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Nature-based education in Sonoma County

Through field trips, extracurricular activities, and outdoor programs, Sonoma County's parks and open spaces provide an outdoor classroom for thousands of students. Sonoma County's 40 school districts and 175 public schools utilize the region's natural capital through a number of outdoor education programs. Trip destinations include Alliance Redwoods, Westminster Woods, Armstrong Woods, Petaluma Adobe State Park, and Mount Gilead. These programs vary in length from a few hours to overnight trips.

Exposing children and youth to nature provides a critical introduction to the possibilities of exploring the great outdoors, especially for those who may not have such opportunities at home. In addition, nature-based education allows students to learn and understand scientific concepts in real-world settings, providing an important complement to their classroom-based education. The purpose of this chapter is to review the benefits that children and youth receive from nature-based education, which range from academic achievement to enhanced critical thinking skills. Nature-based education is defined here as education that uses the natural environment as a context for learning to complement classroom-based instruction.

Nature-based education can improve academic achievement

It has been established through numerous studies in over 100 countries that formal education has a high return on investment, in the 5-15% range, which is on par with high-grade commercial investments such as stocks and bonds (Polacheck, 2007). Studies in the U.S. have found that, on average, each additional year of schooling completed increases an individual's future wages by 10% to 15% (Rouse, 1999; Ashenfelter and Krueger, 1994).[1] The non-income related benefits of schooling are equally important. A quantitative literature review by Oreopoulos and Salvanes, controlling for income, found for example that increased schooling was correlated with improved health (e.g. lower likelihood of receiving health disability payments, greater engagement in healthy activities) and social skills (e.g. greater trust in others, greater social participation) (Oreopoulos and Salvanes, 2009).

A growing body of quantitative and qualitative literature also indicates that place-based and nature-based education can supplement traditional classroom education and result in even greater academic performance. Recent research for example has founds links between nature-based education and higher test scores, enhanced critical thinking skills, increased motivation, and improved attitudes

[1] A 10% return means that for two people who are the same in every other way, if one of those people were to receive an additional year of education, their future annual earnings would be 10% higher. The studies cited here compared up to 450 sets of identical twins (who are presumably as close as possible in terms of mental and physical ability) with varying levels of education in order to isolate the impact of a year of education on their wages.

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towards the environment (Chawla and Escalante, 2012). According to Smith and Sobel (2010), the opportunity to apply "…concepts and skills in 'real-world' settings" may be one of the reasons nature-based education has a positive impact on student achievement and engagement.

Several studies that have been able to demonstrate a correlation between nature-based education and academic achievement. In California, a curriculum model called "Environment as an Integrating Context" (EIC)combines hands-on experiences with collaborative instruction, community-based investigation, and cooperative learning in local natural and community surroundings. A study in 2000 compared eight pairs of demographically-similar schools in California (each pair included one school with EIC programs and one school without EIC programs), and found EIC student scores were higher in 72% of assessments across several subjects compared with non-EIC student scores. This result includes 63% of students improving in math and 64% in science (SEER, 2000). The authors followed up on this study in 2005 and confirmed earlier results, with EIC students scoring "significantly higher" than their non-EIC peers in 96% of standardized tests including reading, math, spelling, and language (SEER, 2005).

A Washington State study demonstrated that for 73 of 77 paired schools, "environmental education" schools achieved statistically significant higher standardized test scores in math, reading, and writing compared with traditional schools (Bartosh et al., 2006). Research into other forms of experiential education also support the idea that direct experiences with nature have a positive impact on student learning. For example, quantitative studies by Smith and Motsenbocker (2005) and Klemmer et al. (2005) found that school gardening programs led to increased science achievement test scores compared with classroom-based methods alone. Klemmer et al. suggest that "Gardens can serve as living laboratories in which students can see what they are learning and in turn, apply that knowledge to real world situations," which may be the case with hands-on environmental education in open spaces and parks too.

Nature-based education can improve attendance, focus, creativity, and confidence

In addition to improved academic performance, nature-based education has been shown to provide many other benefits. At the national level, a 2010 survey of 1,900 educators by the National Wildlife Federation found that 78 percent believed children who spend regular time in unstructured outdoor play are better able to concentrate and perform better in the classroom (Coyle 2010). Of these educators, 75 percent said students who spend regular time outdoors tend to be more creative and better able to problem-solve in the classroom. The previously mentioned SEER (2005) study also noted higher attendance for students in environmental programs 77% of the time, as well as an increase in cooperation, leadership, and confidence for English-as-a-Second-Language students.

Ernst and Monroe (2004) conducted a study in which 9th and 12th graders who received nature-based education were shown to have enhanced critical thinking skills. This study controlled for pretest score, grade point average (GPA), gender, and ethnicity. Smith and Sobel (2010) cite evidence that outdoor programs, in which students are treated as responsible and capable learners, lead to students finding greater meaning in their projects and experience enhanced self-confidence. Another study concluded that green outdoor settings reduced ADHD symptoms in children across a wide range of activities (Kuo and Taylor 2004).

Studies demonstrating academic benefits of nature-based education are further summarized in the "additional resources" section below

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Additional Resources

Table 1. Studies demonstrating academic benefits of nature-based education

Study	Key Finding(s)
American Institutes for Research, 2005	Children who attended outdoor school raised their science scores by 27 percent, as measured by a pre- and post-survey administered immediately upon their return to school.
Bartosh et al., 2006	In a paired-school analysis, Bartosh demonstrates that schools with environmental education programs have higher standardized test scores.
Blair, 2009	This review of studies on school gardening cites quantitative studies demonstrating positive outcomes for science achievement and food behavior.
Chandler and Swartzentruber, 2011	For fourth grade students, higher nature awareness scores are correlated with higher science averages.
Chawla and Escalante, 2012	This summary presents research results on the benefits of placed-based education including higher test scores, advanced critical thinking skills, and greater academic motivation.
Ernst and Monroe, 2004	Nature-Based Education leads to improved critical thinking skills, controlling for other factors such as GPA, gender, and ethnicity.
Klemmer et al., 2005	School gardening programs increase general science achievement scores.
NEETF, 2000	100% of students in a Milwaukee Environmental school passed the Wisconsin Reading Comprehension test compared with 25% across all of Milwaukee.
SEER, 2000 and 2005	Presents results on the benefits of Environmental as Integrating Context (EIC) programs. Results include higher test scores from EIC program participants most of the time.
Smith and Motsenbocker, 2005	School gardening programs in Louisiana lead to increased science achievement scores.
Smith and Sobel, 2010	Connecting classroom based education with place-based and community experiences leads to higher student achievement.

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