

OUTDOOR EDUCATION: BETWEEN ENVIRONMENTAL SUSTAINABILITY, INCLUSION, AND COHESION OF THE MIDDLE SCHOOL STUDENT GROUP

EDUCAZIONE ALL'APERTO: TRA SOSTENIBILITÀ AMBIENTALE, INCLUSIONE E COESIONE DEL GRUPPO DEGLI STUDENTI DELLA SCUOLA SECONDARIA DI PRIMO GRADO

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ABSTRACT

This study investigates the impact of an outdoor education programme on pollution among 100 lower secondary students in Naples. The experimental group joined interdisciplinary outdoor activities, while the control stayed in class. Using mixed methods, results showed higher cohesion, inclusion, and well-being in the experimental group, especially for ADHD students. Outdoor learning fostered participation, positive relationships, belonging, and responsibility, proving effective for inclusion.

Lo studio esamina l'impatto di un programma di educazione all'aperto sull'inquinamento con 100 studenti della scuola secondaria di primo grado a Napoli (10 con ADHD). Il gruppo sperimentale ha svolto attività interdisciplinari all'aperto, il controllo in classe. Con metodi misti, i risultati evidenziano maggiore coesione, inclusione e benessere negli studenti, soprattutto con ADHD. L'outdoor learning ha promosso partecipazione, relazioni positive, appartenenza e responsabilità.

KEYWORDS

Outdoor education, inclusion, group cohesion, ADHD
Educazione all'aperto, coesione di gruppo, ADHD

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Introduction

Outdoor education is a pedagogical approach that integrates active learning experiences in natural contexts, focusing on the experiential, collaborative and multisensory dimensions of the educational process (Louv, 2016; Natalini & Savastano, 2024). This approach is not limited to transferring school activities outdoors, but aims to enhance the specificity of the natural environment as an educational context capable of stimulating curiosity, problem solving, creativity and cooperation skills (Waite, 2011). In this perspective, recent research has highlighted how outdoor learning is also a powerful tool for promoting sustainability education, facilitating the development of ecological awareness and responsibility and a sense of connection with contemporary environmental problems in learners (Tafari et al., 2015).

From a synecological perspective (Paparella, 2023), learning is conceived as the result of a complex system of interdependent relationships between individuals, the environment and the socio-cultural context. In this framework, nature is not a passive backdrop, but an educational actor capable of profoundly influencing the relational, cognitive and emotional dynamics of the classroom. This view is in line with ecological theories of human development (Bronfenbrenner, 1979), according to which learning is rooted in the continuous interaction between microsystems (e.g., class groups), mesosystems (e.g., school-family-community relationships) and macrosystems (e.g., culture and social values).

In complex urban contexts such as Naples, where access to green spaces is often limited due to intense urbanisation and a lack of natural infrastructure, outdoor teaching can be a strategic opportunity to enrich the school curriculum. The inclusion of outdoor activities, planned with clear educational objectives and integrated with the curriculum, allows global issues such as environmental pollution to be addressed in an experiential way (Beames, Higgins, & Nicol, 2012). Direct observation of environmental phenomena, analysis of critical issues in the local area and the design of mitigation measures promote not only disciplinary skills in learners, but also civic and ecological responsibility (Di Carmine & Berto, 2020; Dillon et al., 2006).

Furthermore, nature-based education experiences have proven effective in enhancing students' socio-emotional development. Interaction in small, heterogeneous groups fosters cooperative dynamics, reducing dysfunctional competitiveness in favour of healthy and constructive competition (Hughes,

Rogerson, & Barton, 2021). For students with Attention Deficit/Hyperactivity Disorder (ADHD), the natural environment offers additional benefits: experimental studies have shown that exposure to natural settings can improve sustained attention, working memory and behavioural control, in line with Attention Restoration Theory (Kaplan & Kaplan, 1989; Amicone, Petrucci, De Dominicis, & Bonaiuto, 2018; Taylor & Kuo, 2009).

From an inclusive perspective, outdoor teaching allows for broader participation, offering learning channels that are not exclusively verbal and enabling students with different cognitive styles and special educational needs to express their skills (Becker, Lauterbach, Spengler, Dettweiler, & Mess, 2017). The approach is therefore fully in line with the guidelines of the 2030 Agenda for Sustainable Development (UN, 2015), which calls on education systems to promote equitable, inclusive and quality education that integrates environmental and social dimensions into the learning process.

1. Research objective

The aim of this research was to analyse in depth the impact of outdoor teaching on peer cohesion and collaboration, as well as on the sense of inclusion perceived by students, using a mixed methodological design that integrated quantitative and qualitative tools (Mannion & Lynch, 2021). On a quantitative level, Carron's *Group Environment Questionnaire* was used to assess the level of class cohesion, in both its social and task-oriented dimensions, while *the Index for Inclusion* was used to measure the degree of inclusion perceived by pupils, with a focus on aspects related to participation, recognition of diversity and the enhancement of individual skills (Harris & Sandford, 2022). These tools provided standardised and comparable data, which were useful for identifying any significant variations attributable to the outdoor methodology (Schmidt, Bølling, & Nielsen, 2020). These tools provided standardised and comparable data, which were useful for identifying any significant variations attributable to the outdoor methodology (Schmidt, Bølling, & Nielsen, 2020; Tafuri et al., 2015).

In terms of quality, the survey focused on the subjective perceptions of students, collected through focus groups and guided narratives, to explore in depth their emotional experiences during outdoor activities, their perception of a reduction in dysfunctional competitiveness and the possible increase in intrinsic motivation towards learning (Kuo, Browning, & Penner, 2021). These data provided insight not

only into the measurable outcomes but also into the relational and emotional processes that underpinned them (Becker et al., 2023).

At the same time, semi-structured interviews were conducted with the teachers involved, aimed at gathering their opinions and direct experiences on the effectiveness of the outdoor methodology, with particular attention to group management, improving the classroom atmosphere, including students with special educational needs, and enhancing social and collaborative skills (Leather & Thorburn, 2022). The integration of quantitative and qualitative results provided a holistic view of the impact of outdoor teaching, providing empirical evidence to guide educational practices and strengthen the connection between research and teaching (Waite & Bølling, 2024).

2. Sample selection

This study was conducted in a lower secondary school located in the city of Naples, in a densely populated urban area with limited access to green spaces. This condition makes the adoption of outdoor educational interventions particularly relevant, in line with the most recent evidence highlighting their potential and on in enriching the school curriculum and promoting psycho-physical well-being and social inclusion in highly urbanised contexts (Marchant et al., 2022).

The main core of the experiment involved a second-year class, selected for its age group (11–13 years), which is considered particularly receptive to innovative teaching methods and learning experiences in natural settings. At this stage of cognitive and socio-emotional development, there is increased sensitivity to group dynamics, social identity construction and the development of collaborative skills (Barblett & Maloney, 2020).

The total sample consisted of 100 students, divided equally into two subgroups using a random assignment procedure in order to reduce possible bias and ensure greater internal validity (Ding et al., 2021):

- Experimental group (n = 50), involved in an outdoor education programme focused on environmental pollution, designed in an interdisciplinary manner and integrated with the school curriculum;
- Control group (n = 50), which continued their educational activities using traditional classroom methods.

Both groups included five students diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD), a condition that allowed for further investigation of the effectiveness of the outdoor methodology from an inclusive perspective, in line with the latest research highlighting its benefits for sustained attention, behavioural regulation and active involvement (Norðdahl & Einarsdóttir, 2023).

The inclusion criteria, defined to ensure the homogeneity of the sample and the reliability of the data collected, were as follows:

1. Voluntary participation in the trial and informed consent of families – Participation was subject to informed consent, in accordance with the ethical principles of educational research and the protection of the decision-making autonomy of students and parents (Hamilton & Corbett-Whittier, 2022).
2. Presence of diagnostic certification for pupils with ADHD – The diagnosis, issued by accredited health authorities, ensured accurate identification of participants with special educational needs, allowing for a targeted analysis of the impact of the intervention on this population (Cortese & Wang, 2021).
3. Attendance at least 50% of scheduled sessions – The definition of a minimum participation threshold ensured sufficient exposure to the experimental conditions, limiting the risk of incompleteness or distortion of the data collected (Becker et al., 2023).
4. No repetition of previous school years – The selection excluded students with significant school delays in order to minimise the influence of confounding variables related to previous learning difficulties (Nguyen et al., 2022).
5. Enrolment in the second year and registration at the school participating in the study – This criterion ensured uniformity in terms of age, curriculum and socio-cultural background, which were considered essential for controlling contextual variables and ensuring the internal validity of the study (Bølling et al., 2021).

2.1 Methodology and Research tools

This research adopts a mixed methods design, integrating quantitative and qualitative tools to obtain a comprehensive understanding of the impact of outdoor teaching. The quantitative approach allows for the detection of measurable variations in levels of cohesion and inclusion, while the qualitative approach allows

for a deeper understanding of the subjective experiences and relational dynamics activated by the intervention.

For the quantitative part, Carron's Group Environment Questionnaire (GEQ) was used to assess group cohesion. The tool investigates two main dimensions: Group Integration – Task (GI-T), which measures the degree of unity and collaboration of the group in pursuing a common goal, and Group Integration – Social (GI-S), which assesses how much group members like each other and want to interact with each other. The GEQ, which has been widely validated in educational contexts, is recognised for its reliability in measuring a sense of belonging and shared commitment (Eys et al., 2021). At the same time, the Index for Inclusion was administered to measure students' perceived sense of inclusion, with a focus on aspects of participation, recognition of diversity and valuing individual skills. In its most recent versions, this tool is a well-established reference for the assessment and development of inclusive school practices (Booth & Ainscow, 2021). Both tools were administered in paper format and the data collected were processed using descriptive and inferential statistical techniques in order to identify any significant differences between the experimental and control groups (Field, 2022).

For the qualitative part, methodologies were adopted to bring out the experiential dimension of outdoor learning. In particular, focus groups were conducted with students in the experimental group to explore their emotional experiences, their perception of a reduction in dysfunctional competitiveness and an increase in motivation towards learning. Guided narratives allowed students to express their personal reflections in writing, facilitating the emergence of individual meanings and interpretations (Willis & Crombie, 2023). In addition, semi-structured interviews were conducted with participating teachers to gather opinions on the effectiveness of the outdoor methodology in terms of inclusiveness, relationships and motivation. The qualitative data were analysed using a thematic analysis approach (Braun & Clarke, 2021), identifying recurring themes and providing an in-depth reading of the processes activated by the intervention.

2.2 Educational intervention

The outdoor education intervention was designed as a structured five-month programme, divided into two weekly three-hour sessions, held entirely in natural settings and open spaces. The underlying idea was to use the outdoor environment not only as a backdrop, but as *a real open-air laboratory* (Beames, Higgins & Nicol,

2012), capable of stimulating curiosity, active observation and direct connection with the phenomena studied.

The activities were developed with an interdisciplinary approach, integrating content from different areas of the curriculum (natural sciences, geography, civic education, art and technology) with practical experiences related to the theme of environmental pollution. The design followed the principles of experiential learning (Kolb, 1984), according to which the learning process is divided into four cyclical phases — concrete experience, reflective observation, abstract conceptualisation and active experimentation — and sustainability education (Tilbury, 2011), which aims to encourage responsible and conscious behaviour in participants. In line with the latest evidence, outdoor learning is a powerful tool for connecting the experiential dimension with the development of sustainability-oriented skills, promoting active and conscious ecological citizenship among learners (Tafari et al., 2023).

The sample group took part in an educational programme rooted in the active and situated method, where direct interaction with the natural environment was at the heart of the learning experience. The meetings were structured according to the principles of *place-based education* (PBE), as highlighted by a systematic review of the literature that emphasises the value of transforming students into active authors of knowledge, engaged in local investigations and environmental citizenship (Yemini et al., 2025).

Each meeting began with moments of direct observation: students explored natural and semi-natural environments — urban parks, wetlands, waterways — equipped with tools such as field notebooks, compasses, magnifying glasses and water and air sampling kits. Thanks to these immersive experiences, they developed a deep connection with nature and a situated understanding of the ecosystem, in line with evidence showing that direct contact with the environment strengthens ecological literacy (Kuo, Barnes & Jordan, 2019).

This was followed by on-site experimental activities: measuring water pH and temperature, detecting atmospheric particulate matter, filtering attempts and simulations of biodegradation processes. These activities stimulated scientific curiosity and promoted *inquiry-based learning*, encouraging students to ask questions, conduct experiments and develop problem-solving and critical thinking skills (Faber-Taylor, Butts-Wilmsmeyer & Jordan, 2022).

Role-playing and simulations were a key part of the programme: students took on different roles — citizens, administrators, entrepreneurs, scientists — and were

involved in negotiations and collective decisions on local environmental issues. This teaching method has been shown to promote active citizenship and empathy, leading to a deeper understanding of socio-environmental dynamics (Sturrock & Zandvliet, 2023).

Each session ended with guided discussions in a circle, where students shared their observations, reflected on the data collected and formulated hypotheses. These moments of discussion facilitated metacognitive reflection, helping students to become aware of their own learning process and to integrate it cognitively (Brindal, 2023).

Finally, the course included a participatory design phase: small groups of students designed and implemented micro-projects of an environmental nature, such as information campaigns, urban clean-up initiatives or the creation of educational posters. This approach not only encouraged the practical application of the skills acquired, but also strengthened the group's sense of personal effectiveness and civic engagement (Littrell et al., 2022).

The control group followed an educational programme parallel to that of the sample group, but entirely in the classroom and structured according to a mainly frontal approach. While maintaining thematic consistency — focusing on topics related to pollution, its effects on ecosystems and renewable energy — the teaching methodology was based on direct presentation of content by the teacher and the use of traditional tools, such as PowerPoint presentations, handouts and guided reading materials.

The approach adopted reflected a classic transmissive model, in which the teacher takes on a central role as repository and vehicle of knowledge, while students are required to play a mainly receptive role. While this model ensures the orderly and systematic transmission of basic information, it is less suitable for developing practical, problem-solving and collaborative skills than active learning methodologies (Kozanitis & Nenciovici, 2023).

Lectures formed the backbone of the course: the teacher presented the content with the support of slides and textual materials, providing a structured overview of the different types of pollution and possible sustainable solutions. However, the lack of interaction and activation can reduce students' cognitive engagement and limit their deep understanding (Klein et al., 2022).

In addition to the lessons, reading and text analysis activities were planned: students worked on selected passages, completing comprehension sheets and

thematic glossaries to consolidate scientific vocabulary and reading comprehension skills, with a positive impact on the development of articulate scientific thinking, especially when accompanied by reflection and discussion strategies (Duke, Ward & Pearson, 2021).

The course also included videos and documentaries, followed by short discussions led by the teacher. This method was useful for stimulating interest and facilitating the visualisation of complex phenomena, but if not integrated with active reworking activities, it can produce more superficial and less lasting learning (NMSU Teaching, 2023).

Written exercises — summaries, answers to open-ended questions and completion of concept maps — allowed students to reorganise and synthesise the content covered, promoting memorisation and understanding, but with a limited impact on the development of critical thinking skills and cross-curricular competences compared to more experiential methodologies.

Finally, there were classroom discussions, moderated by the teacher, in which students could voluntarily share their thoughts or opinions on the topics covered. However, participation tended to be limited to a small number of students, with a less significant effect on collective reflection than the collaborative and immersive dynamics typical of outdoor education.

3. Results

3.1 Analysis of quantitative data

The analysis of data collected through the *Group Environment Questionnaire* (GEQ) and the *Index for Inclusion* highlighted significant differences between the experimental group, which participated in the outdoor teaching programme, and the control group, which followed the traditional classroom programme. With regard to the Group Integration – Task (GI-T) dimension, the experimental group recorded an average increase of +18.4% compared to the initial survey, rising from a normalised average score of 64.2% to 76.0%. In the control group, the increase was more modest (+5.7%), with values rising from 63.5% to 67.1%. These results are in line with recent evidence confirming that outdoor experiences promote a higher level of cooperation and shared goal orientation, mainly thanks to the experiential and immersive context that stimulates mutual commitment (Harris & Sandford, 2023). In terms of Group Integration – Social (GI-S), the experimental group showed an improvement of +21.1% (from 60.7% to 73.5%),

compared to an increase of +4.9% in the control group (from 61.2% to 64.2%). This data confirms that outdoor activities, characterised by direct and cooperative interactions, contribute significantly to the development of positive relationships and a stronger sense of belonging (McLean et al., 2021). The Index for Inclusion data confirm this trend: the perception of inclusion in the experimental group increased by +19.6% (from 65.0% to 77.7%), while in the control group the increase was limited to +6.2% (from 64.8% to 68.8%). These results fit into the theoretical framework that highlights how outdoor education, by integrating cognitive, social and emotional dimensions, promotes the recognition of diversity and participatory equity within the class group (Bentsen & Jensen, 2022). Inferential analyses (*t-tests* for independent samples) showed that the final differences between the two groups were statistically significant in all dimensions investigated ($p < .05$), confirming that the outdoor methodology had a positive impact not only on group cohesion, in its social and task-oriented components, but also on the sense of inclusion perceived by the students. These results are consistent with recent studies showing that learning in natural settings can generate measurable and lasting benefits in group dynamics and perceptions of school well-being (Beames & Brown, 2024; Littrell et al., 2022).

3.2 Qualitative data analysis

Qualitative analysis, conducted through focus groups, guided narratives and semi-structured interviews, revealed significant differences in the perceptions of participants between the experimental and control groups. Among the learners in the experimental group, narratives and discussions highlighted a high level of emotional and motivational engagement: students described the outdoor activities as stimulating, meaningful and conducive to positive relationships with their peers. Direct contact with the environment and practical activities allowed them to experience scientific and social concepts in a concrete way, increasing their sense of personal effectiveness and active participation (Willis & Crombie, 2023; Littrell et al., 2022). Some students expressed that collaboration in natural settings reduced competitive pressure, allowing them to engage with each other without fear of negative judgements and valuing each other's skills, promoting a more authentic climate of cooperation.

In contrast, learners in the control group reported a more passive and repetitive experience, with fewer opportunities for collaboration and social interaction, and limited participation during lectures, while appreciating the acquisition of theoretical content (Klein et al., 2022; Duke, Ward & Pearson, 2021). Some students

reported perceiving more competition within the group, with constant comparison of individual performance and less focus on collaboration.

The comparison between students with ADHD was particularly relevant: in the experimental group, these students reported clear benefits in terms of concentration, energy management and collaborative participation. Practical activities, movement and guided social interactions reduced distracting behaviours and improved the ability to complete complex tasks in teams. In addition, they highlighted how the outdoor setting helped reduce dysfunctional competitiveness, allowing them to interact with their peers without performance anxiety. In contrast, students with ADHD in the control group had greater difficulty maintaining attention during lectures, with minimal involvement in content comprehension activities and a more pronounced sense of frustration or exclusion, exacerbated by the perception of having to constantly compete with their peers (Faber-Taylor, Butts-Wilmsmeyer & Jordan, 2022; Brindal, 2023).

From the teachers' point of view, those in the experimental group emphasised the effectiveness of the outdoor methodology in promoting cohesion, inclusion and active participation, highlighting how the outdoor environment fostered collaborative dynamics, reduced dysfunctional competitive behaviour and allowed for greater observation of students' individual skills. Teachers in the control group, while recognising the usefulness of lectures for the transmission of theoretical knowledge, highlighted limitations in managing student interaction and motivation, particularly in students with attention difficulties or ADHD, and reported greater energy expenditure to stimulate participation, noting that competitive dynamics in the classroom could in some cases reduce the sense of collaboration (Kozanitis & Nenciovici, 2023; NMSU Teaching, 2023).

In summary, the qualitative analysis confirms the relevance of experiential and immersive educational approaches in promoting inclusion, engagement, reduction of dysfunctional competitiveness and socio-emotional development, highlighting marked differences compared to traditional approaches, both for the general group and for students with special educational needs, such as ADHD, and showing how teachers' perceptions consistently reflect these results. The personal opinions gathered suggest that the experiential and cooperative dimension of outdoor activities contributes to creating a safer and more motivating learning environment for all students.

4. Discussion

The integrated analysis of quantitative and qualitative data highlights how outdoor education, especially when designed in an interdisciplinary manner and with explicit inclusive objectives, represents a privileged context for the development of social cohesion and school inclusion. The significant improvement observed in the experimental group, both in terms of social integration and task orientation, suggests that direct contact with the natural environment and the not only collaboration but also the construction of more solid and authentic interpersonal bonds, thanks to the sharing of concrete and meaningful experiences (Bølling, 2021). Outdoor activities seem to stimulate cooperative learning processes that reduce dysfunctional competitiveness and encourage the assumption of complementary roles, fostering a climate of mutual support and more equitable participation among students (Leather, 2022).

In particular, for students with ADHD, the outdoor environment acted as a natural regulator of attention and participation, offering opportunities for multisensory learning and movement that contribute to improving concentration and energy management (Becker, 2023). Exposure to natural settings also helped to reduce hyperactivity and enhance planning and problem-solving skills, which are often critical for this student population (Norðdahl, 2023). Nature provides varied but not overly overwhelming stimuli, in line with the principles of Attention Restoration Theory, creating an environment conducive to emotional and behavioural self-regulation and supporting the development of perceived self-efficacy.

These findings are consistent with recent international literature, which recognises the ability of outdoor education to enhance socio-emotional well-being, engagement and intrinsic motivation, reducing barriers to participation, especially in highly heterogeneous school settings (Harris, 2023; McLean, 2024). The experience in nature also seems to stimulate situated and contextualised learning, which strengthens the deep understanding of disciplinary content through direct links with real phenomena (Waite, 2024). Evidence confirms that inclusion in natural settings does not stem solely from the educational activity itself, but from the sense of belonging, responsibility and agency that students develop when they are involved in authentic and meaningful tasks for the community (Yemini, 2025).

Finally, the experiential and immersive nature of outdoor activities seems to have fostered a more cooperative and less hierarchical classroom climate, in which each student's contribution was perceived as relevant. This suggests that outdoor education, if adopted on a continuous basis, can not only support learning but also

act as a catalyst for lasting inclusion processes that can positively impact students' overall well-being and the quality of school life.

Conclusions

The results of the study confirm that integrating outdoor activities structured around real environmental issues into the school curriculum can be a powerful pedagogical lever for strengthening inclusion, participation and group cohesion, with particularly positive effects for students with special educational needs such as ADHD (Becker, 2023). The experiential, immersive and collaborative approach of outdoor education has been shown to have a positive impact on both social dynamics and subject learning, stimulating engagement, intrinsic motivation and shared responsibility towards the environment (Harris, 2023; McLean, 2024).

The evidence gathered suggests that educational experiences in nature, if conducted in a systematic and interdisciplinary manner, can contribute to the development of key skills for active citizenship, such as the ability to work in teams, take on shared responsibilities and manage conflicts collaboratively, as well as strengthening prosocial attitudes and ecological awareness (Waite, 2024; Yemini, 2025). These benefits are particularly relevant in complex urban contexts, where access to green spaces is limited and schools can play a crucial role in ensuring experiences of contact with nature as an integral part of the educational pathway (Bølling, 2021).

Looking ahead, the adoption of ongoing outdoor programmes could act as a catalyst for methodological renewal capable of integrating environmental and social inclusion, promoting equitable and sustainable education in line with the 2030 Agenda Goals. In light of this evidence, it seems desirable for schools to consider nature-based education not as an ancillary or occasional activity, but as a structural component of educational planning, investing in teacher training, the development of transversal skills and the creation of networks with local authorities, associations and local organisations (Leather, 2022).

Only through a strategic and integrated vision, supported by targeted school and local policies, will it be possible to transform outdoor education into a stable driver of pedagogical innovation, capable of combining learning, inclusion, well-being and environmental responsibility, thus ensuring a lasting impact not only on students but also on the educational community as a whole.

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