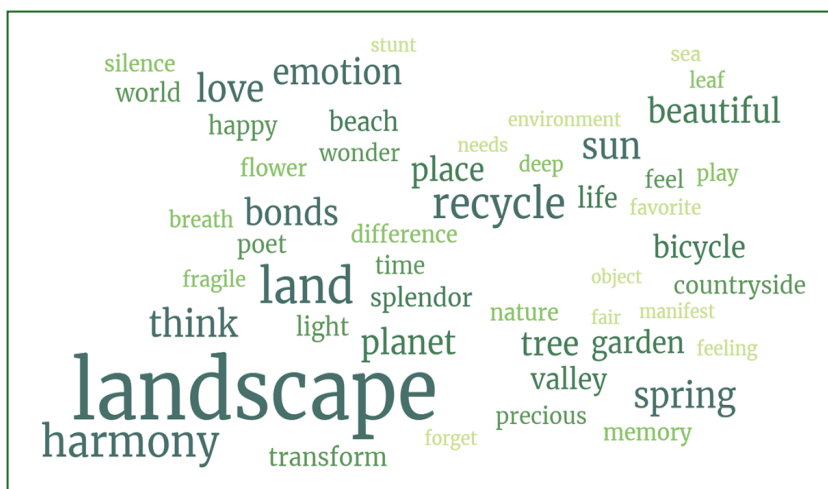
Figure 7. Word cloud representation of circled words frequency in collected works. Authors' elaboration using Word Frequency https://wordfrequency.org/.

Figure 8. Four examples of the students' perceptive and emotional component linked to landscape. Authors' elaboration.

In Figure 8, the compositions of four young learners, chosen for their diverse results, are presented to show the various paths followed by each of them to finalize their compositions. The emotional component tied to landscape is evident in these compositions:

- Text 1: "We must feel the harmony that wanders in a valley, not touch, those sensations are part of the landscape".
- Text 2: "Landscape is an emotion, I go to town by bicycle. Natura 2000 kicks off!".
- Text 3: "When it wanders downstream, harmony is felt by the landscape".
- Text 4: "We love bonds that show us the right path, cycling, like on bicycles, we invite the whole world to the garden, called Earth, in the countryside with our grandparents, who warmly welcome the whole city, in the past slowly, slowly, uncomfortable lands and landscapes have got through".

For example, in compositions 1, 2 and 3, verbs linked to the senses are often chosen to emphasize sensory experiences, as if the landscape "feels" like a person. Composition 4 recalls the countryside of the students' grandparents, symbolizing the landscape of intergenerational ties, and guiding the way from countryside to the city. For something to happen, it must first be imagined, e.g. envisioning a future landscape rooted in the past.

6. Discussion

The three-year journey undertaken by this project has yielded the development and application of an effective and innovative educational framework. This framework encompasses both formal and informal dimensions and is readily replicable in diverse contexts.

Primarily, the project experts have utilized the creative writing activity to advance an innovative approach to sustainability education, aligning with the intricate and cross-cutting nature of this subject. The table below succinctly encapsulates the outcomes derived from the educational initiatives within schools, relating to the six essential attributes required for effective

sustainability education from a participatory pedagogical standpoint[8].

Characteristics of education to sustainability	Results of the format application
Interdisciplinarity and holistic approach	Promotion of biodiversity protection and enhancement in Natura 2000 sites. Involvement of a multidisciplinary group of experts in collaboration with educational institutions. Empowerment of citizens with respect to their consumption and mobility choices.
Acquisition of values	Information and active participation of young learners and school teachers, thus strengthening eco-sustainable behaviours in the use of their territory, and increasing awareness of environmental values.
Multiplicity of methodologies	Use of *Caviardage*® as a tool for exploring the interior landscape. Learning by cycling as a tool for knowledge and relationship with the territory. Videos and/or interviews on the project registered in different regions of Italy. Dedicated interventions in each visited school.
Shared and participatory decisions	Active involvement of young learners in creative writing activities. Development of a shared vision of the Natura 2000 Network and the concept of biodiversity.
Importance of the local context	Global and local project at the same time since it promotes and disseminates European environmental policies at local level.
Development of critical thinking and problem-solving	*Caviardage*® as a useful tool to develop critical thinking and to stimulate young learners' creativity

Table 1. Relationship between the six characteristics of education to sustainability and the results of the project. Authors' elaboration.

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[8] https://www.invalsiopen.it/educazione-sostenibilita-apprendimento-trasversale/.

Secondly, the implementation of this format in different regions has outlined its adaptability to different contexts. This malleability facilitated its adoption by various experts involved during the three-year duration of the project. The robustness of this approach is illustrated in Table 2, highlighting both Favourable and Critical Issues of the developed framework.

Favorable Issues	Critical Issues
Flexibility, adaptability and replicability	High operator/learner ratio (at least 1/10)
Easy operators training	Dedicated time required (at least 90')
Practical and engaging activities involving soft skills	Difficulty in quantitatively measuring the results of the activity
Applicability in different thematic areas	Lack of collaboration and co-planning with teachers
Useful for involving different stakeholders Multiplicity of subjects to train and raise awareness	Resistance to change
Cheap and recyclable	

Table 2. Favourable Issues vs Critical Issues of the developed format. Authors' elaboration.

Thirdly, the production of a concise manual and accompanying audio-video materials (these texts are available in Italian language on the project website[9]), in addition to the exchange of accrued experiences, has provided experts with rapid and efficient training mechanisms.

The evaluation above has shown how *Caviardage®* embodies a creative writing technique that harnesses words, which linguistically function as both signifiers and meanings. The signifier represents the audible or written form of a word, perceptible by the senses and uniform for all; meanwhile, the meaning embodies the subjective and distinctive mental interpretation unique to each individual (Saussure de, 2009).

With this foundation, *Caviardage®* can be conceptually defined as a bridge connecting text and landscape, essentially a tool enabling the exploration of an inner landscape through text. The process of drawing and poetry facilitates the external communication of this inner imagery (Festa, 2015). Similarly, landscape can be deciphered as text in a semiotic sense, extending beyond the written word to encompass figurative art (Lotman, 2006) and even the entirety of the physical world, a vast text to be interpreted (Volli, 2003).

Indeed, landscape can be understood as an interplay between two forms of text (Trezza, 2006, p. 2). The semiotics of landscape serves as the nexus linking these two textual forms: *Caviardage®* as an internal landscape, and landscape as an external text.

Within the "Sic2Sic" project, landscape is conceived as an intersection, a relational connection established between young learners and experts or educators, and between learners and their surroundings. Through the "learning by doing" approach, implemented with bicycles (learning by cycling), everyday territories evolve into internal journeys.

In this relationship, a physical location emerges, akin to *Caviardage®* where words are circled, shaping them into "figures" against an otherwise indistinct backdrop (Clarkson, 2012). This process transforms a place into a landscape, imbued with meanings and values for human experience (Greimas and Fontanille, 1996). Cycling through these territories extracts them from routine and sometime obscurity (everyday

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[9] https://lifesic2sic.eu/scuole/.

landscape) and situates them within experiential life and personal memory (inner landscape).

If creativity involves "the ability to define and structure one's experiences and knowledge in a new way" (Treccani Vocabulary[10]), then it implies a departure from established rules both in science and the arts (United Nations, 1992; Jaoui, 2000; Rossi, 2009). Those rules one habitually follows without questioning. The journey towards sustainability thus entails seeking new rules for coexisting with people and the planet.

Educational endeavours in schools fostered synergy between formal education and the extra-curricular realm. This collaboration forged a strong territorial connection while engaging research scientists and environmental associations.

Crucially, the project's approach aligns seamlessly with Italy's contemporary educational policies. Law 92/2019, mentioned before, bolsters environmental education by mandating educators with multidisciplinary proficiencies and adopting a holistic approach. This aligns with the complexity of landscape discourse, demanding appropriate methodologies and theoretical frameworks in educational settings (Castiglioni and Cisani, 2020). The need for regulatory alignment with the importance of integrating environmental and landscape education is hence underlined, as this remains relatively underdeveloped in Italy (Branduini and Castiglioni, 2019).

Yet the unifying term underlying the diverse aspects and methodological approaches of the "Sic2Sic" project is "network". Originating from the drive to disseminate knowledge of NN2000, project experts employed cycling routes to interconnect network sites, and employed school-based activities to heighten awareness of existing networks, fostering new people-landscape interactions. The words encircled by young learners in their compositions, resembling nodes in a network, acted as start and end points for envisioning and constructing individual and shared landscapes termed "Our landscapes". Through this method, landscape evolves into a realm capable of evoking emotions and bonds; a

"domesticated" space analogous to how a text attempts to label things and emotions. This concept of a "domesticated landscape" emerges, encapsulating the idea of creating ties, where landscape serves as a testament to connections, a landscape of relationships, exemplified by "Our landscape" as explained earlier.

The use of creative writing and the implemented format have proven to be a novel, beneficial and effective approach to disseminating environmental education, particularly in the context of sustainability education. This experience aligns with the historical direction of environmental education, initially underlined as a tool for safeguarding natural heritage during the 1965 Bangkok Conference on Conservation of Nature and Natural Resources in Tropical South-East Asia. Notably, replicability and adaptability are key features; both critical, given the distinct European nature of the topics.

The method presented herein engenders intricate relationships between words (signifiers and meanings) and landscapes (physical and internal) (Cosgrove, 1998), while interconnecting design pathways (real and imaginative) and nodes (creative and meaningful). This direction reflects the principles identified by environmental education (APAT, 2006):

- Environmental systems are regarded as intricate networks of relationships, wherein people are integral and interactive components (Descola, 2021).
- Learning processes ought to rest on a systemic approach (von Bertalanffy, 2004; Yee Keong, 2021), emphasizing the interconnectedness between people and the environment (Borgarello, 2017), alongside a consideration of diversity.
- Young learners are introduced to the notion of "complexity", placing them within the spectrum of sustainability (Davis, 2015 and 2020), and at the same time fostering an understanding of landscape as a holistic and intricate entity (Antrop and Van Eetvelde, 2017).

All these elements are pivotal for triggering a profound cultural transformation, involving young people at its core (Pramling Samuellson and Kaga,

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[10] https://www.treccani.it/vocabolario/creativita/.

2008). This transformation is vital to propagate the communalism approach, which "rejects the separation of nature and society, prioritizing contingency and dialogue over certainty and monologue" (Descola and Pálsson, 1996, p. 72).

In this context, it is imperative to transcend the concept of people-environment relationships based on predation and protection, and instead advocate for relationships grounded in reciprocity (Lai, 2000), respect for the environment and biodiversity, and the right to landscape (Egoz et al., 2011). Additionally, understanding one's local territory (Agnoletti, 2014) and perceived landscapes (Council of Europe, 2000; Turri, 1998) contributes substance and meaning to the concept of public participation (Jones, 2007 and 2011).

7. Conclusions

The "Sic2Sic" activities have operated on three levels. Firstly, through policies and the implementation of international directives, they have contributed to the advancement of global environmental goals. Secondly, by disseminating knowledge on territorial and landscape peculiarities, they have supported the appreciation of the intrinsic character of habitats and species in protected areas. Thirdly, thanks to the experience gained in the project, it has been possible to develop and apply an innovative education format, which considers both tangible and intangible landscape aspects.

CGE, the Commission for the Geographical Education of the International Geographical Union (IGU), in 2016 has affirmed that geographical education should contribute more explicitly to society, encouraging public support and developing processes of meaningful learning practices (van der Schee and Lidstone, 2016). The Sic2Sic approach aims to foster this affirmation, since it could be a useful practical tool for diverse educational contexts.

For instance, it has been an inspiration for the LED Initiative on Landscape and Education by CBLS[11] that aims at a better inclusion between Sardinian learners of different ages. Through workshops on landscape perception, art and

education, it has engaged, in cooperation with ISPRA too, students from the primary to the master classes with their parents and grandparents, for a novel intergenerational approach on the ground.

A different type of practical application of the Sic2Sic methodology can be in the area of environmental collaboration and integration among old and young learners. It can provide, on the one hand, educational resources for the inclusion of people with foreign background, which is urgently required as suggested in literature (Scialdone and Morri, 2013) using landscape as a means in teaching and learning. On the other hand, it can foster environmental education in areas facing early school leaving, or integration problems between the native residents and the new comers (Ferri, Di Castro and Marsiglia, 2013).

This format represents finally a successful example of an innovative education method that combines creativity, participatory approach and emotional involvement, to promote environmental awareness and landscape connection. It also nurtures a sense of belonging to a place, where landscape is a living system, but also a text in which *Caviardage*® is a bridge between inner and outer landscape. The replicability of the format in different contexts and the availability of training materials, make it a valuable resource for educators and experts vested in promoting sustainability education.

In the current era where climate change, risk hazards and environmental degradation are an existential threat to our earth, it could be appropriate to try out new procedures and actions based on landscape and environmental education in different territorial areas, as Sic2Sic has attempted. The application of its format in schools allows reaching the target audience of children and young people, contributing effectively to raise awareness to a future class of consumers and policy makers on those transformative changes necessary to address global environmental challenges.

Inclusions concerns and risk of dropout in schools, together with diasporic education and migration issues, have been outlined by several authors (Güngör and Perdu, 2017; Colombo, 2018; Gholami, 2023). There is therefore a need to identify practices and policies able to tackle

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[11] Centre for Biocultural Landscape and Seascape.

these problems and support solutions, which avoid such a negative trend. The methodology here proposed could help in this, improving the performance of environmental educators to overcome disadvantages of foreign students, and assisting in the search for mitigating solutions at educational level.

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