



National Environmental
Education Week

Greening STEM: Taking Technology Outdoors



EE WEEK 2013 EDUCATOR TOOLKIT



National Environmental
Education Foundation
Knowledge to live by

Greening STEM: Taking Technology Outdoors

EE WEEK 2013 EDUCATOR TOOLKIT

As part of **Greening STEM: Taking Technology Outdoors**, National Environmental Education Week (eeweek.org, April 14-20, 2013) will highlight the growing opportunity to engage today's students in learning about our environment, with new technologies that enable scientific research and develop 21st century skills.

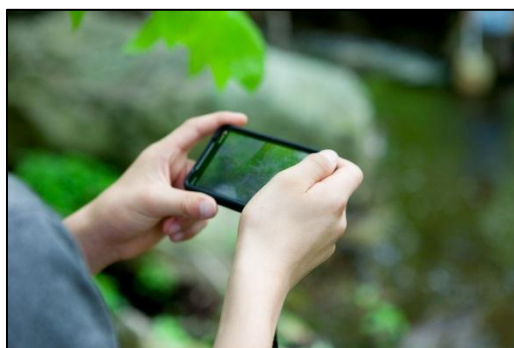


Photo Credit: Nathan Heidt, for EcoMOBILE

According to the *NMC Horizon Report > 2012 K-12 Edition*, 61% of Americans age 12 and up own a mobile device – 44% specifically own a smartphone. A decade ago, teachers struggled to keep students engaged in the learning process and off of their phones. Today, research indicates that 77% of teachers believe that using technology in the classroom increases student motivation to learn, while 75% of 1,900 educators surveyed said students who spend regular time outdoors tend to be more creative & better problem-solvers. For more stats like these about the intersection of education, technology, the environment and the economy, check out the infographic [Tech & Our Planet \(http://bit.ly/ZC53pW\)](http://bit.ly/ZC53pW).

Mobile devices such as smartphones are powerful tools for outdoor and hands-on study. These hand-held, pocket-sized devices enable users to access a world of information, download applications (apps), take and share photographs and much more.

As mobile devices become increasingly embedded in daily life, they can play a contemporary role in enhancing the experience of nature that can often be overlooked. Recent studies indicate that while young people are increasingly concerned about their environment, they also feel more and more disconnected from it. Technology can be tapped as a fresh asset for helping young people “plug into nature” by empowering them to engage with their local environments.

This toolkit highlights a variety of educator resources for utilizing technology to engage students in outdoor learning on behalf of EE Week 2013’s Greening STEM theme, Taking Technology Outdoors.

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Activities to Take Tech Outdoors

Engage students in outdoor learning activities with **tech tools**

Mobile Devices (smartphones, tablets and more)

Knowledge of the natural world at your fingertips

Activities for All Grades

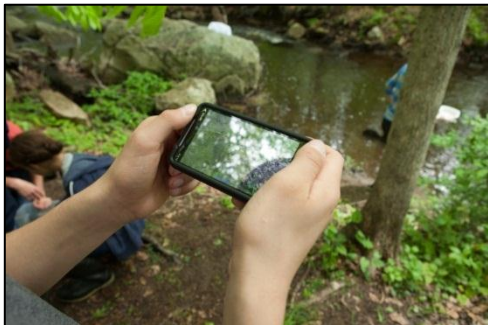


Photo credit: Nathan Heidt, for EcoMOBILE

Backyard Science: Tallying Local Species to Learn About Diversity

Developed by: The Learning Network

<http://nyti.ms/IYna25>

In this activity, students identify and record the number of species they find in a certain area, and document their findings using digital cameras. Students can use apps and/or field guides to enrich the investigative process.

Tracking Seasonal Change With Journey North

Developed by: Journey North

<http://bit.ly/12WJPaT>

Journey North engages students in a global study of wildlife migration and seasonal change by allowing K-12 students to share field observations with classmates across North America. They track the coming of spring through the migration patterns of insects, birds and mammals, as well as natural events. The website offers migration maps, pictures, background lessons (<http://bit.ly/ZoK5qP>), activities and information to help students make local observations and fit them into a global context.

Grades K-4

Wild Writing

Developed by: Project Noah

<http://bit.ly/15mIPsq>

This cross-curricular activity incorporates tech-enhanced scientific observation and descriptive writing. At an outdoor area near or on school grounds, students use digital cameras or mobile devices to photograph an organism of their choice. Students then brainstorm adjectives and write rich descriptions of their organisms and the habitat, and finish by adding their observations to the Project Noah website.

Grades 5-8

Tree Tour

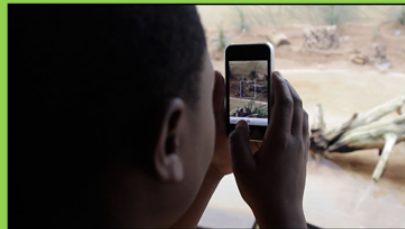
Developed by: Project Noah

<http://bit.ly/XUN7G5>

Students use digital cameras and smartphones equipped with the Project Noah app to identify and map a variety of tree species. Whether in the schoolyard, park or forest, students use tech tools to create an informational Tree Tour for their peers and the community.

Using Tech to Connect Inner City Youth with Endangered Species

The Biodiversity Quest pilot program challenged young minds to create mobile learning experiences at the Lincoln Park Zoo in Chicago using iPhones and a popular scavenger hunt app, 7scenes. Students developed quests that would lead other young visitors around the zoo. Learn more <http://bit.ly/ZYTeu5>



Grades 9-12

Pool Monitor

Developed by: Project Noah

<http://bit.ly/14xVpo9>

Create a springtime Project Noah survey mission of a wetland habitat focused on aquatic insects and amphibians. Students document the wildlife they see with digital cameras or smartphones, take detailed notes describing each finding, and later include their “spottings” on the Project Noah site. If possible, students return to the field site multiple times during the season to capture life cycles and predator-prey relationships.

The Biological Line-up

Developed by: Project Noah

<http://bit.ly/YD1T4m>

In this field investigation, students use transects and quadrats to assess the biodiversity within a distinct area. Students survey species presence and abundance while employing digital cameras to record individual organisms; photos are accompanied by numbers identifying the position at which the organism was discovered. In the process, students gain an appreciation for the diversity of life.

GIS/GPS

Navigate and map your world

A **GIS (Geographic Information System)** is a computer program utilized to view and analyze geographic information. **GPS (Global Positioning System)** is a technology that communicates with satellites to pinpoint specific locations on earth. Both are great tools for getting students outside in their communities and engaged in environmental field research and service-learning projects.



Image used under Creative Commons from Alex Schweigert

Activities for All Grades

Investigating Your World With My World GIS \$

Developed by: National Geographic Education

<http://bit.ly/12EWTKY>

Get outdoors with your students and investigate your surroundings using [My World GIS Software](#) (available for purchase or a 45-day free trial at: pasco.com/myworld). This set of GIS activities is designed to introduce all grade levels to applications of GIS software across a range of subject areas.

Grades K-4

Tree Identification Trail

Developed by: Wisconsin 4-H Youth Development Program

<http://bit.ly/Zc9ZRH>

This hands-on activity engages students in GPS technology and tree identification outdoors. Create a list of local trees and include geographic waypoints indicating where specific trees are found. Students use the provided waypoints and GPS units to find trees in their neighborhood.

Grades 5-8

GPS Treasure Hunt

Developed by: UCLA Ocean Globe

<http://bit.ly/YRonis>

This field exercise brings students outdoors using GPS units in a team treasure hunt; students will navigate and locate various targets using latitude and longitude coordinates. To ensure environmental learning, teachers can choose natural landmarks or features for students to find.

Grades 9-12

Exploring 10 Landscapes

Developed by: Esri

<http://bit.ly/YI7bUO>

This lesson utilizes [ArcGIS Explorer Online](http://arcgis.com/explorer) (arcgis.com/explorer) to educate students about various landscapes and topographic map features. Take your classroom on a mini field trip to investigate the physical features of your local region. Students can observe their surroundings and then create an online map using ArcGIS Explorer.

Get Outside With GPS!

Developed by: Esri

<http://bit.ly/Z94xjU>

This activity introduces students to GPS technology in a fun and interactive way. Students answer a varied list of questions designed to familiarize them with the tool in an outdoor setting, such as a school garden or the school grounds. Teachers may adapt this lesson to include additional questions about the local environment.

Digital Cameras

Picture your natural surroundings

Most families own or have access to a digital camera, and compared to other technologies like smartphones and GIS units, digital cameras can provide a more accessible tool to enhance outdoor learning. Digital cameras allow students to track their progress on science projects, collect evidence and present their findings in the classroom. Students can document the world around them, then upload and share photos online as part of citizen science efforts.



Image used under Creative Commons from
woodleywonderworks

Activities for All Grades

Monitor a Nest

Developed by: Upland Hills School Bird Cam Crew

<http://bit.ly/VKvoTb>

This project engages students in learning about local birds using a video or surveillance camera to monitor a nest or bird box. Learn how to develop a nest monitoring program by reading about the Bird Cam Crew at Upland Hills School in Oxford, Michigan. For additional nest monitoring resources and to share your findings, join the Cornell Lab of Ornithology's [NestWatch](http://nestwatch.org) network (nestwatch.org).

Grades K-4

An Eye on the Garden

Developed by: KidsGardening & the National Gardening Association

<http://bit.ly/16H9pzU>

Students can use digital cameras to capture changes in the schoolyard habitat and sharpen their observation skills. While taking an investigative look into the patterns and shapes of various botanical selections, students gain a new perspective to observe the garden.

At Home in the Water

Developed by: Alaska Seas and Rivers Curriculum

<http://bit.ly/11f3Zf9>

In this unit, students observe and measure local habitats in a field activity, each focusing on one specific area to study. Students participate in a “scientific conference,” take notes and digital photographs, and share their observations with peers, family and the community.

Grades 5-8

Is There a Doctor in the Treehouse?

Developed by: Dennis G. Hahn, Bushkill Elementary School

<http://bit.ly/ZOEZGO>

In this activity, students learn about tree afflictions by studying a medical problem that may affect the health of a tree. Students investigate the outdoors and take digital photos of trees displaying symptoms of an illness.

Using a Forest Setting to Learn to Carefully Observe and Question

Developed by: Jeff Tranell, Park Forest Middle School

<http://bit.ly/ZXXb0k>

In this lesson, students learn to observe a forest or other natural area as scientists. Each student chooses one item to photograph from different angles and using different zooms in addition to writing detailed

observations. Back in the classroom, students use computers to upload the photos and include captions that more fully describe the items.

Grades 9-12

[Our Changing World](#)

Developed by: Alaska Seas and Rivers Curriculum

<http://bit.ly/ZfSFYT>

In the field investigation of this unit, students gain an understanding of local landscapes and changes in climate. Students explore environmental changes by interviewing elder residents of the community and taking digital photos to record differences between past and present.

[Tracking Aliens](#)

Developed by: Project Noah

<http://bit.ly/WtjJap>

With help from the Project Noah site, students learn the difference between native and invasive species, and the impact that non-native species can have on the environment. Students conduct a plot study in the field, utilizing digital cameras to enhance their observations, and using the data to assess local biodiversity issues.

Resources

Apps

[Top Ten Apps for Taking Technology Outdoors](#)

<http://bit.ly/YQopHV>

Join educators around the country discovering new, digital resources to connect students with the environment. Check out some of EE Week's top suggestions for free mobile apps like Project Noah, WeatherBug and Creek Watch that help students document wildlife, Earth systems and water conditions in their communities.

QR Codes

Develop QR (Quick Response) codes that contain information on local plants and animals, place them throughout the school garden, outdoor classroom or local nature area, and then have students find and scan them with a smartphone or tablet to learn more about the types of wildlife they discover. Anyone can create QR codes; get started with this guide: bit.ly/j7PGkN, or connect with your school's technology coordinator for assistance.



QR Codes in the Garden: Using Technology to Open Horizons Outdoors

Educators are exploring how to use the technology of QR Codes and cell phone apps to expand horizons while enjoying nature outdoors. You can put QR Codes on plant labels and outdoor signs to link to changeable online information including videos, text, images and sound. Learn more at: <http://bit.ly/16s7Jcp>.



Websites

BioBlitz Education

<http://bit.ly/pdUCUO>

Whether participating in a National Geographic/National Park Service BioBlitz or a local schoolyard bioblitz, the bioblitz experience helps students study biodiversity firsthand through activities that support students in making observations, recording data, understanding classification and mapping their findings.

Earth Force GREEN

<http://earthforce.org/green>

The Global Rivers Environmental Education Network (GREEN) program provides opportunities for young people to learn more about the watersheds they live in and to use their findings to create solutions for water quality challenges. The [GREEN Hands-On Center \(bit.ly/106jBx0\)](http://bit.ly/106jBx0) explains the importance of different water quality tests. [The Field Manual for Water Quality Monitoring \(bit.ly/YdhGZr\)](http://bit.ly/YdhGZr) details nine water quality tests and is useful for any school water quality monitoring program.

Esri GIS Education Community

<http://edcommunity.esri.com>

The Esri GIS Education Community offers a place to exchange ideas, curriculum, software and information between GIS educators and learners. Learn about GIS, access lesson plans, and utilize mapping tools like [ArcGIS Explorer \(http://bit.ly/16RzbP5\)](http://bit.ly/16RzbP5), a free program designed for use online or on a PC desktop. Students can use ArcGIS Explorer on a smartphone or tablet to collect data in the field, or in the classroom to analyze their findings on a map.

Geocaching

www.geocaching.com

Geocaching is an outdoor treasure hunting game that utilizes GPS-enabled devices (e.g. a GPS unit or a smartphone) to locate hidden items. [EarthCache \(earthcache.org\)](http://earthcache.org) is a specific type of geocaching that combines learning about Earth science with using GPS technology outdoors; rather than hidden objects, EarthCache users search for natural features of the environment that have been administered and listed

by the Geological Society of America (GSA). A free [educator's guide](http://bit.ly/YmFcTh) (bit.ly/YmFcTh) and lesson plans are available to enable teachers to introduce EarthCaching to students.

National Geographic FieldScope

<http://bit.ly/xfTrqZ>

National Geographic FieldScope is a web-based mapping, analysis, and collaboration tool designed to support geographic investigations and engage students as citizen scientists investigating real-world topics both in the classroom and in outdoor education settings.



Guides

GIS Tip Sheet

<http://bit.ly/149USwR>

Learn about the uses of GIS with this helpful tip sheet from Classroom Earth.

Mobile Devices for Learning: What You Need to Know

<http://bit.ly/RSwI2I>

This Edutopia guide explains how mobile devices like cell phones, tablets and smartphones can engage students in a 21st century learning environment. Resources for teachers just starting out with tech-enhanced education, K-12 apps and online tools are also included in the guide.

EE Week Greening STEM: Taking Technology Outdoors Case Studies

<http://bit.ly/148tDE5>

From learning how to use QR (Quick Response) Codes in the school garden or local park to having students design a scavenger hunt at the local zoo with smartphones, EE Week's Greening STEM: Taking Technology Outdoors Case Studies provide thoughtful how-to's, success stories and lessons learned for Taking Technology Outdoors with your students.



Technology for Field Investigations: Scientist-Driven Technology Practices

<http://bit.ly/ZuDR9w>

Developed by the Pacific Education Institute for the Association of Fish and Wildlife Agencies' North American Conservation Education Strategy, this guide describes the technology used by natural resource professionals. It is available to K-12 students for conducting field investigations, problem-solving through stewardship planning and projects, and participation in outdoor recreation.