**Instructional Strategies Using Outdoor Learning Experiences**

Outdoor and environmental learning experiences are powerful tools for implementing key instructional shifts required by the CA NGSS and California’s Environmental Principles and Concepts (EP&Cs). Teachers can effectively use the outdoors as a learning context periodically throughout the year as they teach science. There is also particular value in providing students with longer, concentrated opportunities to explore and explain the natural world by participating in one of California’s rich network of Residential Outdoor Science Schools.

There is wide-ranging evidence to support the value of using natural environments, local communities, and other outdoor settings as a real-world context for science learning that engages student interest as they investigate places around them (Lieberman, 1998, 2013; American Institutes for Research, 2005; National Environmental Education & Training Foundation 2000). Students should have rich opportunities to observe and investigate the multitude of natural and human social systems found throughout California.

The most effective opportunities to use outdoor environmental learning experiences are when they are an integral component of three-dimensional science instruction—fully integrated into units of study that do more than offer students isolated out-of-classroom activities. High-quality outdoor and environmental learning is built on research-based instructional strategies like those identified by the BEETLES program (Lawrence Hall of Science 2016):

* engaging students directly with nature (for example, on the school campus, at an outdoor science school, or in their community);
* thinking like a scientist (using NGSS Science and Engineering Practices);
* learning through discussions (using strategies to promote conversations about science, for example “talk moves”); and, experiencing instruction based on how people learn (for example, the “5E Instructional Cycle,” and “using the environment as a context for learning”).

Table X-XX provides examples showing how well-designed outdoor and environmental learning experiences can be used to implement the Key Instructional Shifts of CA NGSS as students master the ideas represented by California’s EP&Cs.

**Table X-XX. Achieving the Key Instructional Shifts of CA NGSS and EP&Cs Using Environmental and Outdoor Learning Experiences**

|  |  |
| --- | --- |
| **Key Instructional Shifts** | **Examples of Environmental and Outdoor Learning Experiences Supporting the Key Instructional Shifts and California’s EP&Cs** |
| Three Dimensional | Natural phenomena found in students’ local surroundings provide diverse opportunities to engage in three-dimensional scientific inquiries as they learn the EP&Cs. For example, in 4th grade, students can:   * undertake a field investigation in the neighborhood [SEP-3], and record the plants and animals they see in their science notebooks [SEP-8]; * look for patterns [CCC-1] in the types and functions of external structures among the different animals [LS1.A]; and, * discover that changes to natural systems can influence [CCC-2] the functioning of plants’ and animals’ external structures [EP&C II a]. |
| Coherent across the curriculum | Students’ investigations of their local community and natural surroundings help them make connections across multiple scientific disciplines, and to read, write, and engage with mathematical analysis, history-social sciences, and technology. For example, middle school students can:   * collect weather data [SEP-3] for the area and compare it to long-term climate data collected by the school over 35 years; * ask questions about the data and define a problem [SEP-1] about changes in Earth’s climate {ESS3.D] that can be researched using online sources [SEP-8]; * obtain information about the effects temperature changes [CCC-2, CCC-7] have on the snowpack in the Sierra Range; * identify human activities that diminish the snowpack in the Sierra Range [EP&C IV]; and, * use mathematical thinking [SEP-5] to create meaningful comparisons, using tables and graphs, about the local climate over the past 50 years [history]. |
| Relevant to local communities and student interests. | Solving real-world problems in their local environment and community, gives students the opportunity to learn about issues where they live and apply what they learn to engineering design solutions that have personal meaning. For example, continuing from above, in middle school students can:   * identify human activities in their community that release greenhouse gases and influence the global climate [EP&Cs II, IV]; * ask questions to identify evidence [SEP-1] of the possible effects of global climate change [CCC-2, CCC-7] on local habitats and biodiversity [ESS3.C] on the natural systems at a local wildlife refuge; and, * design possible solutions [ETS.1.B.] to local emissions problems and communicate their findings to the school and community [SEP-8] [EP&Cs V]. |

**Instructional Strategy Resources: Outdoor Learning Experiences**

* Beetles-Science and Teaching for Field Instructors. 2016. <http://beetlesproject.org/> Outdoor science education resources that can be used in a wide variety of outdoor science education settings.
* Lieberman, Gerald. 2013. *Education and the Environment: Creating Standards-Based Programs in Schools and Districts*. Cambridge: Harvard Education Press.
* Yager, Robert and John Falk, editors. 2007. *Exemplary Science in Informal Education Settings*. Arlington, VA. National Science Teachers Association.