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CHAPTER 1

BENEFITS OF GREEN TIME

I love this face. (The child's, not the toad's.) Although the toad *is* pretty cute, I am referring to the look of awe and wonder on the child's face. This is my son, Jack, on a walk at a local park where he discovered this little toad on the path. He excitedly pointed it out to me and couldn't believe it when I picked it up and placed it in his hands. I quickly captured his expression with my phone and, even though it's a little blurry, it remains one of my favorite photos of him. As an educator, I have seen this look again and again on the faces of children as they make discoveries in nature. From the excitement of lifting up a rock to find roly-poly pill bugs scurrying underneath, to the surprise of noticing the Moon in a daytime sky, to the wonder in observing a spider weaving an intricate web, nature never runs out of ways to inspire joy and awe in children. Many of us have observed

first-hand the positive effects nature has had on the children in our lives, but the evidence goes beyond our own observations and intuitions as teachers, parents, aunts, uncles, and grandparents. There is a robust body of research suggesting that time in nature is essential for our mental and physical health and can even improve learning. In this chapter and throughout this book, I refer to time in nature as “green time.” Some of the research-based benefits of green time are highlighted in the following section.

The Research

GREEN TIME CAN RENEW ATTENTION

Researchers studying the effect of natural settings on attention have found positive results time and time again. A study investigating how time spent in school green spaces affects children’s cognitive performance found that “natural environments in schools can help students with better recovery of their attention resources, as well as in feeling more restored and less stressed and fatigued” (Amicone, 2018, p. 13). Another study that measured classroom engagement after students spent time in nature found that the rate of teachers needing to redirect students after coming inside was cut almost in half, allowing teachers to teach for longer, uninterrupted periods of time (Kuo et al., 2018). These results are not surprising, because nature inherently provides all of the components of a restorative environment proposed by attention restoration theory (ART) (Kaplan & Kaplan 1989), which is described in detail in Chapter 2. Additionally, research suggests that contact with nature can help children with ADHD cope with their symptoms (DiCarmine & Berto, 2020) and that “‘doses of nature’ might serve as a safe, inexpensive, widely accessible new tool in the tool kit for managing ADHD symptoms” (Taylor & Kuo, 2009, p. 2).

GREEN TIME CAN IMPROVE LEARNING

The evidence that time in nature can support learning is strong, both in direct academic performance measures as well as essential learning skills. A synthesis of research around nature-based learning shows a prevalence of positive impacts on academic outcomes with the highest level of positive results in the area of science, followed by math and language arts (Williams & Dixon, 2013). In another review of literature about nature-based learning

programs, researchers found, “Report after report—from independent observers as well as participants themselves—indicate shifts in perseverance, problem solving, critical thinking, leadership, teamwork, and resilience” (Kuo et al., 2019, p. 1). These skills are essential to deep learning and cross all content areas. These findings have been consistently positive across diverse populations, instructors, instructional approaches, and educational settings (Kuo et al., 2019).



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GREEN TIME CAN LOWER STRESS

Numerous studies show the stress-reducing effects of nature. The impact of natural settings on stress levels can be measured by using heart rates and stress hormone (cortisol) levels before and after time spent in nature. A 2019 study suggests taking at least 20 minutes out of your day to stroll or sit in a place that makes you feel in contact with nature can significantly lower your stress hormone levels. After 20 to 30 minutes sitting or walking in a natural area, cortisol levels dropped at their greatest rate. After that, additional de-stressing benefits continue to add up but at a slower rate (Hunter et al., 2019). Another study showed that participants who spent just 5 minutes sitting in nature experienced an increase in positive emotions (Neill et al., 2019).



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GREEN TIME CAN LEAD TO MORE ENGAGEMENT

It makes sense that renewed attention, reduction in stress, and positive emotions would lead to more engagement from students, and research supports this notion. Teachers, and students themselves, report higher levels of engagement in learning when classes are taken outdoors as well as a higher degree of long-term knowledge retention (Fagerstam & Blom, 2013). These benefits seem especially present in students who are typically less motivated, and they appear throughout the grade levels (Detweiler et al., 2015). One study found that middle school students who previously viewed school-based learning as meaningless and disengaging were motivated and actively involved when participating in a field-based learning experience (James & Williams, 2017).

GREEN TIME FOSTERS IMPROVED BEHAVIOR

Natural settings have been shown to nurture better behavior. It is no surprise that if students are more engaged and less stressed, behavior will improve. A study involving elementary-aged students found that time spent in green and blue (beaches) spaces has been associated with fewer behavioral difficulties, a decrease in emotional symptoms, and a reduction in peer relationship trouble (Amoly et al., 2014). A study involving secondary students with behavior issues taking part in a 2-year gardening program showed that this regular

exposure to nature over an extended period of time was associated with a decrease of disruptive behavior and lower dropout rates (Ruiz-Gallardo et al., 2013).



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GREEN TIME ADVANCES SOCIAL SKILLS

Studies have shown positive links between nature-based early childhood programs and improved social skills and better self-regulation (Johnstone et al., 2022). Green time promotes growth in social skills through providing opportunities that require prosocial peer-to-peer interactions and student-teacher interactions. Positive outcomes in social and emotional development for youth experiencing homelessness were found in an outdoor adventure-based program, with students specifically reporting that they felt more socially competent through experiences of giving and receiving social support (Parry et al., 2021). Extended time in nature, away from screens, has shown to improve preteens' skills with recognizing and understanding non-verbal emotional cues and therefore enhancing engagement with their peers in real-time, face-to-face interactions (Uhls et al., 2014).

GREEN TIME ENHANCES PHYSICAL HEALTH

Being outdoors can enhance our physical health by giving us opportunities to be more active than sitting at a desk indoors, and provides a free source of much needed vitamin D from the Sun. Spending time outdoors can even affect our sight. Research suggests that increasing the amount of time that children spend outdoors

can reduce the risk of developing myopia (nearsightedness) (French et al., 2013; Xiong et al., 2017). And regular exposure to nature can lead to improved immune function (Frumppkin et al., 2017).

GREEN TIME CAN IMPROVE MENTAL HEALTH

Regular exposure to green spaces has been shown to reduce anxiety and boost mood in adolescents and young adults (Bray et al., 2022). Research from the Greater Good Science Center at UC Berkeley suggests that the awe often felt when immersed in nature can play a key role in recovery from trauma (Anderson et al., 2018). Likewise, studies show that experiences in nature can promote resilience and help with recovery from adverse childhood experiences (ACEs) (Poulson et al., 2020; Touloumakos & Barrable, 2020).

GREEN TIME FOSTERS CONNECTIONS WITH NATURE



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Time in nature can result in students feeling more connected to the natural world. One review of literature looked at arts-based nature activities in particular and found that in all eight studies reviewed,

the top outcome reported was increased student connectivity to nature (Mouzla et al., 2022). Likewise, a study where participants spent time in “mundane nature” (also phrased as “nearby nature”) each day for 5 days, focusing on the positive attributes of that natural space, showed increased connectedness to nature (Richardson et al., 2015).

GREEN TIME ENCOURAGES PRO-ENVIRONMENTAL BEHAVIORS

The two biggest factors that lead to pro-environmental attitudes and actions in adulthood are time in nature during childhood and the presence of role models who care for nature (Charles et al., 2018). Time playing in nature in early childhood contributes to attitudes of stewardship toward nature (Ernst et al., 2021). And personal connections with nature, along with meaning-focused coping skills (i.e., the belief that our actions can make a difference), can foster hope when children face fears and worries about the environment (Chawla, 2020).



Source: iStock.com/Motortion

I’ve briefly summarized some of the research around green time in the previous pages, but you should know that there is much more! An abundance of studies from all around the world support the benefits of green time, so many in fact that it can be overwhelming to sift through them all. The best resource I have found for navigating this field of research is the Children & Nature Network’s (C&NN) Research Library, which is curated by the C&NN Scientific Advisory Council. You can easily search by topic to find the studies that apply to your unique learners and setting. The Resources section of the C&NN website provides webinars, case studies, videos, infographics, and other

tools. The infographics can be especially useful when sharing the benefits of green time with others in your school, district, or community. These colorful one-page documents clearly and simply explain many of the research-based benefits of time spent in nature. Scan the QR code on this page to download the C&NN infographics.



bit.ly/3Q0EGLB

NATURE CAN IMPROVE ACADEMIC OUTCOMES

Spending time in nature enhances educational outcomes by improving children's academic performance, focus, behavior and love of learning.

BETTER ACADEMIC PERFORMANCE
Learning in natural environments can:

- BOOST PERFORMANCE** in reading, writing, math, science and social studies ^{1, 2, 3, 4, 5}
- ENHANCE** creativity, critical thinking and problem solving ⁹

Seeing nature from school buildings can foster academic success ^{6, 7, 8}

ENHANCED ATTENTION
Spending time in nature can help children focus their attention:

- FOCUS AND ATTENTION** ^{10, 11, 12, 13}
- ADHD SYMPTOMS** ^{14, 15}

The greener the setting, the better the focus ^{14, 15}

INCREASED ENGAGEMENT & ENTHUSIASM
Exploration and discovery through outdoor experiences can promote motivation to learn:

- INCREASED ENTHUSIASM FOR LEARNING** ^{1, 16}
- GREATER ENGAGEMENT WITH LEARNING** ¹⁷

IMPROVED BEHAVIOR
Nature-based learning is associated with reduced aggression and fewer discipline problems: ^{18, 19}

- MORE IMPULSIVE CONTROL** ¹⁰
- LESS DISRUPTIVE BEHAVIOR** ²⁰

children & nature NETWORK | NLC NATIONAL LEAGUE OF CITIES | THE JTB FOUNDATION | ADDITIONAL RESEARCH ON THE BENEFITS OF NATURE AVAILABLE AT childrenandnature.org/research

SUPPORTING RESEARCH

¹Lieberman & Hoody (1998). Closing the achievement gap: Using the environment as an integrating context for learning. Results of a Nationwide Study, San Diego: SEEP. ²Chavla (2015). Benefits of nature contact for children. *J Plan Lit*, 30(4), 433-432. ³Berezowitz et al. (2018). School gardens enhance academic performance and dietary outcomes in children. *J School Health*, 88(8), 500-518. ⁴Williams & Dixon (2012). Impact of garden-based learning on academic outcomes in schools: Synthesis of research between 1990 and 2010. *Rev Educ Res*, 82(2), 210-235. ⁵Wells et al. (2013). The effects of school gardens on children's science knowledge: A randomized controlled trial of low-income elementary schools. *Int J Sci Edu*, 37(17), 2858-2878. ⁶Li & Sullivan (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape Urban Plan*, 148, 149-158. ⁷Wu et al. (2014). Linking student performance in Massachusetts elementary schools with the "greenness" of school surroundings using remote sensing. *PLoS ONE* 9(10): e108548. ⁸Matsuoka, R. H. 2010. Student performance and high school landscapes. *Landscape and Urban Planning* 97 (4), 275-282. ⁹Moore & Wong (1997). *Natural Learning: Rediscovering Nature's Way of Teaching*. Berkeley, CA: MHC Communications. ¹⁰Faber Taylor et al. (2009). Views of nature and self-discipline: Evidence from inner-city children. *J Environ Plan*, 22, 49-55. ¹¹Mårtensson et al. (2009). Outdoor environmental assessment of attention promoting settings for preschool children. *Health Place*, 15(4), 1149-1157. ¹²Wells. (2000). At home with nature effects of "greenness" on children's cognitive functioning. *Environ Behav*, 32(6), 775-795. ¹³Berto et al. (2015). How does psychological restoration work in children? An exploratory study. *J Child Adolesc Behav* 3(2). ¹⁴Faber Taylor et al. (2001). Coping with ADD: The surprising connection to green play settings. *Environ Behav*, 33(1), 54-77. ¹⁵Amody et al. (2014). Green and blue spaces and behavioral development in Barcelona school children: The BREATHE Project. *Environ Health Perspect*, 122:135-1358. ¹⁶Bair (2009) The child in the garden: An evaluative review of the benefits of school gardening. *J Environ Educ*, 40(2), 15-38. ¹⁷Rios & Brewer (2014). Outdoor education and science achievement. *Appl Environ Educ Commun*, 13(4), 234-240. ¹⁸Bull & Dymont (2008). Grounds for health: The intersection of green school grounds and health-promoting schools. *Environ Educ Res*, 16(10), 775-90. ¹⁹Nedovic & Morrissey (2013). Calm, active and focused: Children's responses to an organic outdoor learning environment. *Learn Environ Res*, 16(2), 281-295. ²⁰Ruiz-Gallardo & Valdés (2013). Garden-based learning: An experience with "at risk" secondary education students. *J Environ Educ*, 44(4), 252-270.

C&NN recognizes that not all studies support causal statements.

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Balancing Screen Time With Green Time

Despite the mounds of research showing the benefits of green time, we spend most of our lives indoors. A survey of people in 14 countries across Europe and North America reports that on average, people in these countries spend 90% of their time indoors (Velux, 2018). As we are spending more time on screens at school and at home, the amount of time spent outdoors is dwindling. Children ages 8 to 12 spend 4 to 6 hours a day watching or using screens and teenagers average 9 hours a day (AACAP, 2020). Overuse of screens is associated with impaired emotional and social intelligence, technology addiction, social isolation, impaired brain development, and disrupted sleep (Small et al., 2020). On the other hand, moderate screen time for young people can have its benefits, for example, staying in touch with faraway friends and family, researching for a project, answering a question in seconds, organizing tasks, capturing photos, being entertained, having their favorite music at their fingertips, connecting with like-minded individuals all over the world, and the list goes on. Researchers are testing out a digital Goldilocks hypothesis to see if there is an amount of screen time that is “just right,” claiming that, “it might

be that ‘too little’ tech use deprives young people of important social information and peer pursuits, whereas ‘too much’ may displace other meaningful activities” (Przybylski & Weinstein, 2017, p. 2). Balancing screen time with green time might serve as an antidote to some of the negative effects of screen overuse. Researchers studying the psychological effects of screen time and green time concluded, “Nature may currently be an under-utilised public health resource, and it could potentially function as an upstream preventative and psychological well-being promotion intervention for children and adolescents in a high-tech era” (Oswald et al., 2020). Simply put by author Richard Louv, “The more high-tech we become, the more nature we need” (Louv, 2011).

This book provides practical, easy-to-implement strategies for adding time in nature into the school day. Students, teachers, administrators, custodians, support staff, . . . *everyone* in your school can benefit from green spaces and green time. By working regular green time into the school day, we can help students develop a lifelong strategy for taking green time to improve their overall wellness and foster lasting connections with nature.

Green Time for All

The research-based benefits of green time summarized in this chapter apply to diverse groups of students and teachers, as well as diverse settings. However, it is important to be aware that the accessibility to green spaces is often not equitable, some students may have negative associations with the outdoors, and others may not feel welcome. For example, children from communities of color and low-income communities tend to have less access to quality natural environments, experiences, and programming (Jennings et al., 2016; Park et al., 2021; Rigolon, 2017). A report from the Center for American Progress details these disparities, stating, “Communities of color are three times more likely than white communities to live in nature deprived places,” and “Seventy percent of low-income communities across the country live in nature-deprived areas” (Rowland-Shea et al., 2020). But lack of access is not the only factor; racial discrimination, inequitable park programming, and the feeling of being unwelcome or unsafe can also affect the use of public green spaces by people of color (Byrne, 2012). In response to these issues, the organization

Cities Connecting Children to Nature (CCCN) has chosen equity as their central goal since 2014. CCCN identifies six key principles to increase opportunities for children of color to have access and experiences in nature. Whether you are designing something as large as an outdoor classroom program or as small as a simple pollinator garden, considering these six principles can help you make your space or program more equitable and inclusive.



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KEY PRINCIPLES FOR ADVANCING EQUITY

Here are six key principles to increase opportunities for children of color to gain more regular access to and experiences in nature. Principles require a commitment to continuous practice and dedication.

- **Recognition and Disruption of Racism:** Continuously acknowledge, recognize, analyze, and interrupt institutional racism and its effects on residents.
- **Culturally Diverse Connections With Nature:** Recognize the many ways diverse cultures, ethnicities, and immigrant groups meaningfully connect with nature.
- **Leadership Opportunities for Youth & Residents:** Provide leadership opportunities for youth and residents in the design and use of natural spaces.

- **Data on Race & Ethnicity:** Regularly collect and use data broken down by race and ethnicity to reflect on progress.
- **Recruitment & Hiring People of Color:** Expand networks and shift recruitment and hiring practices to help people of color join nature-facing professions and city core teams.
- **Equity Outcomes In Policies, Practices, & Investments:** Prioritize equity outcomes when implementing policies, practices, strategic investments, and relationship-building steps.

Source: Advancing Equity in Children's Connection to Nature, CCCN, 2022. Used with permission.

Scan the QR code at the top of this page to access the full resource.



bit.ly/41SPApl

Another helpful resource is Children & Nature Network's guide *Anti-Racism and the Outdoors: Resources Related to Inclusion, Diversity, Equity, & Access*. Scan the second QR code on this page to access this resource.

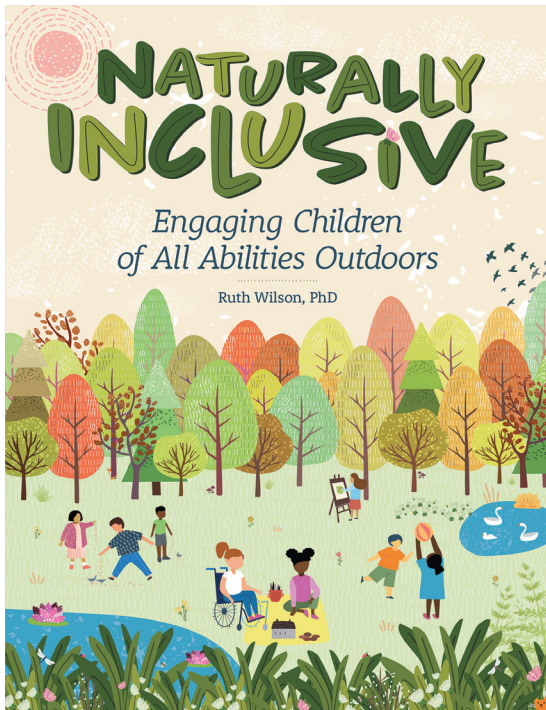
This resource guide includes organizations, presentations, podcasts, affinity groups, books, articles, reports, general anti-racism resources, and ways to be an effective ally.



bit.ly/3LtmBDg



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Source: Wilson, R. (2022). *Naturally inclusive: Engaging children of all abilities outdoors*. Gryphon House. Used with permission.

Likewise, students with disabilities may have limited experience with outdoor learning or find outdoor spaces uninviting. It is important to implement necessary adaptations to make green time accessible for students of all abilities. These adaptations might include physical modifications such as paved paths for students who use wheelchairs, special seating that offers support for students with balance issues, or signage for students with hearing impairments. It is also important to consider inclusive modifications to activities based on your students' needs. A helpful resource for creating inclusive outdoor areas and experiences is the book *Naturally Inclusive: Engaging Children of All Abilities Outdoors* (Wilson, 2022). It is a comprehensive guide to making

outdoor learning accessible to children of differing abilities and is “based on the knowledge that nature is home to us all and that everyone belongs” (p. 161). The book contains practical guidelines, stories and testimonials from educators, families, and therapists, as well as relevant and recent research around the benefits of nature for children with special needs.

The author, Dr. Ruth Wilson, provides the following examples of how to adapt outdoor learning activities for students of differing abilities in a way that focuses on children's strengths and interests:

For children with social, emotional, and behavioral challenges:

- Provide extra structure for activities and use of materials, such as a defined physical space for activities and boundaries for use of materials, such as a tray for manipulating loose parts.
- Allow reluctant children to observe group activities until they are ready to participate.
- Schedule calming activities after vigorous play.
- Provide extra support during transition times.

For children with hearing impairments:

- Provide visual clues, such as pictures and gestures.
- Combine demonstrations with verbal instructions.
- Stay in the child's visual field.
- Be mindful of the fact that hearing aids amplify not only wanted sounds, such as speech information, but also environmental noise.

For children with visual impairments:

- Provide more tactile and auditory experiences.
- Use hand-over-hand guidance when necessary.
- Place materials at the child's level.
- Provide boundaries, such as trays, boxes, and baskets, for loose materials.

For children with sensory and/or anxiety issues:

- Bring a bucket of snow indoors, if playing with snow outdoors seems overwhelming.
- Keep animals in enclosed structures, such as a tank or cage for fish, birds, or turtles, for observation.
- Watch for signs of discomfort, especially in cold, hot, or rainy weather.

For children with motor difficulties:

- Provide sufficient space for maneuvering a wheelchair and other special equipment.
- Provide elevated work areas.
- Use bolsters for floor activities.
- Provide adaptive seating, as needed.
- Allow extra time for completing tasks.
- Provide larger wheels on walkers and wheelchairs for navigating sand, grass, and other bumpy or soft terrain.
- Always ask a child before providing assistance.

For children with developmental delays:

- Keep directions and explanations simple, organized, and sequenced.
- Break down tasks and other activities into simple steps.

Source: Reprinted from Wilson, R. (2022). *Naturally inclusive: Engaging children of all abilities outdoors* (pp. 23–24). Gryphon House. Used with permission.



<https://www.greenschoolyards.org/inclusive-design>

And of course, work closely with special educators, therapists, parents, and the students themselves to provide any unique adaptations or accommodations that will help individuals experience the most benefit from their time outdoors.

For considerations and strategies for designing inclusive green spaces, scan the QR code at the top of this page to see the Green Schoolyards America webpage on inclusive design. This site provides information on ensuring access, engaging parents and caregivers, engaging district personnel, legal considerations, and strategies to meet the needs of students with specific disabilities.



<https://www.humancentereddesign.org/>

Another resource that can be helpful as you are designing inclusive outdoor learning areas, or adapting current areas for accessibility and inclusivity, is the Inclusive Design Principles from the Institute for Human Centered Design. These seven principles can help you design or modify outdoor learning areas to make the space more accessible to all learners and educators. For more information on human-centered design, scan the second QR code on this page to see the Institute for Human Centered Design website.

ACKNOWLEDGING INDIGENOUS HISTORY AND PERSPECTIVES



<https://native-land.ca/>

Another important part of inclusion in outdoor learning is to acknowledge the history of the land you are on. The Native Land app can help you and your students learn about the indigenous peoples who lived on the land that is now your schoolyard, the languages they spoke, and information about their culture. Scan the third QR code on this page to access the app.

A great resource for acknowledging and appreciating the identities of our native students is the Redbud Resource Group's guide titled, *Seeing Our Native Students: A Guide for Educators*, which can be downloaded by scanning the final QR code on this page.



bit.ly/3AmU385

This comprehensive guide includes helpful suggestions to support Native students and educate non-native students. For example, it is important to consider specific communities when teaching about Native peoples, as opposed to grouping all Native peoples together (Redbud Resource Group, 2020). We must educate ourselves about history of Native communities even if we are not history teachers. Our understanding of the historical, environmental, cultural, and psychological aspects of Native history has the potential to help our Native students feel seen, validated, and empowered. A wonderful

resource for bringing indigenous perspectives to light is the book, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*, by Robin Wall Kimmerer, a Potawatomi woman, botanist, and professor of plant ecology.

In this book, Kimmerer shares how considering traditional perspectives and practices of Native Americans can help us make the Earth a better place for future generations. A young adult adaptation of the book was released in 2022, co-written by Monique Gray Smith, a Cree, Lakota, and Scottish woman, and beautifully illustrated by Nicole Neidhardt, a Diné (Navajo) artist of Kiiyaa'áanii clan.

Another great resource is the Outside Voices Podcast, which features personal stories about relationships with nature from Black, Indigenous, and People of Color (BIPOC); people with disabilities; and others who are redefining what it means to be “outdoorsy.” Scan the QR code on this page to access this resource.



<https://www.outsidevoicespodcast.com/>

The benefits of green time are plentiful and apply to all of us, but issues with access, attitudes, and prior experiences can get in the way. School is the perfect place to break down these barriers and welcome ALL students into a connection with the natural world. A 2019 review of literature looking at how experiences in nature affect learning states, “It is time to take nature seriously as a resource for learning and development. It is time to bring nature and nature-based pedagogy into formal education—to expand existing, isolated efforts into increasingly mainstream practices” (Kuo et al., p. 6). One way to get started adding nature time to your school day is to incorporate some green breaks and see how they affect your students and you. The next section provides 25 green breaks that can be incorporated into the school day no matter what grade or subject you teach.

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