

Exploring Sustainability Using images from Space

Loris Chen, Jennifer Salmon, and Courtney Burns

Dwight D. Eisenhower Middle School, Wyckoff, United States (lchen@wyckoffschools.org, jsalmon@wyckoffschools.org, cburns@wyckoffschools.org)

Sustainability is the integrating theme of grade 8 science at Dwight D. Eisenhower in Wyckoff, New Jersey. With a focus on science, technology, engineering, and mathematics (STEM), sustainability establishes relevance for students, connects course work to current news topics, and ties together trimester explorations of earth science, physical science, and life science. Units are organized as problem-based learning units centered on disciplinary core ideas. Sustainability education empowers students to think about human and natural systems on a broader scale as they collaboratively seek solutions to scientific or engineering problems. The STEM-related sustainability issues encompass both global and local perspectives. Through problem solving, students acquire and demonstrate proficiency in the three-dimensions of Next Generation Science Standards (disciplinary core ideas, science and engineering practices, and crosscutting concepts).

During the earth science trimester, students explore causes, effects, and mitigation strategies associated with urban heat islands and climate change. As a transition to a trimester of chemistry (physical science), students investigate the sustainability of mobile phone technology from raw materials mining to end-of-life disposal. Students explore natural resource conservation strategies in the interdisciplinary context of impacts on the economy, society, and environment. Sustainability creates a natural context for chemical investigations of ocean-atmosphere interactions such as ocean acidification. Students conclude the eighth grade with an investigation of heredity and evolution. Sustainability challenges embedded in genetics studies include endangered species management (California condors) and predicting the effects of climate change on populations in specific environments (Arctic and Antarctic regions).

At Dwight D. Eisenhower Middle School, science students have access to a variety of web-enabled devices (e.g., Chromebooks, laptops, iPads). As a result, web-based resources are incorporated into student learning on a daily basis. This has created a truly global classroom for students who, via the Internet, can and do access materials from any country in the world. Students work collaboratively using Google Classroom and a suite of Google apps. Teacher-created websites serve as the textbook with text, video, static images, interactive images, and external links designed to stimulate student growth in scientific literacy, language arts, and mathematics.

Images of Earth's systems generated from data collected by Earth orbiting spacecraft are essential tools for understanding sustainability concepts at global, national, regional, and local scales. Images and supporting data from NASA (U.S.), ESA (Europe), and JAXA (Japan) are used to explore Earth's atmosphere, hydrosphere, and geosphere. Simulations, time-lapses, and graphical representations of historical and real-time, remote-sensing data stimulate student questions and engage students in learning as they design and test models to explain complex interactions of Earth's systems and feedback loops between natural and human-made environments. As students make meaning of observations and communicate their perceptions and understandings to a variety of audiences, they gain mastery of scientific literacy, language arts skills, and mathematics skills.