

## **Exploration of Outdoor Learning Space towards ASD Children: A systematic literature review**

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### **Abstract**

The design of outdoor learning spaces is vital for enhancing attention among children with Autism Spectrum Disorder (ASD). Although the Sustainable Development Goals (SDGs) emphasize inclusivity, there is still a lack of attention to ASD children's needs in educational institutions. A qualitative study examined the characteristics of outdoor learning spaces through a systematic literature review. The analysis highlighted key findings related to authorship and publication, as well as specific attributes of the space characteristics. The study aims to guide professional authorities in developing effective policies and practices to create inclusive outdoor learning spaces for ASD learners.

**Keywords:** Outdoor learning space, Autism Spectrum Disorder (ASD), space characteristics, inclusive.

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### **1.0 Introduction**

Space is the backdrop to play, supplying content, context, and meaning. It is bound to convey a variety of possible messages to children through welcome, dismay, excitement, intimidation, warmth, and coldness (Wang et al., 2018). Learning space is a stage or a place for children to react, and possess the ability of cognitive, social communication, and physical, where it serves as memorable and stimulating learning experiences and enhances excitement in learning interest and motivation to learn (Harris, 2018). An outdoor learning space encompasses a thoughtfully designed environment that blends indoor classroom elements with natural features. This harmonious environment highlights serene climate conditions, lush vegetation, and carefully selected built elements. Together, these components create a rich tapestry that enhances the learning experience for children by facilitating engaging activities and fostering memorable, direct experiences that contribute to their overall well-being. Those spaces are invaluable as they serve not only as venues for educational pursuits but also as vibrant areas for leisure. Children can play and relax, come together with friends, cultivate gardens, engage in physical activities, and socialize in an inviting atmosphere. The composition of components such as nature elements of atmosphere, flora, and fauna and design in these outdoor learning environments encourages curiosity, creativity, and connection, making them essential for holistic development. Autism falls under the broader category of disabilities, specifically categorized as a type of "Learning Disability." Engaging in dynamic outdoor learning offers unique benefits, stimulating both the mind and body, which can lead to increased motivation and activity. For children with autism, such environments can also promote a sense of calm and relaxation, making it an effective approach to support their development and well-being.

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According to data provided by the Department of Social Welfare Malaysia, in 2022, there were about 236,972 registered individuals with learning disabilities. Notably, 54,973 individuals representing 23.2%, were between the ages of 6 to 12 years old (Department of Social Welfare Malaysia, 2023). The growing number of individuals with ASD demands urgent action for built environment improvement. Therefore, support and studies on inclusive design for Autism Spectrum Disorder (ASD) in built environments are needed to develop accessible and comfortable educational spaces. Implementing the strategies early significantly helps in mitigating the challenges faced by individuals with ASD, and fostering inclusive community from a young age. Ahmad Shaherman Shamsuri & Nur Huda Musa (2022) noted that 10% of 400,000 children suffered from a 'speech delay' that limits communication with their parents and peers. However, those conditions are not the signs of autism. Autism children face difficulties in understanding oral communication and responding to their peers, they might not react to the situation. Therefore, they tend to be late to speak and hard to adapt to people and the surrounding environment. More enforcement strategies towards indoor, and limited exposure to outdoor learning spaces led to less social behavior, problems in communication, and interaction, and poor development of social language culture for these groups. Furthermore, they are incapacitated of experiencing fear and have no reflex on fear response which makes autistic children insensible to dangerous or life-threatening circumstances (Rowland, 2024).

The cognitive, social, and communication abilities of people with ASD are varied, therefore their education may take place in mainstream, integrated, or special needs schools. The concept of 'autistic learning space' emphasizes environments designed specifically for autistic individuals, supporting their self-advocacy and neurodiversity (Rowland, 2024). Studies seeking to prevent the rapid increase in autism prevalence in Malaysia have spurred researchers to explore environmental factors (Jackson, 2017) and their conducive space for learning. Therefore, thorough exploration is needed to identify the relevant characteristics for ASD children's well-being. According to the Ministry of Finance Malaysia (2025), under Focus Area 3, through "Ikhtiar 49: Children," various resources will be allocated to support the learning needs and welfare of autistic children. Commitment and budget allocation from the government highlight the pressing necessity to improve the learning environment and educational opportunities for children with ASD. Therefore, in the context of this study, it aims to guide professional authorities in developing effective policies and practices to create inclusive outdoor learning spaces for ASD learners, and objectively identify and emphasize the characteristics of outdoor learning spaces that suit those with Autism Spectrum Disorder (ASD) children. This comprehensive study may assist in creating strategies to help these children manage their daily activities and improve their educational experiences, ultimately leading to a more supportive learning environment for their future.

## 2.0 Literature Review

### 2.1 Outdoor Learning Space

Outdoor learning space essentially is the process of obtaining learning outside of the conventional class or outside of an enclosed learning space (F. Abdullah et al., 2021). It is also defined as "an organic environment where many ecosystem processes are present" (Beery, 2020, p.2) and preferably serves as a transitional zone for learning and healing therapy (Barakat et al., 2019). Outdoor spaces such as gardens, courtyards, and corridors are covered by the sky, illuminated by the sun, fanned by air from nature outside, and carpeted with soil, clumps, and rocks (Constable, 2017). The concept of outdoor learning category is divided into two parts, 1) the formal activity managed by the teacher in the syllabus or curricula, and 2) the informal activity such as individual or group exploration or exercises to discover children's preferences (Acar, 2014) to gain experience. Outdoor experience in nature can facilitate the enhancement of physical and mental health as well as social well-being (Barakat et al., 2019). ASD children who are mentally unburdened and less stressed thinking will indulge in positivity, reduce fatness through sufficient vitamin D gained from sunlight exposure, and more attention and focus on social conversation (Barakat et al., 2019). There are significant impacts of using outdoor learning spaces during teaching and learning.

### 2.2 The Significance of Outdoor Learning Space Towards Autistic Children

Studies have shown that individuals more connected to nature report higher psychological, emotional, and social well-being (Linda Steg, 2019). Furthermore, conducting classes in outdoor classrooms can significantly improve academic performance, facilitate a deeper understanding, and enhance environmental education. This 'environmental education' is to ensure children not only an understanding of the ecological balance but also their roles in this balance; to enable them to develop ideas about how to live together in harmony with the planet, and to make them gain the necessary skills needed for effective and liable participation (Acar, 2014). This study is significant to help reduce the harm of excessive individual ASD syndrome in the future. Research done by researcher Gilmore et al. (2023) reveals that "the American healthcare system is unprepared to accommodate the unique needs of autistic people," and this applies not only to America but to many other countries as well because the treatments that work for non-autistic people may be ineffective or even harmful for autistic people. Therefore, it is essential to mitigate the syndrome of increasing ASD in individuals through an environmental solution to prevent it from getting worse.

Effective educational spaces for autistic children should incorporate thoughtful design principles, including optimized layouts and acoustic considerations, to facilitate better communication and learning outcomes (Chu & Lee, 2023). These special groups suffer from complex neurological conditions that affect their behavioral activities, socializing, and communication abilities. Therefore, play learning activities in the outdoor learning space are good for overcoming those with learning problems. This is because outdoor learning spaces lack rigid classroom-led learning sessions, where they can freely process and express their interest accordingly. Accessing nature freely is highly beneficial, particularly for individuals who may encounter significant barriers that prevent them from enjoying meaningful daily

experiences outdoors. This exposure fosters relaxation, reduces stress, and encourages exploration and appreciation of biodiversity. Many autistic children may fear new environments, but some are fearless of things such as sand, water, wind, and vegetation, due to their sensory overload (Rowland, 2024). However, by experiencing senses such as having activities through enjoying the views, and experiencing a sense of touch, their ability to cope with autistic sensitivities will improve (Ghazali et al., 2018). For ASD children, gross and fine motor skills are improved when they experience play with loose natural elements, like sand, boulders, leaves, and sticks (Rahim et al., 2020). They experience a beautiful sense of nature textures, colors, and smells. Interacting with farm and petting animals significantly fosters a connection to nature for individuals with ASD. Equine therapy, using horses, effectively enhances nonverbal communication, focus, creativity, and behavior (Srinivasan et al., 2019), besides enhancing social communication, fostering tolerance, and establishing trusting relationships. In addition, it makes children feel tranquil and resilient (Prisk & Cusworth, 2018), increases tolerance to sensory stimuli, improves sleep, and boosts tranquil feelings (Barakat et al., 2019). It is beneficial to react and learn with living creatures of an outdoor natural environment rather than a barren environment. Happiness level during learning especially out of the classroom space will be even stronger engagement with the presence of a friendly learning space together with a comfortable environment. According to research conducted by M. Abdullah et al. (2022), children choose and are very interested in play structures combined with a conducive atmosphere to perform learning activities at school, they not only release good energy for physical development, but their senses also active to explored thousands of senses such as sense of touch, smell, taste, sight, and sense of emotion. These senses respond well to sensory stimuli for ASD children.

### 3.0 Methods

The systematic literature review utilized journal search engines to explore relevant topics thoroughly. Research articles published within the last seven years, from 2018 to 2024, were selected based on clearly defined criteria from key databases, including Science Direct, Web of Science (WOS), ProQuest, and Google Scholar. The search focused on important key topics: "outdoor learning space," "design characteristics," and "ASD" and "children", emphasizing social sciences, art and culture; and language set all in English, as outlined in Table 1. Moreover, literature seeking also used Connected Papers search engines to find the relevant scholarly articles related to the key topics highlighted in Table 1.

The gathered data underwent a comprehensive screening process through SciSpace to establish inclusion and exclusion criteria for the study. This research aimed to delve into the physical built environment and assess the abilities and limitations of children with Autism Spectrum Disorder (ASD) in utilizing outdoor learning spaces. By identifying essential attributes and characteristics of these spaces, the study consciously excluded articles about ASD's medicinal or neuroscientific dimensions, such as therapy medicinal treatments, medicines, and biological factors related to genetics and neuron details.

Through the systematic screening and filtering of literature via SciSpace, the study effectively aimed to uncover the key characteristics that make outdoor learning spaces beneficial for children with ASD. This approach not only enhances our understanding of their needs but also contributes to designing inclusive and supportive environments not only for ASD children but also for all children.

Table 1. Search setting method

Search key topics (2018-2024)	Search terms
Outdoor learning space	Outdoor space; outdoor environment; outdoor classroom; outdoor design; outdoor education; outdoor play; nature learning, nature play
Design characteristics	Design feature; garden design; green space character, design strategies; sensory design; therapeutic design; outdoor characteristics
ASD	Autism Spectrum Disorder; autistic; autism, neurodivergent, neurodiversity
Children	Child, kids, toddlers, younger, early age

### 4.0 Findings

#### *The Characteristics of Outdoor Learning Space (OLS) for ASD child*

Creating strategies and well-designed outdoor learning spaces is essential for teaching and developing meaningful learning experiences, particularly for children with ASD. The identification of characteristics associated with outdoor learning spaces is vital for enhancing engagement and addressing the unique needs of children with Autism Spectrum Disorder (ASD). Table 2 presents the results of a systematic literature review by researchers investigating the design attributes of outdoor learning spaces specifically intended for children with ASD. This body of work primarily focuses on children under twelve, highlighting the critical role of thoughtfully designed environments in promoting their development.

Table 2. The Characteristics of Outdoor Learning Space (OLS) for ASD Children

Authors	Publication year	Outdoor Learning Space (OLS) Characteristics
Shabrina Salsabila & Muna	2023	<b>Nature Based learning (NBL)-</b> group activities in nature 1) Excitement and <b>freedom space</b> , 2) Diverse play and peer interaction, <b>3) Engagement and connection with nature</b> , 4) Skill development and <b>sensory changes</b>
Friedman et al.	2022	
Pogoda & Majczyk	2022	1) Space sequencing: creating simple room layouts in an order related to the building use schedule,

Hansen	2021	<ul style="list-style-type: none"> <li>2) Design of buffer zones: <b>sensory neutral between spaces</b> with differ functions and/or levels of sensory control,</li> <li>3) Attention to acoustic conditions: subdued colours and diffused light,</li> <li>4) <b>Designing "hideouts": places to calm down</b></li> <li>1) Changing colours, reducing room sizes, and creating quiet spaces</li> <li>2) <b>Escape spaces</b></li> <li>3) <b>Nature shape, forms, and lighting infiltration</b></li> <li>4) <b>Retreat space</b></li> </ul>
Tola et al.	2021	<ul style="list-style-type: none"> <li>1) Low arousal environment</li> <li>- <b>Visual stimuli: Lighting, Materials, and textures, Colours</b></li> <li>- Acoustic stimuli: Flooring, Walls and roofs, Background noises</li> <li>- Smell stimuli: Air quality, Vegetation-avoid smelly plants</li> <li>2) Transition and flexible space (avoid sensorial overload)</li> <li>3) <b>Quiet and accessible space</b> (avoid face sensory overload)</li> <li>4) Clear and simple spatial layout- navigate independently</li> <li>5) Visual relation-easy navigate</li> <li>6) Predictability and routine – avoid unexpected situation</li> <li>7) Circulation and possibility of choosing- hierarchy of spaces supports social and sensory</li> <li>8) Proportion and proxemics- mutual: personal space and the environment</li> <li>9) Visual supports-pictorial, colour, small sentences</li> <li>10) Wayfinding- use sign</li> <li>11) <b>Safety and security</b></li> <li>1) <b>Tranquil and quiet location</b></li> <li>2) <b>Safe and security</b></li> <li>3) Choice &amp; Control and create a variety specialized space: close in view</li> <li>4) <b>Special lighting: dappled shade</b></li> <li>5) Accommodate Challenge and rest</li> <li>6) Calming area</li> <li>7) <b>Child-nature interaction</b></li> <li>8) Play space coordination</li> <li>9) <b>Therapy garden</b></li> <li>10) Less maintenance: vegetation and structure</li> <li>11) Visual ques and orientation: signage</li> </ul>
Barakat et al.	2019	<ul style="list-style-type: none"> <li>1) Disable friendly,</li> <li>2) Attractive and <b>friendly environment</b>,</li> <li>3) Activities: Social interaction</li> <li>4) <b>Safety and security</b></li> <li>5) Form, pattern, and texture</li> <li>6) <b>Lighting and color</b></li> <li>7) <b>Natural elements</b></li> <li>8) Scale and proportion</li> </ul>

The findings indicate that the characteristics of outdoor spaces designed for individuals with Autism Spectrum Disorder (ASD) encompass a diverse range of functions, uses, and opportunities. Additionally, the presence of appropriate facilities merits careful consideration. A quality outdoor learning environment for children with Autism Spectrum Disorder (ASD) offers diverse opportunities for nature-based play and exploration, related to 1) types of spaces, 2) equipment and materials 3) Lighting exposure, 4) Escape quiet space, and 5) therapy components. Exposure to nature during outdoor learning enhances calmness and significantly improves concentration in educational activities (Shabrina Salsabila & Muna, 2023). Children who venture outdoors will confidently engage with nature, gaining valuable hands-on experiences with the diverse flora and fauna around them. These factors collectively contribute to significant comfort and effectively address physical and emotional needs. Hence, it is essential to consider safety and security factors when engaging with nature, as these factors may impose limitations to ensure a safe and controlled environment. These factors may include the availability of safety equipment, secure facilities, and the supervision provided by guardians or trusted trained individuals. Every part of the elements plays a vital role in creating an environment where outdoor learning can thrive, allowing ASD children to explore and enjoy nature while minimizing risks. This element contributes to the prevention of potentially hazardous situations for children.

## 5.0 Discussion

The study found that ASD exposure to outdoor learning spaces consisting of nature provides a positive impact in improving the development of ASD children, especially in the context of socio-communication, physical, and learning. The ability to engage in peer interactions not only facilitates children's responsiveness but also enhances their attention and fosters greater independence in attempting new tasks. These findings align with Barakat et al. (2019) and Harris, (2018) who also reveal that intervention through nature-learning play increases social interaction between neurodevelopment children and improves language, communication, and emotional development. Moreover, children with ASD demonstrate a notable sense of joy when engaging in play-learning outdoors. This study provides insight by focusing on the specific features of outdoor learning spaces that can be tailored to meet the needs of these children. By identifying the characteristics, the study can meet the effective and supportive environments for children's growth and development.

The findings indicate that ensuring safety and security within a comfortable environment is crucial, particularly when activities are outdoors. This is because the surrounding environment is influenced by various safety factors, which may include potential dangers, threats, and unforeseen events that could arise. Creating a secure environment for outdoor learning allows individuals to engage in outdoor activities with peace of mind, free from unexpected occurrences that might disrupt their enjoyment and well-being. Hence, analyzing the features and characteristics of outdoor learning environments is very important. These findings can provide valuable insights, aiding informed decision-making for policymakers.

## 6.0 Conclusion and Recommendations

The study on the characteristics of outdoor learning spaces reveals several design attributes essential in planning educational learning spaces for children with Autism Spectrum Disorder (ASD) covering the types of spaces with play learning types, safety and security, equipment and materials, lighting exposure, and therapy components related to senses stimuli. Notably, the study emphasizes the benefits of outdoor learning, particularly the positive impact of natural elements such as greenery, sensory attached elements, and appropriate lighting exposure to evoke calming and escape space. Play interaction with flora and fauna evokes happiness in children with ASD and helps to reduce the spectrum disorder associated with their condition. An autistic child has a unique need that requires a customized design approach. The United Nations Children's Fund (UNICEF) also points out the importance of natural play in child development, as it allows children to express themselves freely while exploring, discovering, moving, and using their imagination. This form of nature-play is crucial for holistic development—physical, mental, emotional, and social. It is important to note that this study focuses on children aged 6 to twelve years old, and is limited to outdoor learning spaces. The researchers recommend expanding the study with a wider age range and various learning environments will develop the comprehensive needs of children with ASD in the future.

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## Paper Contribution to Related Field of Study

This paper is part of a Ph.D. research study entitled 'Developing a Conceptual Design Strategies of Outdoor Learning Space for ASD Children' under landscape studies from the Faculty of Design and Architecture, Universiti Putra Malaysia (UPM).

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