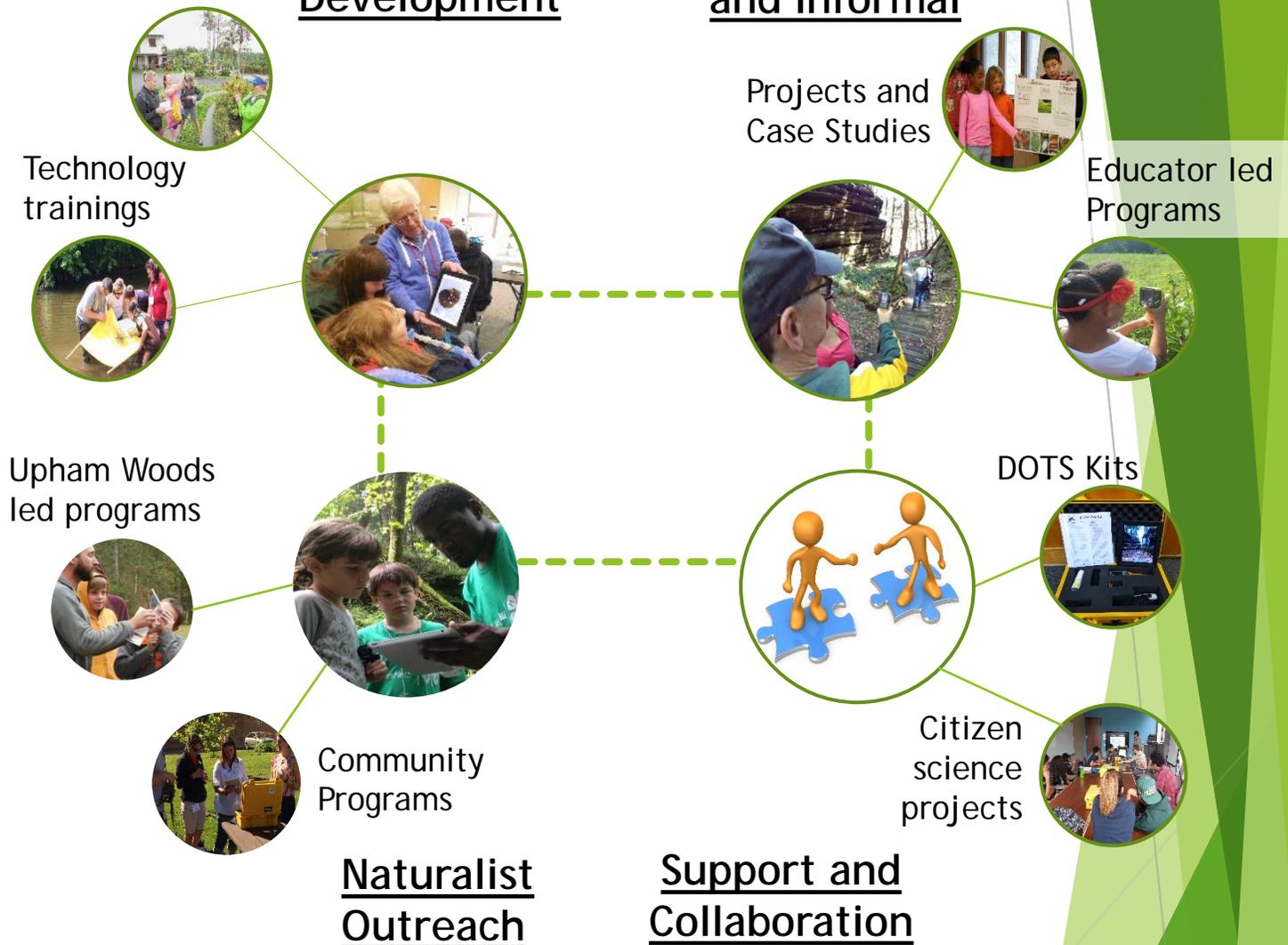


Digital Observation Technology Skills (DOTS)

2016 Report

Professional Development

Educators: Formal and Informal



University of Wisconsin- Extension

<http://fyi.uwex.edu/environmentaleducation/>

(608)254-6461

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An EEO/AA employer, University of Wisconsin-Extension provides equal opportunities in employment and programming, including Title IX and American with Disabilities (ADA) requirements.



Programming in 2015-2016

Professional Development

A multitude of professional development and trainings relating to DOTS are offered, from place-based experiential education, to technology trainings. Upham Woods staff also disseminates research findings from projects and case studies to further strengthen support for the DOTS program.

Educators: Formal and Informal

Educators can get involved in the DOTS program in a variety of ways, including educator trainings that provide the background knowledge and skills necessary to lead programs. Educators can then lead their own DOTS kits programs, or participate in projects and case studies sponsored by UW-Extension.

322
professionals
reached



553
adult
educators
inspired



5,973 youth
reached through
programming



\$90,000
in grants to
support DOTS



Youth are impacted through the kit lending program, community outreach, school-based inquiry investigations and technology programs held at Upham Woods Outdoor Learning Center. Upham Woods naturalists are able to reach youth, educators, communities, and professionals through DOTS outreach.

Naturalist Outreach

Support and Collaboration comes in the form of grant funding, and through UW-Extension staffing and research support. Upham Woods is able to support and collaborate with the broader community by providing DOTS equipment for long-term loan, citizen science projects and the ability for organizations to leverage their own grant funding.

Support and Collaboration

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UPHAM WOODS

Upham Woods



Outdoor Learning Center

“These lands are to be used as an outdoor laboratory and camp for youth, such as 4-H clubs and other people cooperating with the University of Wisconsin in the advancement of conservation, of agriculture and rural culture.”

—Elizabeth and Caroline Upham, 1941

For more information, please contact Upham Woods at:
608-254-6461 or uphamwoods@ces.uwex.edu
<http://fyi.uwex.edu/uphamwoods/>



4-H

AT UPHAM WOODS

4-H empowers youth to reach their full potential, working and learning in partnership with caring adults.



Upham Woods is a state 4-H youth camp and offers many ways to partner with 4-H:

- ◆ Summer camps
- ◆ Weekend art camps
- ◆ Winter activity camps
- ◆ IFYE trainings and retreats
- ◆ Adult leader trainings

Upham Woods



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OUR ACADEMIC PROGRAMS

- Hands-on, field-based learning experiences
- Programs in science inquiry, geology, water ecology, physical education, social studies and reading
- Standards alignment with NGSS, Common Core and state standards
- Prepares students for college and career readiness
- Ideal environment for team building facilitation

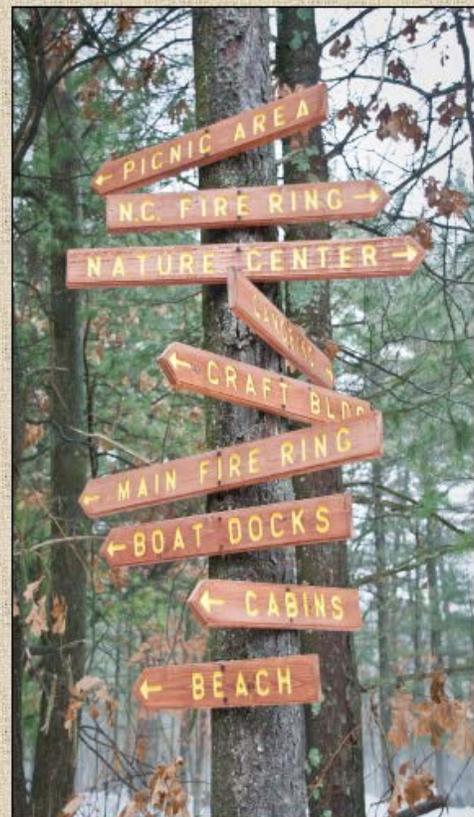


- Accessible facilities
- Safe and comfortable teaching spaces
- Year-round operation
- Experienced staff



UPHAM WOODS — BY THE NUMBERS

- 1941 — the year Upham Woods was founded
- 310 wooded acres, including 210-acre Blackhawk Island
- 200 beds (cabins and dormitory)
- Over 10,000 students, scouts, 4-H members, and other youth and adults from over 36 Wisconsin counties served every year
- 40+ different educational and recreational activities
- 4 1/2 miles of Wisconsin River shoreline
- Year-round operation
- 14 staff
- 14 buildings
- Countless smiles





OUR PROGRAMS

Upham Woods has a wide variety of programs to serve different groups:



- Residential Environmental Education Programs
- Day Programs
- Outreach Programs
- Conferences & Retreats
- Adventure Education
- Summer 4-H Camp
- Family Camps & Public Days



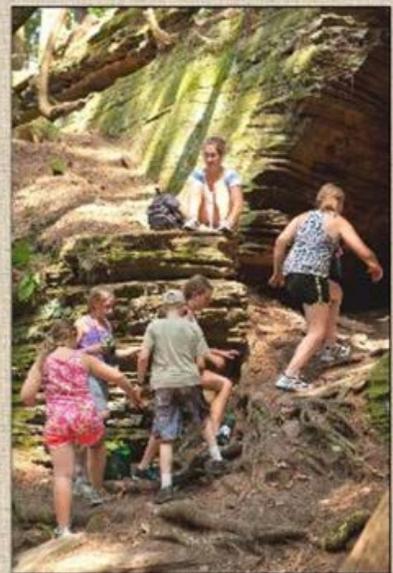
EXPERIENCE NATURE AT UPHAM WOODS

... Nestled on 310 beautiful acres along the Wisconsin River near Wisconsin Dells

- ◆ Paddle the Wisconsin River in a canoe or kayak
- ◆ Explore the trails and sandstone caves of 210-acre Blackhawk Island, a Wisconsin State Natural Area



- ◆ Discover a hidden world of aquatic invertebrates at the pond study area, now with a wheelchair-accessible path and platform



DOTS: On the Cutting Edge of Education

“The exploration of nature should be a critical component of education.”

–David Sobel, 2015

“In order to engage learners, educators must first be able to recognize and navigate in the learner’s own landscape.”

–Jan Visser, author of *Learners in a Changing Learning Landscape* (2008)

“Digital Natives”

The generation of youth who have developed learning strategies shaped around the use of technology.

(Prensky, 2006)

“Many educators believe that the most feasible learning activities of natural science is **outdoor inquiry**, which takes science investigation outside the classroom.” (Liu, 2009)



Place-Based Education

Place-based education provides a way to understand new concepts through making connections with relevant locations.

“...this approach to education increases academic **achievement**, helps students develop **stronger ties** to their **community**, enhances students’ **appreciation for the natural world**, and creates a heightened commitment to serving as **active, contributing citizens**.” (Sobel 2004)

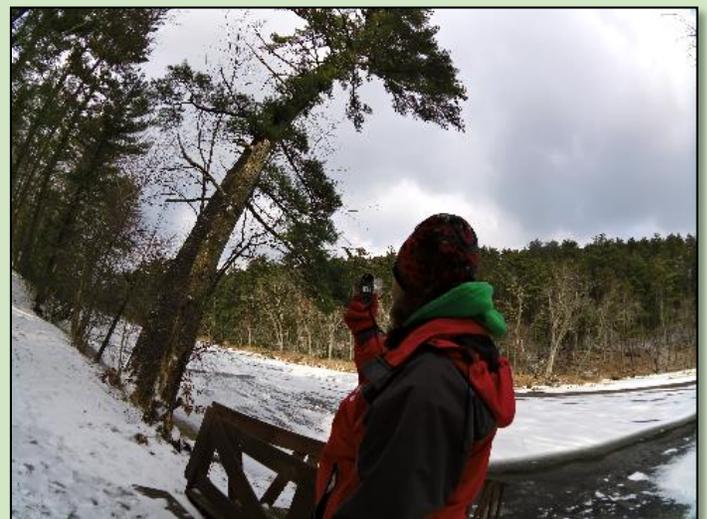
“Place-based teaching includes all learners as they connect new **science-related ideas** to **community-based experiences**. We adopt the view that place-based learning can **connect** out-of-school learners to their communities.” (Zimmerman 2014)



Students explore a sense of place by observing local fauna and flora.



Students find the intricate details of their surroundings by using classic and digital tools in their local stream.



Students create a data point in their local environment by using a Kestrel hand held weather station.

Technology in Environmental Education

Liu studied the use of mobile technologies in an outdoor lab setting, with students using mobile computers to enhance their lesson, finding that:

49% of students “felt that their opportunity to use a tablet PC throughout the learning activities was a **source of motivation.**” (2009)



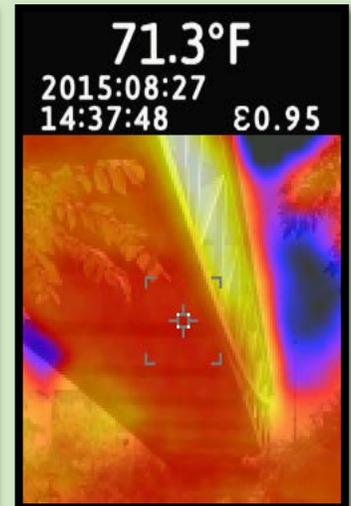
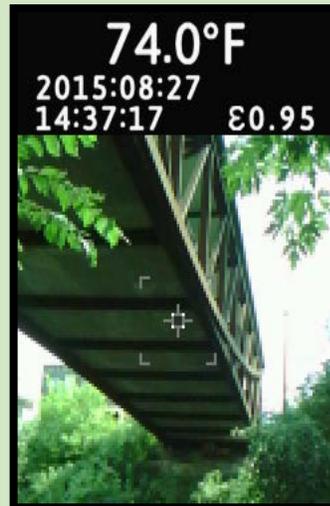
These students described their experience using the mobile technologies as more “personal,” “collaborative,” “hands-on,” and “interesting and interactive” than a typical class lecture. (2009)

“Technology can support reflection and articulation of new knowledge if artifacts are captured for sharing.”

(Zimmerman 2014)



Students using a digital microscope can store images on the iPad in order to share their discoveries with their peers.



Students can save thermal images of their surroundings in order to find differences in microclimates and think about the reasons for such differences even after they have left their study site.



A program developed by Dr. Justin Hougham at Upham Woods Outdoor Learning Center in Wisconsin Dells, WI, Digital Observation Technology Skills (DOTS) is an engaging way to explore the natural world using innovative and exciting technology tools. The DOTS kits and curriculum provide unique, hands-on opportunities for students to study and explore details of their environment, essentially turning the 'invisible', visible.



The DOTS Program

The Digital Observation Technology Skills (DOTS) program is an innovative Science, Technology, Engineering, and Mathematics (STEM) program designed to utilize mobile digital technologies in experiential environmental education. The program was developed to engage learners of all ages and to help bridge the gap between technology and the environment. Students, young and old, are encouraged to make enhanced observations about their surroundings through a unique technological lens, utilizing modern mobile technology tools to connect to the outdoors in new and exciting ways. The inquiry-based curriculum navigates the basics of the scientific method and focuses on the importance of good scientific communication and sharing discoveries with others.



Digital Observation Technology Skills (DOTS) Kits



Design Considerations

Tools in the DOTS kits measure an assortment of metrics, allowing investigation of many topics such as temperature in living versus nonliving objects and materials. Several design attributes were considered when selecting the tools that would comprise the kit including: memory, power, portability, ability to function off-line, dedicated devices for specific observations, and the collection of digital artifacts.



The Tools:

Kestrel 4000 Weather Meter

The Kestrel specializes in taking atmospheric measurements. This tool is great for determining features of microclimates, and observing differences across different areas. It is characterized by its small propeller and wet bulb located at the top of the tool.

A variety of measurements can be taken from this tool, including wind speed, heat index, atmospheric temperature, humidity, wind chill, dew point, wet base dew point, barometric pressure, and altitude.



Kintrex Infrared Thermometer

The infrared thermometer is used to measure the surface temperatures of different objects. It is a dedicated device, with a single button that projects a red light and reads the surface temperature of where that light is aimed. It is great for measuring temperatures of objects that may be out of reach, and quickly comparing these surface temperature readings. The infrared thermometer is used in the DOTS curriculum for many inquiries, and is a great way to investigate temperature differences in living versus non-living objects.





Fluke Visual Infrared Thermometer VT04A

Referred to as the “thermal imager,” this tool is used to investigate temperature variance of an object or neighboring objects. The screen projects an image of what the viewfinder is pointed at. The image can be supplemented with a thermal gradient layer of 25%, 50%, 75%, or 100% gradients, revealing differences in temperature through a spectrum of colors. Images can be taken with the Fluke, with and without thermal gradients. It is most effective to first take an image without a gradient, and then subsequently take an image of that same view with a gradient to learn about temperature variance that we are not normally able to see.



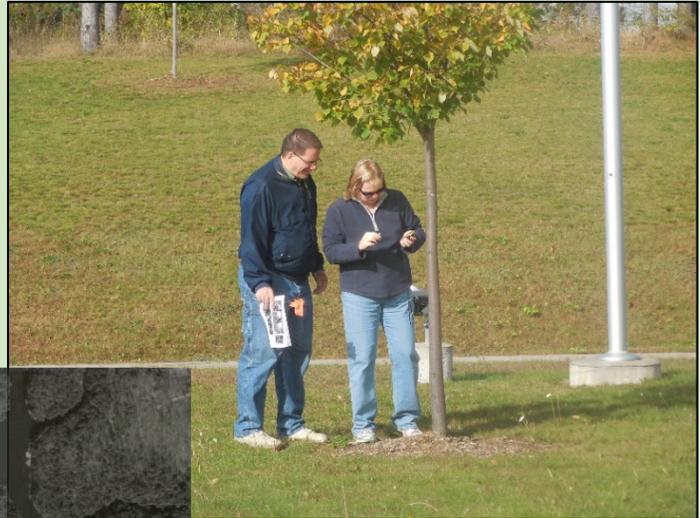
Aven Mighty Scope digital microscope and iPad

This wireless microscope gives us the ability to make the invisible, visible. Used in conjunction with the iPad and the Wi-Viewer application for optimized viewing amongst groups, the Aven Mighty Scope allows mobility and ease in inspecting the tiny details around us. It is even equipped with its own wi-fi, allowing us to take our equipment straight to the samples, instead of collecting and compromising samples to bring back to the lab. The camera feature on both the microscope and the Wi-Viewer app snaps pictures of what’s being viewed and stores them on the iPad, to keep these digital artifacts for later use.



Garmin Dakota 10 GPS

The Dakota 10 is a navigational tool that can be used in a variety of ways. Its features include: the ability to mark waypoints that can be revisited, the ability to navigate to preset waypoints, a tool that allows you to trace a perimeter and measure its area, the coordinates of your current location, a view of the satellites within range, and a compass, among other features.



Nikon CoolPix L610 and Garmin Virb

These cameras and video recorders allow the documentation of the scientific investigation taking place with the DOTS kits. In fact, many of the pictures within this report were taken with the Nikon digital camera. Recording and sharing these digital artifacts help us to tell our scientific story.

DOTS Kit Accessories

Bushnell Trophy and Moultrie Wildlife Camera

Wildlife cameras positioned in strategic locations around Blackhawk Island allow DOTS participants to gain insight on the wildlife happenings on the island in their absence. Participants navigate to the wildlife cameras using paper maps and GPS then are able to view the information on the SD card using an iPad adapter or, as a last resort, from the digital camera.

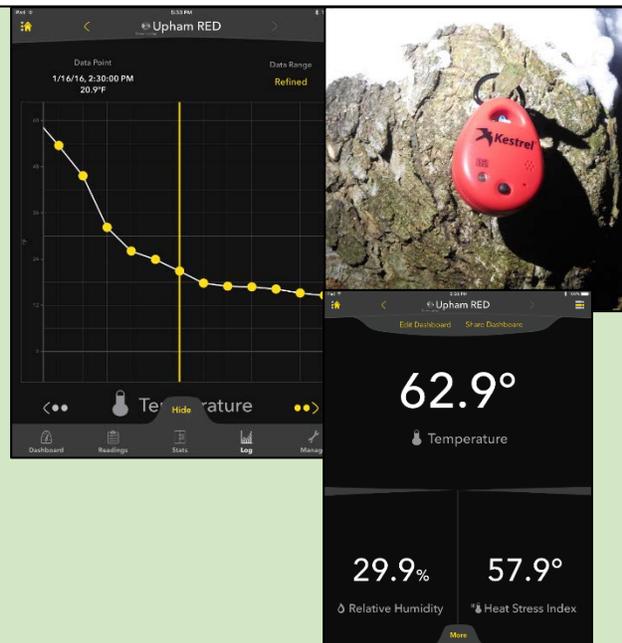


The Kestrel Drop

This tool measures and records atmospheric information such as temperature, humidity, and heat index. The user is able to set a time interval to record these measurements, anywhere from every 5 seconds to every 3 hours. The data can be accessed by coming into close proximity to the device itself and then downloading the information via BlueTooth onto a tablet or other mobile device via the Kestrel Connect app. This data can then be used, manipulated and analyzed for many uses.

Mastech Digital Lux Meter

The Lux Meter measures the brightness of an area quantitatively. Participants can describe the brightness of microclimates then compare and contrast their findings. One application of this tool involves comparing the differences in canopy cover in deciduous and coniferous forests.



DOTS Impacts: Participation by the Numbers

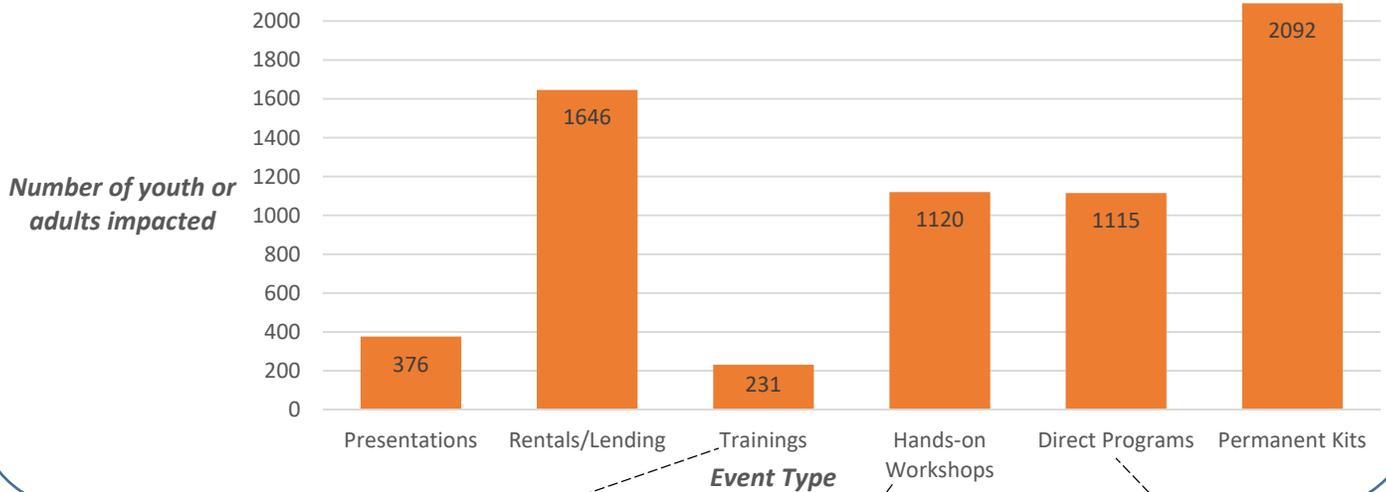
The overall numbers of impact for this program inspire reflection. The DOTS program has reached a total of **6,580** participants in two years of programming. In 2016, there were a total of 31 events, including: 9 direct programs, 5 educator trainings, 8 presentations, and 9 hands-on workshops. There were 4 partners participating in long-term lending of DOTS kits and 10 new organizations facilitated events.



[Left] Educators listen intently to a DOTS presentation hosted at Upham Woods. [Right] Youth at Wehr Nature Center test the soil conditions with a probe in their local park as part of the DOTS long-term lending program.



DOTS Impacts
2015 and 2016 combined



[Above] Educators receive training on effective use of the DOTS tools during the Training events. [Right] Students receive similar instruction by Upham Staff during workshops.



A student makes observations during a program lead by Upham Woods naturalists.



DOTS Educator Trainings



5

training events
held in 2016

Upham Woods hosts multiple training events throughout the year. Participants include educators from school districts, county offices and community centers around Wisconsin. The trainings involve a presentation regarding the history, pedagogies, design and conception of the DOTS program and kits, followed by an opportunity to go outside and explore the capabilities and functions of the equipment through hands-on inquiry. While outside, participants hike to multiple locations and explore various microclimates with the DOTS tools.



As they learned the applications of the mobile technologies in an outdoor education setting, the educators brainstormed ways in which they could incorporate DOTS into their own programming. Once trained, educators have access to the DOTS lending program enabling expanded technology outreach.

72

educators
impacted in
2016

What did you find most interesting or enjoyable about this presentation?

" [Learning] how to use the pieces of technology to compliment each other, and roles of team members-keeping all members engaged."



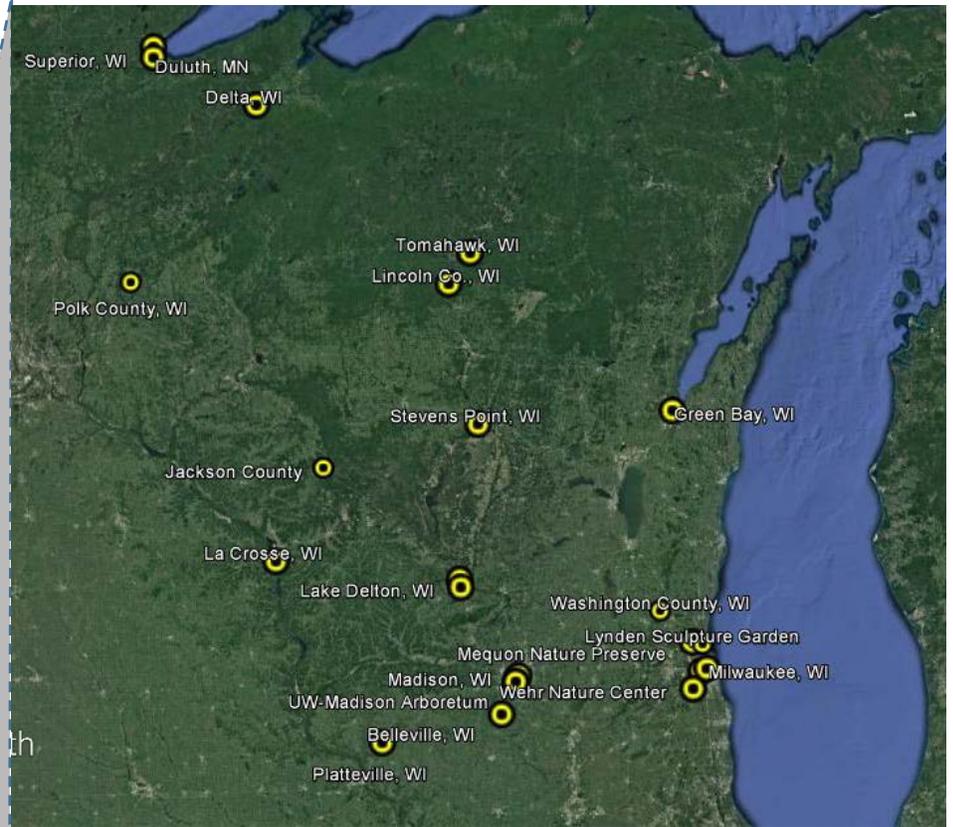
"I enjoyed actually being able to use the tools and see what they can do. The case studies were helpful to see this program in action."

DOTS Impacts: Outreach and Trainings

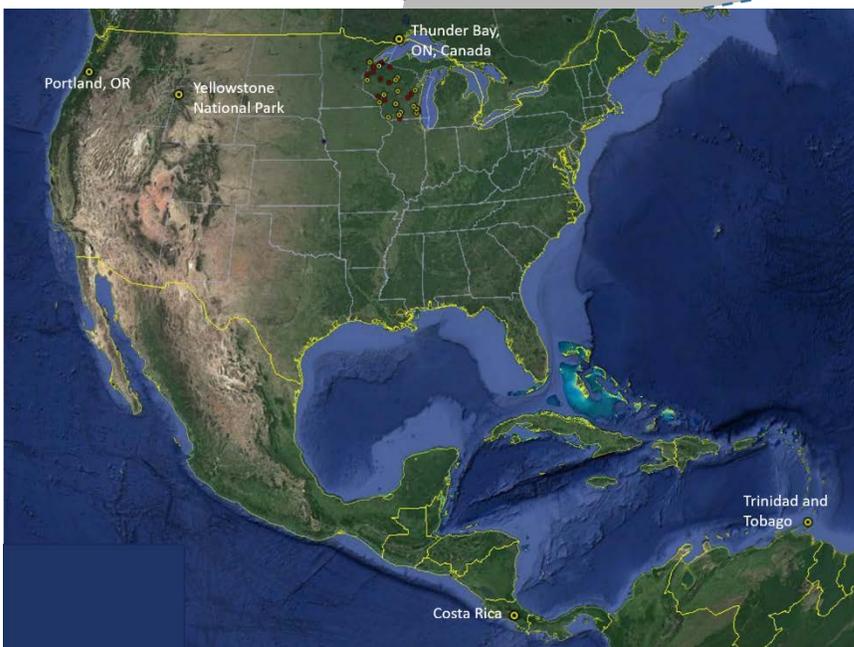
The DOTS curriculum has been facilitated in 25 different locations throughout North and South America, 21 of which were in the state of Wisconsin.

DOTS kits have even accompanied groups to engaging places such as Yellowstone National Park. They are most commonly used in school yards and parks to meet participants where they are, a principle of place-based education.

The DOTS kits have collected data in: Costa Rica; Portland, Oregon; Thunder Bay, Ontario; Duluth, Minnesota and Trinidad and Tobago, as well as throughout Wisconsin from Platteville to Superior and from Green Bay to Milwaukee.



This reach is possible because of all the educators who have been trained in the proper facilitation of the DOTS kits and the collaborations that have been created and fostered throughout two years of the program. These educators have been able to adapt the DOTS program to fit the needs in their own locations, and to better promote critical thinking, youth development, and overall environmental stewardship for the students who are engaged.



DOTS Kit Lending

After an educator is trained on use of the DOTS kits, they can participate in the DOTS Kit Lending program.

The educator fills out an online Lending Interest form, identifying their unique needs and uses of the DOTS kit. Collaboration occurs between educators and Upham Woods staff to get the most out of the DOTS kits curriculum programming.

DOTS
Digital Observation Technology Skills

DOTS Rental Interest

Program materials may include:
Lesson Plan 7 Role descriptions Recorder sheet
Document list Equipment list Spare batteries
iPad adapter Pencil Tablet

Rental equipment may include:
-Thermal Imager -IR Thermometer -Camera
-Light Meter -WiFi Microscope (and iPad) -Game Camera
-GPS -Kestrel Weather Station

Please circle which tools you intend to use

Who is your intended audience? Please Circle
Youth Volunteers Scouts 4-H Other _____

Number of kits you would like: _____

Requested length of time to use kits: _____

Have you attended a training with the DOTS kits? Yes No

Do you/ your group need a facilitator with the DOTS kits? Yes No

On the back of this sheet, please go into detail on how you intend to use the DOTS kits (purpose, events, learning objectives, etc.)

To learn more about the DOTS program or rental information contact Justin Hougham at justin.hougham@ces.uwex.edu or (608) 224-5965

Upham Woods Upham Woods Outdoor Learning Center

1934 County Road N
Wisconsin Dells, WI 53965
Phone: (608) 254-6461
Website: uwex.edu/uphamwoods/

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The DOTS kits are sent out via Spee-Dee Delivery Service to anywhere in the state for around \$7.

(Left) Youth from a 4-H group explore their local area using a DOTS kit sent to them through our lending program.

By the Numbers...

21

different organizations have participated in the DOTS Lending Program since 2015

1,646

youth and adults have been reached through the DOTS Lending Program

Including:

- University of Wisconsin Arboretum
- Calumet County Extension Office
- Washburn County Extension Office
- Rusk County Extension Office
- Bad River Band of Lake Superior Tribe-Chippewa Indians
- Juneau County Extension Office
- La Escuela Fratney
- Lynden Sculpture Gardens
- Juda School District



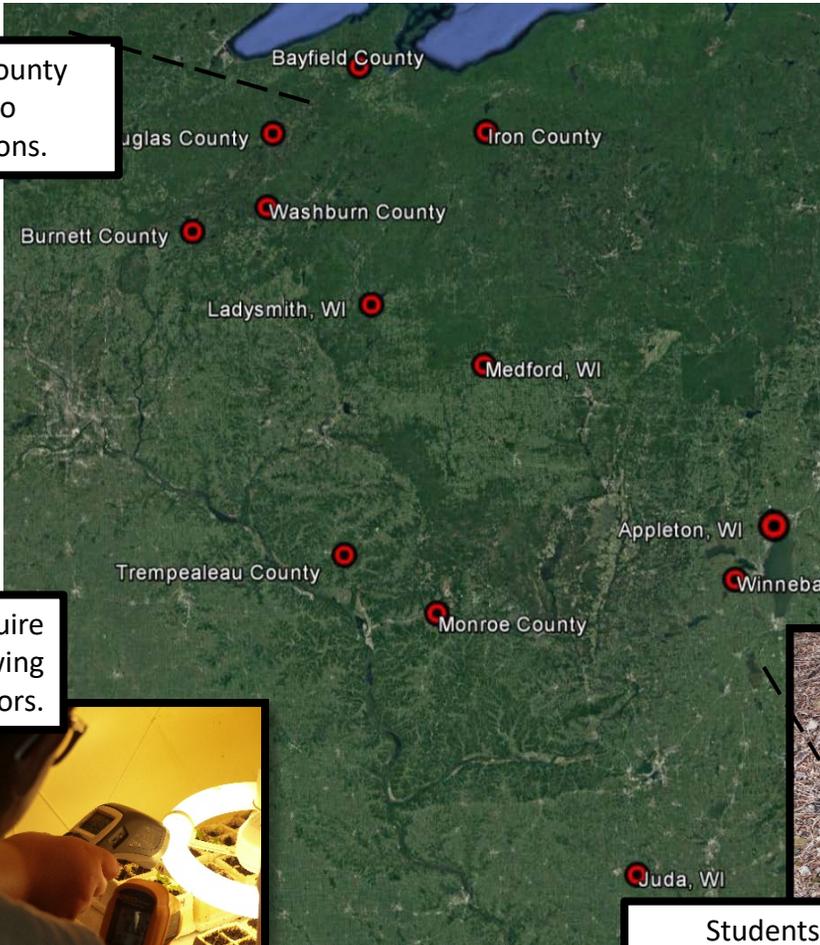
DOTS Impacts: Lending

Ten different organizations participated in the DOTS lending program in 2016. Trained educators from these areas use the kits to inspire youth and community inquiry and to enhance observations of the natural world.



The DOTS kits have been used in agricultural education classrooms to investigate plant growing conditions, in 4-H youth STEM development workshops to heighten youth observations, and even as tools to enhance data collection for water monitoring in far northern Wisconsin.

2016 Lending Locations



Youth in Bayfield county use the DOTS kits to enhance observations.



4-H Teens come together to investigate winter conditions and develop skills in STEM programs.

Students inquire about plant growing conditions indoors.



Students use the digital tools to inquire about a tree.

Workshops and Direct Programs



Many educators who have utilized the DOTS kits indicated that time is one of the major barriers preventing them from organizing or leading programs. This barrier is alleviated by running the DOTS kits programming from Upham Woods, where the kits are permanently housed. Both Direct Programs and Workshops are available.

Direct Programs involve Upham Woods staff facilitating a DOTS program while on site with visiting groups. Some educators and organizations can also request Upham Woods staff to run a DOTS workshop at their specific site. Both of these options are provided to spark interest and participation for educators who have not previously received training on the DOTS kits.

1,115
Direct
Program
Participants

Examples include:

- Washington County Nature Investigators
- Nekoosa STEM Event
- Discover Charter School Family Science Night
- UW-Extension Day at the WI State Fair

1,120
Workshop
Participants



Professional Outreach

To bridge the gap between theory and practice, Upham Woods staff continually share about DOTS kits outreach and impacts to the broader community. These events include presentations at professional conferences, publications in scientific journals, and leveraging grants to continue the financial support of the DOTS kits programs.

12 professional presentations

- WI Lakes Partnerships Convention
- WI Assn. of Agricultural Educators
- WI Society of Science Teachers Conference
- WI Assn. for Environmental Education- Winter Workshop
- National After School Assn. - TechXcite for STEM
- Northwest Advanced Renewables Alliance Conference
- North American Association for Environmental Education
- Association for Experiential Education

Publication in Journal of Extension

“Engaging At-Risk Populations Outdoors, Digitally: Researching Youth Attitudes, Confidence, and Interest in Technology and the Outdoors.”



376
Professionals
inspired by DOTS
in 2016



\$90,000 in grants in 2016 alone to support DOTS programming

- U.S. Environmental Protection Agency: Environmental Education Local Grants Program (EPA-EE-16-01) \$80,000
- Wisconsin Environmental Education Board: Engaging At Risk Populations Outdoors, Digitally \$10,000

DOTS Impacts: Permanent Kits

Some partners and collaborators have expressed interest in using the DOTS kits on a long-term or permanent loan basis. For these partners and collaborators, use of the DOTS kits are woven into the everyday curriculum; such as seasonal phenology studies, man-made vs. natural object temperature studies within classrooms and outdoor STEM programming.



Youth examine their local weather conditions during a program at Wehr Nature Center.

Having access to these permanent kits places these organizations and schools in position to apply for independent grant funding and substantially increase community outreach of STEM programming.



Over
2,000
youth served
by these
organizations



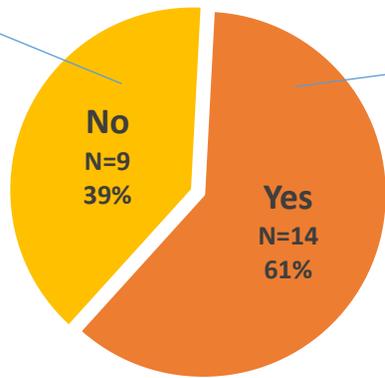
- La Escuela Fratney-Milwaukee, WI
- Maryland Ave. Montessori, Milwaukee, WI
- Wehr Nature Center, Franklin, WI
- Omaha Public Schools, Omaha, NE

DOTS: Educator Feedback

Educators who have previously utilized the DOTS programming resources were asked to provide feedback on the programs.

Q1: "I currently organize or lead programming in Environmental Education."

100% of these educators indicated that time was a barrier to doing programming. Other barriers included expertise and cost.



- Program topics include:
- Conservation and Land Stewardship
 - Wildlife Ecology
 - Forestry
 - Hydrology and Watershed science
 - Sustainability

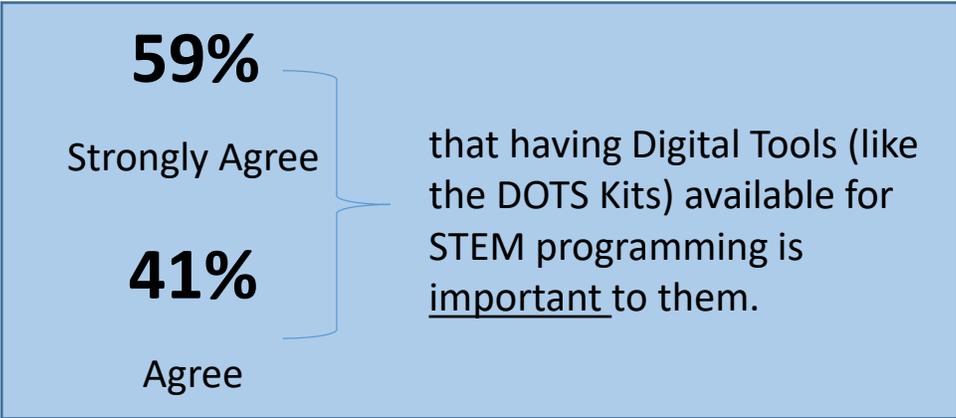
The most requested digital tools that educators would like to use more in their programming include (N=14):

- Digital, portable microscopes
 - 71% requested
- Data Collection Mobile Apps
 - 57% requested
- Thermal Imager
 - 50% requested

Educators indicated that other educators and youth within their community valued environmental education the most. 82% of educators conducted their programming in schools, with other popular programming options being nature centers, public lands, and local parks. Community partners are not limited to these places, environmental education program partners include state and national forests and parks, zoos and tribal communities.

Many educators are requesting more trainings and professional development in Place-based education methods, citizen science data collection and experiential education, fundamental pillars of the DOTS programming.

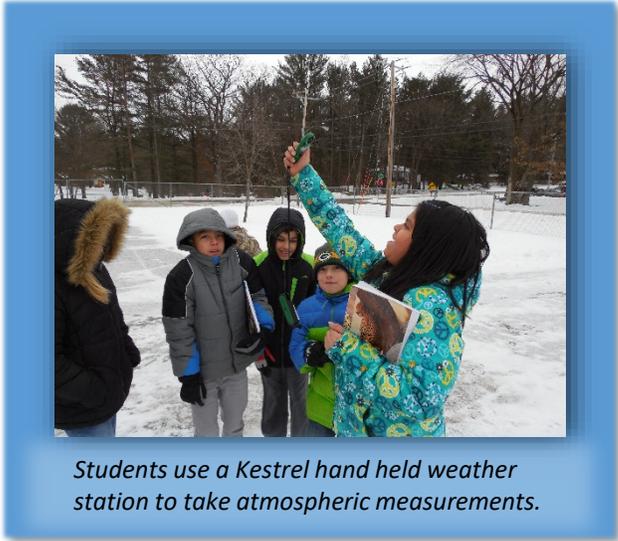
Of the educators surveyed:



Digital Observation Technology Skills (DOTS)

Digging Deeper with Data: A Case Study

Digging Deeper with Data (DDD) was a semester long project that allowed students to collect data on wind speed, air temperature, and surface temperatures of different objects in order to answer essential questions about our natural world. Addressing STEM initiatives and using common core standards in math, language arts, science, and reading, students participated in eight different lessons focused in climatology, microbiology, data analysis, and thermal inquiry. Students presented their findings to their peers bi-weekly which showcased their academic achievement, data processing and inquiry development skills.



Students use a Kestrel hand held weather station to take atmospheric measurements.

“The students spent more quality time observing leading to more purposeful writing.” *Mary Roberts 5th grade teacher, Portage Elementary*

DDD was the highlight of the year for many participating classes. This experience allowed students to thrive through hands-on learning activities and think critically about the environment in a manner that promotes civic engagement amongst peers. The culminating experience was a data summit at Upham Woods attended by four different 4th grade classes, from Portage and Lake Delton Elementary Schools. At this summit, they presented their final data and patterns to each other, allowing the students to compare weather patterns within the state while reflecting on how technology can help us understand the natural world.



Students familiarize themselves with the capacities of the tools indoors before taking their curiosity outside. Tools and support may be available for your classroom this year!

January



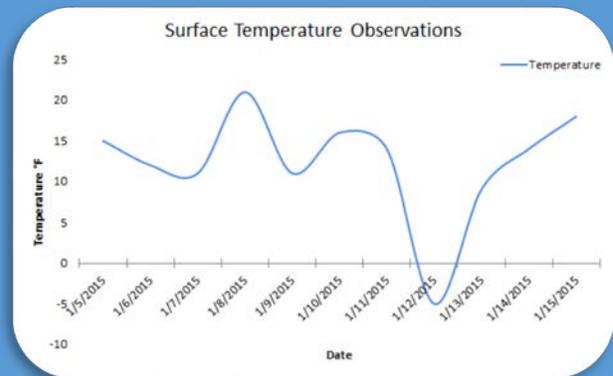
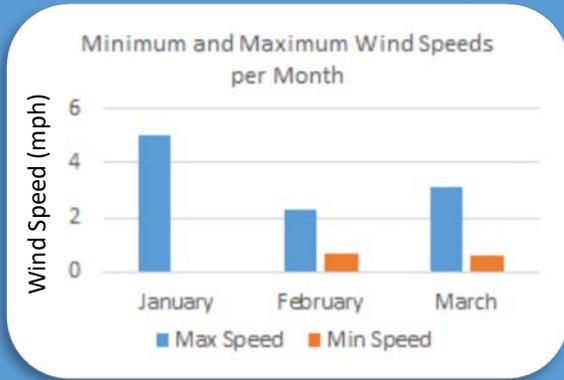
Research naturalists will help introduce the tools used in DDD and teach climate science, weather, data management, and other DDD related concepts to you and your class.

February



Students keep track of their daily observations by creating bar graphs of wind speed and air temperature. A large part of DDD is having students interpret their own results and share their results with others.

April



Third grade students took daily atmospheric measurements in their recess area over the course of the semester. Students input and analyze their own data and share their findings with other students.

In addition to the visits made by Research Naturalists, the teachers continued to run their own programming by taking daily weather measurements and conducting weekly journaling of weather patterns. DDD also provided an example of affordable deployment of technology tools: **the total cost of the entire kit was a mere \$150.** The study was longitudinal in design, focusing on data collection from set locations near their classroom over the spring semester. Although the DOTS kits have been available for rental by other teachers, 4-H educators, Extension employees, and informal educators throughout the state, there had not been a system by which to have a class use the kits in a longitudinal study over the course of an entire semester until 2015. This experience proved that long-term rental of the kits to a classroom is feasible and perhaps a preferred future model for the DOTS program.

“Students understood negative and positive numbers much more completely due to thermometer work.”

Amy Luebke 5th Grade Teacher, Lake Delton Elementary

“The students were able to see and make connections from educational readings to real life situations (Aha moments).”

Amy Luebke 5th Grade Teacher, Lake Delton Elementary

“Scientific thinking allowed them to have better understanding and processing due to practical data.”

Mary Roberts 5th grade teacher, Portage Elementary



“Teachers noticed after the project was over, the students spent more time thinking and processing information. The students’ observational skills increased because of the project.”



Engaging At-Risk Populations Outdoors, Digitally

Researching Youth Attitudes on Technology and Nature



Students use a field microscope in conjunction with a tablet to observe details of their surroundings as a part of the 2015 Project EARPOD. EARPOD was designed to research student engagement in a technology-rich learning environment outdoors.

Project EARPOD: Engaging At-Risk Populations Outdoors, Digitally was a program funded through the 2014-2015 Wisconsin Environmental Education Board (WEEB) grant. Project EARPOD used an integrated technology program to engage underserved youth in meaningful outdoor experiences that increased environmental literacy and provided substantial evaluation data with implications for pedagogical approaches in environmental education. This project collected data on the impact of classic and technology-integrated environmental education programming on youths' environmental awareness, knowledge, and attitudes towards the natural world. Research in this area will help future educators and administrators make decisions regarding best practices and resource allocation within the field of environmental education.



Students first use hand lenses and field guides to observe details and figure out the identity of a tree growing on their school grounds.



Students then use state-of-the-art resources to examine their surroundings and learn more about what they cannot see at first glance.



Students create scientific sketches of what they see without the aid of technology and then again with the use of the provided technology tools.

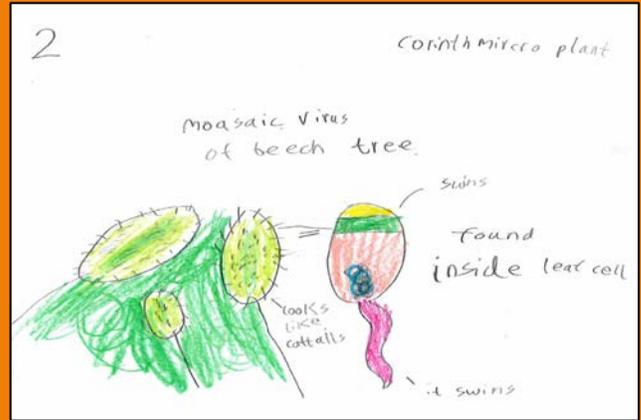
Classic Observation

Technologic Observation

Scientific Sketches



Students create personal scientific sketches of what they observe with analog tools as well as with technology tools. Observations connect students with minute details of the world around them. Corinth Micro Plant (tablet app) allows students to zoom into and learn about a tree's leaf, down to the cellular and sub-cellular level.



Results: Changing Student Attitudes on Technology and the Outdoors



EARPOD met students on their home turf: a technology rich environment. By using technology to enhance outdoor observation, students have significantly more interest in the use of technology outdoors and interest in observing plants and birds (see table, right). Student's confidence in knowing about and using mobile technology has also increased due to this project. Capable, confident students with a new found passion for outdoor observation are eager to contribute to both the scientific and local communities.

Assessment Questions	Pre	Post	Difference	p Value
I know about different types of technologies*	3.81	4.15	0.34	<0.001
I like to be outside	4.39	4.48	0.09	0.236
I like to use technology*	4.25	4.46	0.21	0.017
I know how to use different technologies*	3.76	4.11	0.35	<0.001
I like to use technology outside*	3.40	3.99	0.59	<0.001
I can use technology to learn	4.33	4.44	0.11	0.12
I care about nature	4.57	4.52	-0.04	0.53
I use technology at home	4.38	4.51	0.13	0.098
I can use technology to have fun*	4.35	4.54	0.20	0.024
I like to look at birds*	3.53	3.87	0.34	<0.001
I like to look at plants*	3.57	3.97	0.40	<0.001
I want to learn more about technology	4.15	4.29	0.15	0.123

Students were asked the above questions before and after the EARPOD lesson (n=136). Answers were collected on a five-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). The average response was calculated with total paired student responses. Differences in the average between pre and post assessment were then calculated. To test for significance, a paired t-test was calculated for each assessment question.

*Assessment questions that have significantly different post assessments scores when compared to pre assessments. This means that the measured change in response is due to the EARPOD lesson and not random variation in responses.



"It was amazing to see the level of excitement in each and every student when they were given the responsibility of exploring the outdoors with the Microsoft Surface tablets, microscopes, and Corinth Micro Plant App."



Digital Observation Technology Skills (DOTS)

La Escuela Fratney: A Case Study

The case study with La Escuela Fratney highlights the first three month partnership that was created between one school teacher and the Research Team at Upham Woods. La Escuela Fratney represents a case of repeated exposure to the DOTS curriculum and to the DOTS tools and equipment. It culminated with a mini elementary research symposium which was the first of its kind. Upham Woods hopes to use the process detailed below with many other schools.

Sarah Oszuscik, 5th grade science teacher at La Escuela Fratney, a public Elementary School in Milwaukee County, attended a Digital Observation Technology Skills (DOTS) educators training at the Urban Ecology Center in Milwaukee on June 24, 2015 through the Latino Earth Partnership.



The 5th grade students from La Escuela Fratney display their skills with the DOTS tools

After this educator training in the summer, Sarah was interested in lending several DOTS kits for the 33 5th grade students in her school to use in their own classroom over the fall semester, in preparation for their visit to Upham Woods in November. Three DOTS kits were delivered to her through the DOTS lending program, and Sarah developed a schedule for the kits' intended use throughout the time the kits were at Fratney.

With the help of the Upham Woods Research Naturalists, the mobile technology tools were first introduced to the 5th grade students, allowing them to develop tool familiarity in an indoor setting.



The students gained experience using the tools outside as they investigated the area surrounding their school. They explored tool capabilities and made temperature connections to a familiar place.

September



Outdoor inquiry continued as the students took the DOTS kits on a field trip to the Lynden Sculpture Gardens in Milwaukee. They utilized the tools in an aquatic macroinvertebrate lesson, as well as in an exploration of the various sculptures in the area.

October



The students came to Upham Woods and participated in the DOTS program on Blackhawk Island. They also participated in a technology grant that studied their attitudes towards technology and the outdoors.

November

The second exposure to the DOTS tools came about one month later during a field trip the students took to the Lynden Sculpture Gardens. The Research team from Upham Woods once again met with the students to help facilitate open inquiry investigations.

Throughout the month leading up to this field trip, the students were able to utilize the DOTS tools in their everyday classroom environment, and it showed! The students were much more comfortable with the tools, and had a better grasp of their capabilities. The students were able to create their own questions and find their own answers with the tools they had available. The students were beginning to make critical observations about their surroundings



Research Symposium at Upham Woods



The culmination of this three month project resulted in an elementary-level research symposium, in which the students presented their scientific findings after participating in the technology programming at Upham Woods. They prepared posters full of photos, drawings and descriptions. The students shared what they had observed, connections made, and questions that they still had after their investigation.



This symposium was a way to synthesis and analyze all of the repeated exposures the students have had to the DOTS tools and lessons. The students were genuinely engaged, eager, and excited to share their findings with each other, their teachers, and the Upham Woods staff.



A student taking the time to reflect after using the DOTS tools to look at aquatic macro-invertebrates

It was evident that the technology resources and programs offered through Upham Woods had given the students a valuable educational experience that will impact their future time spent outdoors.



Students use the DOTS tools to explore the sculptures at the Lynden Sculpture Gardens

To learn more about the DOTS program, Kit lending, and keep up with what's new at Upham Woods,

visit our website:

<http://fyi.uwex.edu/environmentaleducation/>



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