



**Outdoor Learning,
Outdoor Play and the
School Environment
Literature Review**





Literature Review

Nature Play WA was contracted by the Western Australian Department of Education (The Department) to undertake a small research project examining three key areas and providing recommendations based on the findings.

The three key areas were:

- Designing for play;
- Designing for outdoor learning; and
- Beyond infrastructure, where policy meets place.

Nature Play WA undertook a comprehensive literature review that considers three critical elements to improving student experience and learning in school settings: outdoor learning, outdoor play and the school environment.

Outdoor learning is a term used to describe any learning that occurs outside of a building (outdoors). Play is the foundation form of learning for children in the early years (age 0-8) and fundamental in the physical, social and cognitive development of students across all primary school levels (Sahlberg and Doyle 2019).

For the purpose of this report, outdoor learning and outdoor play are often addressed separately, as occurs in many primary schools, but the authors acknowledge that play is a vital part of learning.

Children spend anywhere up to 40 hours a week at school. Research demonstrates that the physical environment of the school significantly impacts social, educational and behavioural outcomes, and this impact is amplified in lower socio-economic and urban areas. This growing field of research is very valuable and should be considered in new school planning.

Scientific observation has established that education is not what the teacher gives; education is a natural process spontaneously carried out by the human individual, and is acquired not by listening to words but by experiences upon the environment.

- Maria Montessori 1947

The impact of greenery on academic results, behaviour and well-being

A green school environment that includes mature trees and rich biodiversity offers many positive outcomes for students and staff. The following research focuses on the academic and developmental benefits and how various student groups benefit differently.

Kweon et al. (2017) explored the impact of green space on students' academic performance in the USA. Their research controlled for school size, student-teacher ratio, and free lunch enrolment. Their research found that schools with more trees had a higher percentage of proficient or advanced scores in Mathematics and Reading standardised tests. They also found that not all types of landscapes have the same beneficial properties. For example, large expanses of land, or "feature-less landscapes" (ovals and large lawn areas), have negative effects on academic performance. These relationships with students' school performance were also found by Matsuoka (2010) and Wu et al. (2014) in high school and elementary school respectively (Kweon et al. 2017; Matsuoka 2010; Wu et al. 2014).

Extending on previous cross-sectional research on the "greenness"-academic achievement link, Kuo et al. (2018) considered interactions between greenness and disadvantage. Their findings suggest that the greenness-academic achievement link is different for student bodies with different levels of disadvantage. To determine what forms of green cover were most strongly tied to academic achievement, tree cover was examined separately from grass and shrub cover. It was found that only tree cover predicted school performance (Kuo et al. 2018).

Kuo et al. (2018) considered recent findings that planting in and around schoolyards could boost academic achievement. They argue that the three key preconditions for learning—ability to concentrate, manageable levels of stress, and intrinsic motivation to learn—have each been tied to green settings and views. Their work supported that of others that covered the restorative effects of contact with nature on both attention and stress (Becker et al. 2017), and how views of greenery from classroom windows improve concentration and reduce both self-reported stress and heart rate, whereas classrooms without green views do not (Li and Sullivan 2016).

This also supports findings in numerous studies that learning in relatively green classrooms, in school gardens, and in natural contexts has been associated with high levels of student interest in, and greater appreciation of, nature (Lavie Alon and Tal 2015; Lekies, Yost and Rode 2015).

Further to this, Kuo et al. (2018) found that the more disadvantaged the student group, the less tree cover existed in the neighbourhood and around the school. They argue that given the research pointing to the disease-fighting impacts of contact with nature, positive impacts on crime and violence as well as the possibility that school trees contribute to increased academic achievement, the paucity of tree cover in low-income areas is not merely an aesthetic issue, but an important environmental justice issue (Kuo et al. 2018).

In addition to general academic improvement, research by Rios & Brewer (2014) indicates that providing frequent opportunities to learn outdoors in a familiar setting (place-based learning) with a trained teacher "can result in greater engagement and science achievement for students" (Rios and Brewer 2014).

Place-based outdoor learning has also been proven successful in delivering curriculum outcomes while connecting students to nature, "stimulating [their] academic learning and contributing to overall wellbeing" (Lloyd 2016). Findings that improvements in children's wellbeing developed through learning in the outdoors has also been linked to academic improvements for children from disadvantaged backgrounds (Lloyd 2016; McCree, Cutting and Sherwin 2018).



“ Place-based education is the process of using the local community and environment as a starting point to teach concepts in language, arts, mathematics, social studies, science and other subjects across the curriculum.

Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students; appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens.

Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. ”

- David Sobel “Place-based education: Connecting class room and community.” 2004

Outdoor learning and play – definition, benefits, and barriers

Learning through play

Play is one of the most important ways in which young children gain essential knowledge and skills, whether that be at home or in an education setting. Play is so central to childhood development that it is often said to be part of the definition of childhood (Sahlberg and Doyle 2019; Milteer et al. 2012).

Play involves all the senses and being physically active. There are some common attributes to play. Sahlberg & Doyle (2019) describe play as:

- Self-initiated and self-motivated. It is freely chosen and not facilitated or governed by adults.
- Creative. It involves imagination, imitation (often imitating adults, older children or animals) and bends reality.
- Active. It is physically and mentally engaging (to the best of the child’s ability).
- Has negotiated rules. These rules are negotiated by the children and include who can play and what is acceptable behaviour.

(Sahlberg and Doyle 2019)

To overcome biases and misconceptions around play, Sahlberg & Doyle (2019) suggest the acronym SEED to replace play in the educational context. SEED stands for systematic exploration, experimentation, and discovery, and represents the key elements of play and play-based learning (Sahlberg and Doyle 2019).



Play opportunities, and environments that promote play, exploration and hands-on learning, are at the core of an effective education system (UNICEF, 2018). Despite an abundance of strong research-based evidence that demonstrates the value and importance of play across childhood, the value of play is more widely accepted in Kindy and Pre-primary (Hesterman and Targowska 2020).

The educational approach in years 1 to 6 in Australian schools largely relies on teacher-led instruction, information memorisation and recall. This is in response to increasing focus on standardised testing and reporting. This shift in approach has not resulted in better educational outcomes nor improved international rankings for Australia's education system (Thomson 2021).

While there has been a steady decline in international standard testing achievements since 2000 (ACER, 2019), there has also been a marked decline in the physical activity of young people¹ and declining mental health and well-being.²

Students reported feeling more negatively and anxious around attending school in the 15 years from 2003 to 2018, and girls reported more negative experiences than boys, despite achieving better academic results (Thomson et al. 2019; Commissioner for Children and Young People WA 2021).

Research suggests that all of these elements – educational outcomes, physical health and mental health – can be positively affected through greener school environments and increased opportunity for outdoor learning and play.

Benefits of outdoor play - play for the sake of play

The United Nations Convention on the Rights of the Child - Article 31 states that “children have the right to rest and leisure, to engage in play and recreational activities appropriate to the age of the child” (United Nations 1990).

Play is the first way that children learn and is valuable in and of itself for the development of the whole child. But time spent in play in early learning and school settings can often be discounted as time that could be better spent in “teaching academic skills through direct instruction” (Nicolopoulou 2010).

In their paper “The Power of Outdoor Play and Play in Natural Environments”, authors Kemple et al. (2016) list the following benefits outdoor and nature-based play provide children:

- Physical health and development; highly energetic movement involving large motor physical activity promotes increased lung function, and improved muscle, bone and joint health.
- Self-regulation and attention; the opportunity to play outdoors at regular intervals (recess and lunch) has been linked to greater levels of attention in the classroom, and a reduction in distracting or disruptive behaviour.
- Communication and social development; when afforded more freedom in the outdoors to express themselves, children use more complex language, feel less inhibited and demonstrate a greater level of assertiveness. There is also evidence to suggest that outdoor play affords more opportunity for friendship development than indoor environments.
- Social behaviour and emotional well-being; children behave less aggressively in natural environments and engage in more social interaction. They also experience lower levels of stress, and a greater sense of well-being and calm.
- Cognitive development and creativity; children are more observant and curious, and explore and investigate their surroundings more in the outdoors. Symbolic play (using objects to symbolise other objects), important to the development of abstract thinking, is more prevalent in the outdoors, as is creative play (Kemple et al. 2016).

¹ Only 2% of teenagers aged 13 to 17 meet the guidelines for physical activity in Australia (Australian Government Department of Health, 2021)

² One in three Australian young people reported high or very high levels of distress (34%) in 2020, compared to 32% in 2018. (Headspace, 2020)



The Playtime Matters report brings together existing research and new findings that highlight the importance of playtime as part of the school day. It demonstrates that outdoor play at school helps develop healthy, inquisitive and active children who are better connected to their environment.

It brings together evidence that shows that time outdoors is particularly important for children's mental health – reducing stress, giving a sense of calm, and simply making them happier.

Key Findings

- 62% of Australian primary school teachers reported that children in their primary school class have more than 60 minutes of outdoor playtime/recess on a normal school day, which is significantly higher than the reported global average of 33%.
- 95% of Australian teachers believe their colleagues think time for play is important.
- Almost one in three (32%) of teachers surveyed said that their school has increased outdoor playtime since getting involved in Outdoor Classroom Day.³ This proportion increases the longer the school is involved.

(Prisk 2019)

These findings suggest that many teachers are willing to introduce more outdoor learning, but require support, resources and motivation to do so.

A child-led study where researchers engaged with school children as 'co-researchers' to investigate the "social, emotional and mental health and well-being aspects of playtime" (Bristow and Atkinson 2020) discovered children felt that playtime was important to them in terms of taking a break from "work", and they correlated "fresh air" and being outdoors with positive playtime experiences.

The children also reported that variety and availability of play opportunities, along with having someone to play with, led to positive play experiences. This research found thematic connections between time provided for play, the types of play experiences available, and the opportunity to connect positively with peers as important to "children's social and emotional development, and mental health and well-being when accessing their right to play during playtime" (Bristow and Atkinson 2020).



³ Outdoor Classroom Day is a global movement to celebrate and inspire outdoor learning and play. Nature Play WA has been the Australian delivery partner of Outdoor Classroom Day since 2017.



Benefits of outdoor learning

Taking learning outside the classroom, into nature-specific settings, has measurable academic, socio-emotional and well-being benefits for children, including “increased student engagement and ownership of their learning, some evidence of academic improvement, development of social and collaborative skills, and improved self-concept factors” (Mann et al. 2022). Providing learning opportunities for children in nature-based, outdoor environments also promotes an appreciation of the environment and inspires life-long connections to nature (Gray and Martin 2012; Louv 2008; Hinds and Sparks 2008).

Ensuring children have adequate access to nature is of critical importance for their health and wellbeing. Mann et al. (2022) argue that it is essential for education policy-makers to recognise that nature-specific learning outside the classroom is no longer a fringe, “nice-to-have” approach to teaching and learning (Mann et al. 2022).

In fact, time spent outdoors in nature has beneficial effects on children’s cognitive development (e.g., thinking, reasoning, remembering, and imagining) and mental health, and supports positive physical health outcomes and children’s ability to regulate their emotions. Primary school-aged children who take part in nature-based learning programs demonstrate improved social and educational development and show evidence of positive changes to their level of engagement, mental health and well-being (Fyfe-Johnson et al. 2021; Gill 2014; Miller and Almon 2009).

Research on weekly or fortnightly classes held in the outdoors demonstrated evidence of positive academic, psychological, physical, and social changes in the students, and not just for a primary-school aged cohort.

High school students also experienced benefits to their physical, mental, and social health outcomes when taking part in nature-based learning experiences (Becker et al. 2017; Mygind et al. 2019).

As the Australian delivery partner of the global outdoor learning movement, Outdoor Classroom Day, the team at Nature Play WA has first-hand experience of the swathe of benefits derived from taking everyday learning and play outdoors. Since our involvement began in 2017, we have grown the movement to involve 10,399 teachers and educators around Australia, who have registered 1,191,990 children to take part.

In addition to anecdotal evidence gathered from schools through case studies, photographs and videos demonstrating the benefits that children and teachers experience from taking part in Outdoor Classroom Day, the Muddy Hands Report, developed by the global Outdoor Classroom Day team through research and teacher surveys, reports on global trends of outdoor play and learning, and highlights the importance of providing this as part of children’s everyday school experience.

Key statistics from the Muddy Hands Report state:

- **97%** of teachers say that outdoor play is critical for children to reach their full potential.
- **88%** of teachers say that children are happier after playing outdoors.
- **88%** of teachers say that children are more engaged in learning when taking lessons outdoors.
- **86%** of teachers say that playing outdoors gives children a better understanding of the environment.
- **44%** of teachers have increased outdoor learning since getting involved in Outdoor Classroom Day.

Key Findings

- Getting outdoors connects us to the places we live and the environments we will want to protect.
- Getting outdoors results in better learning outcomes, across the board.
- The benefits of outdoor learning and play last beyond early education.
- Outdoor learning and play create healthier, more active children.
- Time spent outdoors boosts mental health.

(Prisk and Cusworth 2018)

Barriers/solutions to teaching and learning outdoors

While research demonstrates teachers value and understand the importance of outdoor play and learning for children, there are several significant barriers in place that hinder teachers' ability to deliver lessons outdoors. A lack of formal status for outdoor learning in teachers' practice; unfamiliarity with, or lack of inspiration; lack of time; fear of losing control and managing challenging behaviours; maintenance of green space; and weather constraints, have all been identified by educators as barriers to delivering lessons outdoors (van Dijk-Wesselius et al. 2020).

In identifying these barriers, educators worked on devising solutions, which included:

- Inspiration from outdoor educators and taking part in activities themselves.
- Teamwork or collaboration with peers.
- Inspiration from children's response to teacher's efforts.
- Make time by consciously mapping outdoor learning into teaching plans and incorporate it into the curriculum.
- Maintain control by implementing rules and explaining expectations.
- Trust children's own sense of independence and responsibility.
- Dedicate resources and attention to additional maintenance of green space and the provision of more green resources.
- Plan for the weather.

(van Dijk-Wesselius et al. 2020)



Mann et al. (2022) and Mettis & Våljetaga (2021) identified some common key requirements for schools to overcome many of the barriers to taking learning outdoors. Both research papers identified the importance of pre-service education, as well as ongoing professional learning opportunities throughout teachers' careers, focusing on how natural settings can be used effectively for learning. Teachers require more skills and encouragement to step outside their "comfort zone" and explore the potential of indoor/outdoor and nature-based learning models. Trained educators and teachers recognise the significance of outdoor learning experiences, and that bringing the indoors outdoors enriches the learning experience, but this requires pedagogy and training — not just provision of an outdoor learning environment (Mann et al. 2022; Mettis and Våljetaga 2021; Zamani 2016).

Designing for outdoor learning

Teachers are, and need to be, the drivers/change agents who take an active role in designing learning experiences (Mettis and Våljataga 2021). Wagner (2000) argues that the provision of flexible spaces—like open-air verandahs adjacent to classrooms and art and science rooms, and various seating areas such as amphitheatres, steps, planters and benches—creates an environment conducive to hybrid indoor-outdoor, and nature-based, learning experiences (Wagner 2000).

Similarly, involving children in school design is important in determining the needs and wants of the students that the space is designed to serve. The new build is not the finished product, and “children need to be allowed to take ownership, experiment and change how they use the space” (Ghaziani 2021).

Wagner (2000) states the design of outdoor learning spaces must be considered at the very beginning of the school site development plan, so that the design team understands the importance of the space and the infrastructure required to facilitate its use. This includes storage facilities, overhead shelter, seating, lighting and access to running water (Wagner 2000).

Research into hybrid indoor-outdoor learning environments has identified biophilic design (the concept of connecting a building’s occupants more closely to nature) as a way of facilitating greater connectivity between spaces and nature in schools for children. Ghaziani, Lemon and Atmodiwirjo (2021) highlight that while biophilic design principles are becoming more commonplace when designing spaces for adults, more work needs to be done to bring this into spaces designed for children (Ghaziani, Lemon and Atmodiwirjo 2021).

In their research paper, Biophilic Design Patterns for Primary Schools, Ghaziani, Lemon and Atmodiwirjo (2021) explored existing biophilic frameworks, and from these developed 10 biophilic design patterns for use in school design.

These patterns are:

- 1 **Visual connection with nature (view of plants/animals/landscapes)**
- 2 **Non-visual connection with nature (sound/smells/touch)**
- 3 **Non-rhythmic sensory stimuli (water/swaying grasses/insects)**
- 4 **Thermal and airflow variability (air flow/external workspaces)**
- 5 **Presence of water (waterfalls/fountains/aquariums)**
- 6 **Dynamic and diffused light (daylight from multiple angles/ambient diffused lighting)**
- 7 **Connection with natural systems (native planting with seasonal growth patterns)**
- 8 **Biomorphic forms and patterns (organic shapes/natural colours/geometric forms/spirals/curves)**
- 9 **Material connection with nature (wood/clay/stone)**
- 10 **Complexity and order (repetitive, symmetrical shapes/exposed structure and mechanical system facades/pattern order in wallpaper, flooring design)**

(Ghaziani, Lemon and Atmodiwirjo 2021)

An important factor in school design is the mix of permanent buildings and temporary, relocatable classrooms, and the relationship between these in terms of design and location within the school site.

The Future Proofing Schools project, led by the University of New South Wales, conducted significant research into the future design of schools, particularly focusing on the design of demountable classrooms, to create better connections between indoor and outdoor spaces through new possibilities in design, pedagogy and manufacturing (Newton et al. 2011). Building on this research, the project team has formulated ten recommendations on how to take the next steps into making future design concepts a reality, through their publication Future Proofing Schools: The Phase 3 Research Reflections (Newton et al. 2012). These recommendations include:

- Promote careful design, selection and placement of temporary buildings to ensure better physical and cultural connections to the school context while improving the amenity of outdoor spaces and their use for play and learning.
- For new temporary spaces to better link active and passive strategies for ensuring user control and high quality, comfortable indoor environments.
- Develop ways to involve end-users in the design, development and selection of temporary buildings to meet the individual culture and context of the school community without compromising the efficiency of future inter-school moves.

(Newton et al. 2012)

Designing for outdoor play

Significant research has been conducted into designing for outdoor play, and many schools have embraced the emerging “nature play” design principles to create more natural constructed playground environments for their students. But designing for play goes beyond the playground structures, and into the overall environment of the whole school.

Leading environmental educator David Sobel highlights seven “play motifs” (Sobel 2008) or design principles in his book, *Childhood and Nature: Design Principles for Educators*, which he developed after observing children at play. Sobel’s play motifs are “common among all children regardless of socioeconomic status, ethnicity, or ecosystem when they have safe free time in nature” (Sobel 2008). The play motifs/design principles are as follows:

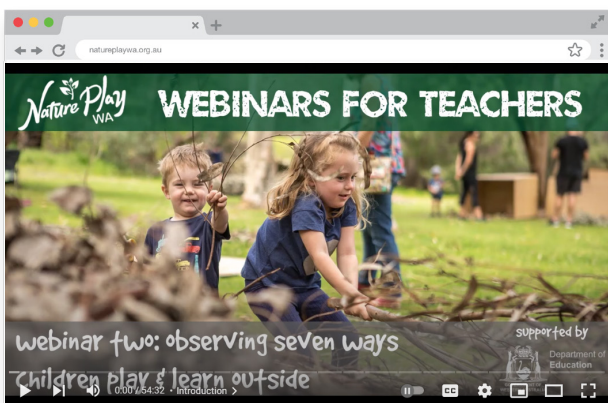
- **Adventure**
Places to explore to create a sense of exploration, mystery and excitement. Lots of potential for linking to science and writing in particular.
- **Fantasy and imagination**
Using loose parts to create whatever comes to the imagination, great for the skills of negotiation and collaboration, STEM projects.
- **Animal allies**
Dramatic play involving animals. Investigating the homes, movement and features of local creatures.
- **Maps and Pathways**
Creating trails and shortcuts through bush or gardens with natural resources such as stepping stones, logs, gravel or bark, follow or write directions, explore natural habitats.
- **Special places**
Having the opportunity for places to hide in, withdraw from, a place to call home, cubbies, forts, team work to create something as a group, share resources.
- **Small worlds**
Out of the way places where children can make little ecosystems or habitats out of nature.
- **Hunting and gathering**
Treasure hunts, scavenger hunts, looking for resources to use for maths or musical instruments.



Nature Play WA, with the support of the Western Australian Department of Education, delivered a series of webinars for teachers and early years educators on the importance of outdoor play and learning, with one episode dedicated to David Sobel's seven play motifs, where we encouraged teachers to consider:

- children's perspectives and observe these seven different types of play,
- how to create inviting spaces in their outdoor environment, and
- how these play types can be harnessed for learning.

(Outdoor Learning Webinar 2: Observing Seven Ways Children Play and Learn Outside 2020)



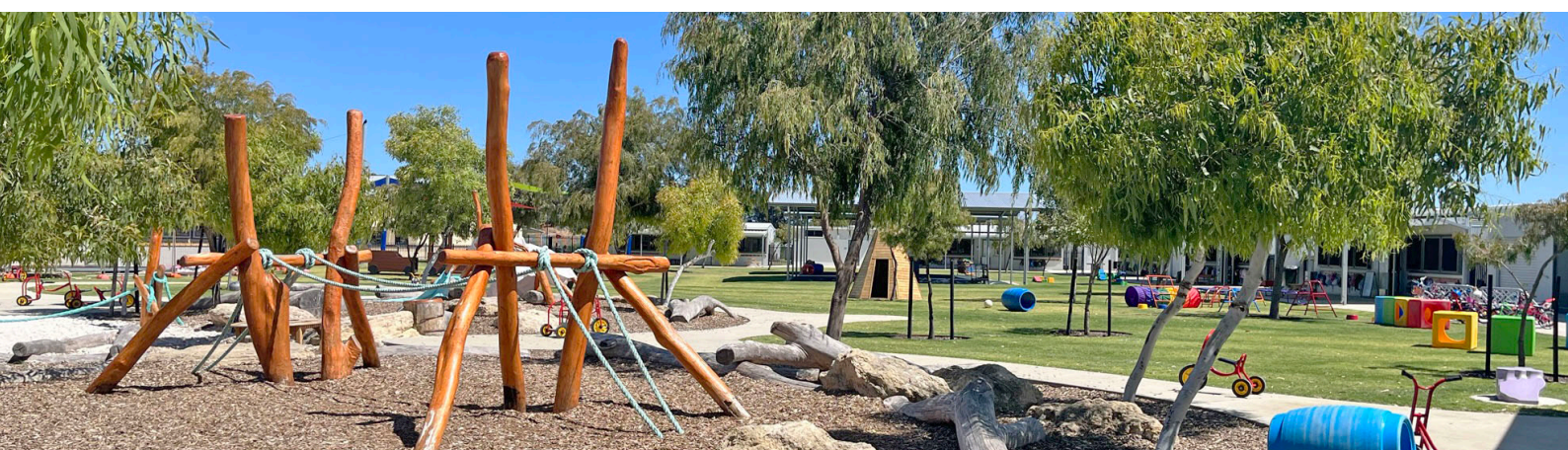
The webinar can be viewed here:

[Outdoor Learning Webinar 2 - Observing seven ways children play and learn outside](#)

Aminpour (2021) explores the importance of play “zones” in the Australian context, and the types of environments children are (and are not) interested in, in terms of play opportunities. Zones provide a variety of activities across different areas, including:

- Active, open areas for large and fast movements and games.
- Tucked away nooks and crannies so that children “feel” like they are hidden away from adult eyes, so that they can play creatively.
- Bush areas with opportunities to hide, make tracks, use loose parts, climb and balance.
- Bikes tracks/circuits for younger children to ride tricycles and scooters (can also be used as solid surfaces for chalk drawing and painting hopscotch, for example).
- Open-ended structures to stimulate ideas for play such as a decking or raised platform.
- Vertical logs placed close together so that sheets or rugs can be draped over to make cubbies, for example.
- Designated area for loose parts play where constructions can exist for several days without being cleared away.
- Gardens with flowers, bushes, a variety of greenery and vegetation (different leaf shapes and textures) and trees with low foliage that can inspire dramatic and imaginative play.
- Garden beds for growing produce and herbs including plants with pleasant smells such as lavender and rosemary.
- Trees that will grow large and create shady canopies for students to gather under or for use as an outdoor classroom.
- Places for projects such as growing sunflowers.
- Area for sand and mud play including digging patches.
- Stream areas with water pumps or at least a tap/hose.
- Small areas, large areas, sunny areas, shady areas.
- Areas close to verandahs and classrooms for immediate access as well as further away so that there is a small journey to arrive there.

(Aminpour 2021)





Aminpour's (2021) research into what children want (and do not want) in their play and learning spaces supports the findings from Nature Play WA's ethnographic research (site visits, interviews and focus groups). The research indicates that children want spaces that feature different plant species with "massive roots and reachable limbs", large and low tree canopies, and trees with soft and dense foliage, as these attributes offer more play opportunities (Aminpour 2021). Children seek play opportunities located around edges and boundaries of spaces, as these provide better "hiding" opportunities or the chance to play without being watched, and they favour well-maintained natural settings that are visually appealing. Conversely, children are not interested in playing in manicured garden beds, or plants around buildings—only those incorporated into play areas. Plants away from main play areas do not engage the children.

Additional findings from Nature Play WA's research supported by Aminpour's (2021) observations include:

- Trees in the middle of play spaces tended to get more damaged (as they're exposed) and are less fun to play with.
- Raised boundaries (logs/benches) around natural play areas encouraged socio-dramatic play but discouraged running games.
- Younger children (8y) spent more time in natural areas than older children.
- Younger children play more in socio-dramatic play, older ones (boys) in more active/running games.
- Include children in the consultation process if possible as they have the best ideas of what they like and want.

(Aminpour 2021)

When observing the outdoor play habits of four and five-year-old preschool students, Zamani (2016) recommended incorporating natural features and settings to support a diverse spectrum of cognitive play.

Zamani (2016) noted that manufactured play spaces—including concrete/asphalt/sofffall surfaces, playhouses, pathways/painted concrete and sandpits—that offered functional play opportunities, could become tedious and less challenging over time, as they led to more "prescriptive" play opportunities. Natural spaces, and spaces with mixed environments of manufactured loose elements (rope, tyres, recycling materials) and some manufactured equipment (swings) but in a grassed environment with change in gradation, offered an "open-ended spectrum of cognitive play, challenging experiences and evolving knowledge" (Zamani 2016).

These kinds of spaces allowed for more diverse and ever-evolving play opportunities, and more opportunity to play in groups and create games than the manufactured space. Nature Play WA's case studies of West Greenwood Primary School's loose parts play project and East Manjimup Primary School's nature play space project offer excellent examples of this kind of mixed environment space ("Nature Play Case Studies" 2022).

Gendered play

Pawłowski et al. (2019) examined the differences in play between boys and girls, and recommended particular elements for girls (an often overlooked/under-served group) when considering activating schoolgrounds for play opportunities. These elements include trampolines, gymnastic equipment, obstacle courses and dance zones, which are favoured by girls over traditional "sporting" facilities. Designated spaces that are smaller and more secluded than large open spaces (which tend to be taken over by boys) are favoured by girls, with spaces close to building entrances, exits and classrooms preferred by older girls (high school aged), and small spaces located away from the classroom preferred by younger years (primary school). (Pawłowski et al. 2019)

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