

OUTDOOR EDUCATION AND UNIVERSAL DESIGN FOR LEARNING: RESEARCH PERSPECTIVES AND GUIDELINES FOR INCLUSIVE TEACHING

OUTDOOR EDUCATION E UNIVERSAL DESIGN FOR LEARNING: PROSPETTIVE DI RICERCA E LINEE GUIDA PER PRATICHE DIDATTICHE INCLUSIVE



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ABSTRACT

Outdoor Education is an inclusive teaching approach that, when combined with Universal Design for Learning principles, creates flexible, accessible, and motivating learning environments (Moscato & Pedone, 2024). This paper reviews literature showing how Outdoor Education aligned with UDL's three core principles—engagement, representation, and action/expression—supports cognitive, motor, emotional, and social development, while fostering curiosity, resilience, and empowerment (Kelly et al., 2022). It offers practical guidelines for designing inclusive outdoor experiences that address individual differences and systemic barriers to promote equitable education for all.

L' Outdoor Education rappresenta un approccio didattico inclusivo che, in sinergia con i principi dell'Universal Design for Learning (UDL), genera ambienti di apprendimento caratterizzati da flessibilità, accessibilità e elevata motivazione (Moscato & Pedone, 2024). Dalla revisione della letteratura scientifica nazionale e internazionale, si evidenzia come l'Outdoor Education, in linea con i tre principi cardine dell'UDL – coinvolgimento, rappresentazione e azione/espressione – contribuisce allo sviluppo cognitivo, motorio, emotivo e sociale, incentivando curiosità, resilienza ed empowerment (Kelly et al., 2022). Il contributo è corredato da Linee guida per la progettazione di esperienze outdoor in ottica UDL, mirate a mitigare le differenze individuali e le barriere sistemiche, al fine di promuovere un'istruzione equa e accessibile a tutti.

KEYWORDS

Outdoor Education, Universal Design for Learning, UDL 3.0 Guidelines

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² R. Di Fuccio Introduction, paragraph 2 and Conclusions.

Introduction

Each individual's identity develops in close connection with the environment in which they live and work. It is essential to encourage each student to become an active agent in their own learning journey, expressing their uniqueness through collaboration with others (Bertin and Contini, 2004, p. 15). Therefore, it is crucial to consider the context which, as Bateson (1972) states, constitutes the “matrix of meanings”. Every educational space must promote “well-being” (WHO, 2002) and the inclusion of all students, with particular attention to the needs of the most fragile and vulnerable students. Today, inclusive teachers are designers of inclusive learning environments (Laurillard, 2014) that are capable of promoting real participation through the search for pluralistic teaching mediators, applying active methodologies in which students are enriched by interaction with their peers (Miato and Miato, 2003). This implies that educators must create environments in which students feel valued and recognised, stimulating their active participation in the educational decision-making process (Barandica et al., 2023).

1. OE and UDL: literature review

In the school context, Outdoor Education (OE) is now fully recognised as an important experiential learning tool, capable of supporting the development of personal and social skills in students (Mann, 2018). As early as the 1980s, Simon Priest, a Canadian expert in outdoor leadership, proposed a definition of the term: 'Outdoor education is an experiential process of learning by doing, which takes place primarily through exposure to the outdoors. In outdoor education, the emphasis for the subject of learning is placed on relationships, relationships concerning people and natural resources' (Priest, 1989, p.13). From the most recent scientific literature (Lloyd, 2018; Guardino, Hall, Largo-Wight & Hubbuch, 2019; Beames, Christie & Blackwell, 2017; Dahl, Standal & Moe, 2018), OE effectively responds to the contemporary needs of society by developing skills such as resilience, empathy and conflict resolution. It is a valuable experiential learning tool that supports students in developing social and personal skills (Mann, 2018) and guarantees educational benefits in a variety of contexts, such as improved academic performance, increased cognitive abilities and greater collaboration among students, which also benefits those with disabilities. Outdoor play and physical activity in natural environments, such as gardens and forests, offer multiple benefits, including the recovery of a sense of wonder, fuelling intrinsic

motivation to learn (Rosenow, 2008), stimulating self-confidence, the ability to take calculated risks and independent judgement, facilitating integrated growth processes (Finch & Bailie, 2015; Brussoni et al., 2017). Exploring and searching for natural elements such as leaves, branches and insects support the development of both fine and gross motor skills, while collaborative practices such as caring for green spaces, making maps and participating in group games promote fundamental socio-emotional skills (Bailie, 2010; Clark, 2007; Waters & Maynard, 2010). The natural environment encourages greater tranquillity and types of play that are conducive to psychological and physical well-being, promoting positive and cooperative relationships between children (Kuo et al., 2019). Furthermore, this educational approach supports training that contributes to the achievement of the Sustainable Development Goals of the 2030 Agenda (Alkire & Jahan, 2018), as it encourages students to reconnect with nature, promoting a more conscious and respectful attitude towards the natural environment, with consequent positive effects (Barrable & Booth, 2020).

From a neuroscientific perspective, learning activities conducted outdoors activate the neural networks responsible for sensory perception, working memory, and problem-solving, thereby facilitating multisensory and metacognitive learning (Dettweiler et al., 2023; CAST, 2018). Specifically, practical methodologies based on scientific investigation and the use of natural elements can enhance performance in scientific disciplines, including among children with disabilities (Alber-Morgan et al., 2015; Villanueva et al., 2012). These approaches encourage complex cognitive processes such as systematic observation, critical analysis, and hypothesis formulation, thereby promoting a deeper understanding and more effective knowledge consolidation. Direct interaction with natural materials is also crucial as it stimulates synaptic plasticity and multisensory integration, both of which are fundamental to the development of scientific skills and intrinsic motivation to learn (CAST, 2024). Studies have shown that teaching interventions based on scientific enquiry and hands-on experience with natural elements can significantly improve science outcomes, even among students with disabilities (Alber-Morgan et al., 2015; Villanueva et al., 2012; Sugerman 2001). Direct experiences in natural environments offer unique educational opportunities that are difficult to replicate in the classroom. These experiences can be facilitated in various ways, depending on the geographical context and the needs of the students. Even in urban areas, school gardens can be created or regular visits to local parks organised.

Despite concerns among educators about learning transfer outside the classroom, research indicates that outdoor activities can improve concentration and reduce problematic behaviours, particularly among children with disabilities (Guardino et al., 2019). For instance, children with autism spectrum disorders can benefit significantly in terms of their sensorimotor, emotional and social development from exposure to nature (Li et al., 2019). Furthermore, recent studies suggest that contact with nature can mitigate attention deficit symptoms in children with ADHD (Di Carmine & Berto, 2021). Teachers can maximise the effectiveness of outdoor learning by adapting their strategies to meet the diverse sensory, physical, and behavioural needs of their students, while also taking into account individual differences. Involving children with physical and sensory disabilities in outdoor activities can present logistical and sensory challenges. Nevertheless, it is crucial to fully include these students in outdoor explorations to ensure they receive the physical, cognitive, and social benefits. Providing accommodations such as accessible trails, visual aids and sensory regulation can encourage participation and learning for all students.

2. The Universal Design for Learning framework as a pedagogical model for designing inclusive outdoor experiences

Simply transferring activities outdoors is not enough; guided exploration and empirical research are needed to encourage deep cognitive and sensory engagement, facilitating the development of critical observation and scientific reasoning skills in accordance with the principles of OE and experiential learning models. Therefore, it is necessary for teachers and educators to design inclusive outdoor educational experiences that embrace the student population in all its diversity and value differences in individual needs and learning paths. In this regard, the Universal Design for Learning (UDL) framework is undoubtedly a pedagogical model to look to, as it considers student variability to be an integral aspect of human diversity, not an obstacle (Rose & Meyer, 2002; Meyer, Rose, & Gordon, 2014; Lambert et al., 2023).

The UDL is rooted in the principles of *Design for All* and *Universal Design*, sharing a commitment to universal accessibility and flexible design. It champions an educational vision that embraces human diversity as an inherent condition requiring systematic and mindful engagement, rather than as an exception to be managed (Sasanelli, Di Fuccio & Baldassarre, 2025). This perspective reflects an evolving social consciousness towards an educational model grounded in universal

inclusion. This aligns with the principles enshrined in the Salamanca Statement (UNESCO, 1994), which emphasises the right of every individual to participate fully in school life. The framework serves as a tool designed to overcome the 'barriers' present in classrooms by ensuring flexibility in the presentation of information, diversifying the ways in which students can demonstrate their learning and promoting greater engagement in educational activities (Sasanelli, Di Fuccio, Baldassarre & 2025). This is achieved by adhering to three fundamental principles, briefly summarised below (Courey, Tappe, Skermer & LePage, 2014).

The first principle is the engagement that focuses on employing strategies to foster active student participation in the learning process by clarifying the purpose of learning itself. Teachers can enhance engagement by anchoring educational content to real-life situations relevant to students' everyday experiences to strengthen interest and motivation.

The second element is the representation as it involves presenting educational content through various modes and formats. It emphasises the 'what' of learning, allowing content to be conveyed through diverse forms of representation. Specifically, it recommends removing potential learning barriers by designing instructional materials and content in multiple flexible formats, such as written text, visual images and audio.

Finally, we consider the action and its consequent expression. These principles focus on the how of learning, relating to providing students with various ways to express what they have learned. It also includes the use of assistive technologies, multiple media, and strategies supporting executive functions such as goal setting, resource management, and progress monitoring.

Inclusive education requires the careful planning of educational interventions that encourage active involvement and the meaningful use of flexible materials, thereby creating meaningful experiences for all. However, it is not only crucial to design such an inclusive environment, but also to maintain it over time. If the pedagogical approach is based on unclear objectives and traditional teaching methods, as well as inaccessible resources and rigid ways of demonstrating knowledge and skills, identifying barriers becomes considerably more complicated (Hitchcock et al., 2002; Jackson & Harper, 2005). For this reason, the UDL framework addresses all components of the curriculum, including objectives, materials, methods and assessment, to make the curriculum more accessible physically, cognitively and emotionally for the whole class (Hitchcock et al., 2002)

In this regard, Meyer, Rose and Gordon (2014) underline that teachers, educators and trainers should: (1) set challenging yet appropriate goals for all students; (2) use flexible and diverse methods to engage and support each student; (3) use flexible and variable materials, leveraging digital technologies where possible; and (4) adopt flexible assessment techniques that provide continuous and accurate data to inform teaching and learning. From an operational point of view, this means integrating the three fundamental principles of UDL designing multiple modes of engagement, representation and action/expression (corresponding to the 'why', 'what' and 'how' dimensions of learning respectively), to provide a wide range of options that support all aspects of learning (CAST, 2018, 2024). The effective implementation of these principles relies primarily on a strategic tool: the UDL Guidelines. Originally developed in 2008 by the Centre for Applied Special Technology (CAST), these guidelines constitute a dynamic and flexible framework that continually evolves to incorporate advances in learning research and best practices in education and inclusive teaching (Hitchcock et al., 2002). Version 3.0, published in July 2024 (CAST, 2024), demonstrates a renewed commitment to equity. This commitment is particularly evident in the efforts to eliminate systemic barriers such as racism, sexism, and ableism, which hinder equal learning opportunities (Sasanelli, Di Fuccio & Baldassarre, 2025). The aim is to eradicate the various prejudices associated with different identities, including ethnicity, gender, disability, and sexual orientation. (Meyer, Rose & Gordon, 2024).

3. Synergies between UDL 3.0 and Outdoor Education

From a theoretical perspective, UDL 3.0 and OE share a focus on individual variability, active engagement, meaningful and authentic learning, inclusion, and well-being. The UDL 3.0 Guidelines (CAST, 2024) present a pedagogical framework with significant similarities to the principles underlying OE. These frameworks complement each other, forming synergistic approaches to creating environments and developing inclusive teaching practices (Table 1).

In the UDL 3.0 Guidelines, student agency is considered a fundamental prerequisite and is pursued by providing multiple modalities to accommodate individual differences in interests, identities and autonomy. This guides students towards making conscious choices and participating in the design of their education (CAST, 2024). Meanwhile, OE fosters intrinsic motivation by offering immersive experiences in the natural environment that encourage spontaneous and meaningful engagement (Priest, 1989).

Components of UDL	Outdoor Education
<i>Design Multiple Means of Engagement</i> It is important to make learning relevant to students and help them to be motivated to learn (CAST, 2024).	Children show a strong interest in being outdoors, and the natural environment offers numerous opportunities to engage these interests. Adults support this process by observing and responding to the children's lead, thereby facilitating their learning (Waters & Maynard, 2010).
<i>Design Multiple Means of Representation</i> Information needs to be presented in a way that it can be recognized and so that children can truly grasp it (CAST, 2024).	The natural environment offers a variety of visual, auditory, and tactile materials. Teachers and educators can enhance this by incorporating additional supports like picture cues, audio descriptions, home languages, and technology.
<i>Design Multiple Means of Action & Expression</i> The way children can successfully express themselves varies from one child to another and multiple options need to be provided (CAST, 2024).	Outdoor learning provides an ideal context for implementing diverse pedagogical approaches. The outdoor environment, acting as a stimulus and catalyst, encourages the design of educational programmes through which students can express themselves in multiple ways. (Harte, 2010).

Table 1: Application of UDL to OE (adapted from Harte, 2013).

Furthermore, accessibility and differentiation are common strategic axes. UDL proposes a variety of modes of representation, action and expression to respond to class heterogeneity (CAST, 2024). OE ensures personalised pathways for even the most fragile and vulnerable students through the adoption of multisensory and adaptable experiences (Priest, 1989; Schenetti et. al. 2015).

From an epistemological perspective, UDL encourages educational practices that reflect students' backgrounds, fostering deep connections and facilitating the transfer of skills to different contexts (CAST, 2024). OE translates these principles into exploratory and experimental activities in natural environments, promoting interdisciplinary approaches and the development of integrated knowledge . On a

socio-emotional level, UDL recognises joy, play, and empathy as essential elements in building inclusive, motivating environments (*Consideration 7.3, Guidelines 3.0, CAST 2024*). Studies in cognitive science and developmental psychology confirm that play stimulates curiosity, a sense of wonder, and imaginative abilities, thereby improving the construction of new knowledge and socio-emotional development (Yogman et al., 2018). OE brings all this to life (Craig, 2024; Mackinder, 2023) by offering spaces in which to experience a variety of activities, from sensory manipulation to narrative exercises. These activities support psychological well-being and empowerment. This is particularly important for students from historically marginalised groups, in line with the concept of '*Black joy*' as a form of resilience and cultural celebration (Bass-Adams & Coleman-King, 2021; Love, 2024). Finally, both models share a constructivist perspective on learning. UDL promotes educational communities based on cooperation and interdependence, a configuration reflected in the OE system where group activities encourage shared responsibility and social cohesion (CAST, 2024; Schenetti, 2022).

4. Guidelines and operational proposals for adapting UDL principles to Outdoor Education

Contextualising UDL principles within OE is an emerging and highly promising area for promoting inclusive education and teaching. It opens up new possibilities for improving accessibility and educational effectiveness by taking into account the cognitive, sensory, cultural, and motivational diversity present in school environments. Below is a theoretical and practical reflection on integrating UDL guidelines into OE educational experiences and teaching.

4.1 Designing multiple means of engagement in OE

The first UDL principle focuses on affective and emotional engagement, recognising that deep learning is strongly influenced by motivation, interest, and self-regulation skills (CAST, 2024). In an outdoor setting, engagement plays an even more pivotal role, as the natural environment, with its complexity and sensory richness, provides distinctive stimuli that can inspire enthusiasm, curiosity, and a sense of wonder (Waite et al., 2023). However, it is important to recognise that such environments are not experienced in the same way by all students. While some benefit from continuous stimulation, others may feel disoriented, anxious or vulnerable (Wilson, 2023). It is therefore useful to set up activities that allow students to choose the level of challenge, the time of participation, and the mode of interaction with the

natural environment, balancing freedom and structure. Self-Determination Theory (Deci & Ryan, 2000; Fischer et al., 2023) supports this approach, emphasising the importance of autonomy and social relationships in fostering genuine commitment. Another crucial aspect is promoting strong and inclusive social relationships as the foundation of outdoor learning, as emphasised by Jorgensen (2018) and supported by recent research on collaborative experiences in outdoor education (Kietzmann et al., 2024). Focusing on inclusion and effective group dynamics prevents asymmetrical support, which, despite positive intentions, can limit genuine participation and skill development (Rankin et al., 2023). Designing cooperative activities and peer tutoring is therefore essential for creating welcoming and stimulating learning communities. Consequently, educators and designers must consider how direct interaction with nature can stimulate enthusiasm and engagement, support perseverance and commitment in the face of difficulties, and leverage emotions for learning.

One possible way to reflect on this is as follows:

- *How can outdoor activities be designed and adapted to take into account students' sensory, cognitive and emotional preferences, while ensuring a safe, stimulating and inclusive environment?*
- *How can the level of difficulty be adjusted to offer opportunities for gradual success, thereby encouraging motivation, confidence and perseverance?*
- *How can we plan strategic breaks and moments of reflection to support emotional self-regulation, and what support tools can we use, such as quiet spaces or sensory materials?*
- *What simple tools and strategies can I use to facilitate student autonomy and orientation during outdoor experiences, and how can I effectively train students to use these tools?*
- *How can inclusive collaboration and peer tutoring be promoted by organising groups with varying roles that enhance individual abilities and strengthen the sense of belonging?*
- *What methods of immediate and positive feedback should be adopted to maintain high levels of engagement, and which emotional indicators should be observed to interpret implicit needs and adapt activities in a timely manner?*
- *How can accessible tools for documenting and sharing experiences, such as diaries, photos or recordings, be structured to stimulate self-awareness, reflection and motivation during outdoor activities?*

Orienteering is an effective example of stimulating multiple means of engagement, as it aligns with self-determination theory by promoting autonomy, competence, and relatedness - all of which are fundamental to authentic engagement (Fischer et al., 2023). Students can choose the level of difficulty for reaching checkpoints, which encourages them to autonomously regulate the challenge and creates opportunities for success. The addition of aids such as simplified maps or assistance from more experienced peers helps maintain commitment and strengthens social support, while avoiding asymmetrical dynamics. Reflecting on the emotions experienced during the outdoor activity promotes emotional self-regulation and perseverance in the face of difficulties. Another activity involves creating an outdoor school garden with variable, rotating roles. This allows each student to participate actively according to their preferences and abilities, thereby improving their sense of belonging to the school community and their intrinsic motivation.

4.2 Designing multiple means of representation in OE

The second UDL principle focuses on the cognitive dimension of recognition, emphasising teaching methods that utilise various modes of content presentation to ensure accessibility and comprehension for all learners (CAST, 2018). According to this principle, the linguistic, cultural, and cognitive diversity in classrooms (Legard et al., 2024) needs a design that incorporates multiple modes of representation, in line with the three categories defined by Meyer, Rose, and Gordon (2014).

An important aspect falls in the improvement of perception, such as tactile materials, sensory maps or audio guides, which allow sensory-perceptual barriers to be overcome.

Secondarily, the UDL approach aims to facilitate access to complex languages, symbols and mathematical structures, such as visual examples, glossaries and linguistic simplifications.

Finally, it promotes the construction of in-depth and reflective knowledge through experiential activities, interdisciplinary links and the use of multimodal tools.

The effectiveness of these strategies is supported by neuroscientific studies on multisensory experiences, which show that students who learn through multiple sensory channels have improved memory and greater cognitive flexibility (Shams & Seitz, 2008). At the same time, outdoor environments can present challenges in terms of implicit and contextual knowledge, which is often taken for granted in the classroom. Therefore, it is important to explain and support the meaning of

cultural, natural, and social elements present in the environment (Waite et al., 2023; Meyer et al., 2014). The outdoor environment is crucial in multisensory learning, integrating visual, auditory, tactile, and kinaesthetic stimuli to promote knowledge construction rooted in concrete experience (Waite et al., 2023). Introducing natural materials into the classroom not only promotes sustainable practices by reducing plastic usage, but also offers students direct, multisensory contact with authentic elements of their environment (Kellert, 2012; Di Fuccio et al., 2025). This sensory familiarisation, which precedes direct outdoor exploration, can be particularly beneficial for children with specific sensory needs, as it reduces anxiety and increases engagement (Roe et al., 2017). To stimulate exploration of the surrounding natural world and support ecological literacy (Louv, 2008), the selection of materials should reflect local biodiversity. In coastal settings, for instance, shells can be incorporated into mathematical activities, while in woodland environments, items such as sticks and pinecones can be used to enrich artistic and construction activities. Using natural materials in artistic and playful activities promotes aesthetic appreciation of nature, stimulating creativity, problem solving and motor skill development (Ulseth, 2022). Educators and teachers can facilitate exploration by curating collections of materials organised by type, which encourages observation of properties and comparison (Neville, Petrass & Ben, 2022). Adding alphabetical and iconographic labels, along with books and visual resources, supports different modes of representation and understanding. However, it is important to carefully consider how content is represented, bearing in mind that students with sensory disabilities or learning difficulties require alternative, accessible forms of information that go beyond simply using the environment directly (Sherman & Shilkofski, 2021).

Therefore, teachers and educators can use a series of questions to guide their reflection and actions when designing OE experiences that adhere to the second UDL principle, as proposed in the following lines:

- *What natural materials can be used to create multisensory activities that facilitate the perception of complex content?*
- *How can we clarify the meaning of specific cultural, natural, and social elements of the external environment that may be unclear or implicit to some students?*
- *How can collections of natural materials or elements be organised to support mathematical, artistic, or linguistic activities involving different sensory channels?*

- *How can outdoor activities be adapted to provide access to complex languages and symbols? For example, could visual glossaries or iconographic symbols be included during exploration?*
- *How can the use of natural materials in the classroom be integrated with subsequent outdoor exploration to build deeper knowledge rooted in concrete experience?*
- *How can interdisciplinary teaching activities be facilitated by exploiting the variety of multisensory stimuli provided by the OE?*
- *How can the observations and knowledge acquired during outdoor experiences be documented and shared with students to reinforce their understanding?*

4.3 Designing multiple means of action and expression in OE

The third UDL principle recognises that knowledge and skills can be demonstrated through different channels, consistent with individual abilities and preferences (CAST, 2018). In the context of OE, this involves a particular focus on developing executive functions such as planning, self-monitoring, and strategic flexibility (Moilanen et al., 2023). Research indicates that children and students with executive function difficulties frequently employ trial-and-error strategies and require structured support to cultivate metacognitive awareness (Nesbitt et al., 2024). Concrete models of behaviour, continuous feedback and reflective tools (such as digital or paper diaries) are therefore effective strategies for facilitating this stage of development, particularly in complex environments such as outdoor settings (Samson & Stoeger, 2023).

The following key questions can help teachers and educators reflect on and plan inclusive outdoor experiences effectively:

- *Are outdoor tools and spaces accessible and usable by all students?*
- *How can they be adapted to facilitate active participation and physical interaction for all students?*
- *What potential barriers could prevent some students from fully participating in outdoor activities? How can these barriers be overcome?*
- *What different modes of expression can we offer students to help them build, communicate and share the knowledge they acquire during outdoor activities?*
- *How can digital tools be used to enhance learning for all students?*
- *How can we ensure that the modes of expression chosen are accessible and relevant to students from different cultural and linguistic backgrounds?*

- *What kind of support is needed to help students plan and manage outdoor activities, particularly in strengthening executive functions such as planning, organisation and self-regulation?*
- *How can monitoring be provided to gradually promote students' independence and autonomy during outdoor activities?*
- *How can support strategies be adapted to meet the individual needs of students with executive function difficulties?*

Encouraging multiple forms of expression and action with natural materials is essential in all areas of the curriculum. For instance, in science, providing magnifying glasses, tweezers and measuring instruments alongside clear instructions facilitates an experimental and analytical approach (NASEM, 2021). Such hands-on investigative activities promote a deeper understanding of scientific principles and prepare students for future learning (NGSS Lead States, 2013). Designing instruction with natural materials must go beyond mere provision and actively engage students in discovery processes, as this has been shown to lead to more positive and lasting academic outcomes (NASEM, 2021).

For instance, activities involving documenting and reporting on content learned in outdoor settings can utilise various modes of expression. As examples are the creation of digital or paper logbooks including written accounts, photos, drawings and audio stories describing experiences, with students choosing the method of expression that suits them best (Samson & Stoeger, 2023). Also guided reflection sessions, either in small groups or individually, help students to plan concrete goals for subsequent activities and monitor their results. This facilitates the development of executive functions (Moilanen et al., 2023). Another interesting approach could be the application of monitoring apps or visual checklists support students in independently managing their outdoor learning experience with personalised scaffolding (Tremblay et al., 2024).

Conclusions

The synergistic integration of Outdoor Education and Universal Design for Learning presents itself as an innovative framework for the development of authentically inclusive and transformative learning environments. This synergy effectively addresses the inherent challenges in adapting outdoor pedagogy to meet contemporary curricular demands and the diverse needs of learners, thereby accentuating the pivotal role of the natural environment as a catalyst for

multimodal skill acquisition. A key emergent feature is its demonstrated capacity to mitigate educational disparities. The UDL framework provides a robust methodological foundation, ensuring equitable opportunities for experiential learning within nature for all children, including those identified as particularly vulnerable or fragile. This inherently implies an ethical imperative in the design of educational interventions that proactively dismantle barriers and foster genuine inclusion. The implications for educational and pedagogical practice are substantial, necessitating, as a primary requisite, specialised training for both teachers and educators. Such training is crucial to fully harness the potential inherent in the synergistic integration of OE-UDL. Furthermore, prospective research endeavours should focus on developing scalable pedagogical models to facilitate its widespread implementation. In conclusion, the OE-UDL synergy not only enriches the existing methodological repertoire but also reasserts the fundamental necessity of an educational paradigm that is experientially grounded, equitable in its provision of opportunities, and ultimately oriented towards the full realisation of each individual's potential (Kelly et al., 2022; Lieberman et al., 2023).

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