Engaging At-Risk Populations Outdoors, Digitally

Researching Youth Attitudes, Confidence, and Interest in Technology and the Outdoors

Dr. R. Justin Hougham, Marc Nutter, Alex Nussbaum,

Taylor Riedl, Max Myers, Lori Berget, Kayla Oberstadt, Andrea Braatz, and Sarah Oszuscik

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University of Wisconsin-Extension

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Abstract

Project EARPOD: Engaging At-Risk Populations Outdoors, Digitally (EARPOD) was a research study funded through the 2014-2015 Wisconsin Environmental Education Board (WEEB) Technology Grant. EARPOD used an integrated technology program to engage underserved youth in meaningful outdoor experiences that increased environmental literacy in youth and provided substantial evaluation data with implications for pedagogical approaches in environmental education. This study collected data on the impact of classic and technology-integrated environmental education programming on youths' environmental awareness, knowledge, and attitudes towards technology in the natural world. Lessons were conducted in small groups, encouraging youth-youth mentoring with regards to tool use and observation which promoted teamwork within groups. Results indicated that best practice in environmental education is to adopt technology tools whenever possible. Students in this study self-reported three main characteristics with regard to technology: increased confidence in using mobile technologies outdoors, increased knowledge of available technologies, and increased knowledge of using different technologies. As a result of participation, students believe that they can use technology to have fun, one of the first steps in engaging digital natives in learning objectives. Furthermore, participants reported statistically significant increases in the desire to observe plants and birds. The results of the Project EARPOD study will help future educators and administrators make decisions regarding best practices and resource allocation for the use of technology within the field of environmental education.

Situation

Best education practices suggest educators should "identify underserved student populations related to environmental literacy and sustainability" (Wisconsin Department of Public Instruction, 2011). Environmental education professionals suggest educators pursue projects that include increasing access to environmental education for communities that are lacking such programs or resources (National Environmental Education Advisory Council, 2015). Underserved student populations may be lacking effective environmental education programs, but the ubiquity of mobile technology persists in most youth populations (Lenhart & Pew Research Center, 2015). Furthermore, youth maturing in the digital age are technologically advanced; educators need to adapt to the students' changing learning styles (Prensky, 2001b).

The shift in emphasis towards electronic usage is a key characteristic of the youth generation that has been raised with ubiquitous mobile technology – referred to as "digital natives." (Prensky, 2006). How do collaborators in environmental and sustainability education reach youth that are increasingly 'plugged in' to electronics, but who would benefit greatly by being 'unplugged' in nature? The call to invent new digital native methodologies across all subjects was made over a decade ago (Prensky, 2001a). Educators are now engaging youth to help invent these new methodologies. Research and evaluation is needed to hone the most effective educational practices in the digital age.

To engage learners at a visceral level, first, educators need to see the subject material from the student's perspective and understand how students process information (Visser & Visser-Valfrey, 2008). To make things more challenging, the way students perceive and understand content differs significantly from how today's "digital immigrant" educators comprehend and teach the material (Prensky, 2001a). Project EARPOD met the needs of digital natives by providing an opportunity to engage with nature through the lens of new mobile technologies and place-based education while assisting digital immigrant educators in navigating this new, digital landscape of today's youth. The influence of technology on student attitudes was the focus of this research, studied through parallel lesson plans—one technology-based, implementing a Microsoft Surface Pro 3® tablet and applications, and the other with traditional education tools such as field guides and hand lenses.

The authors of *Growing Youth Water Literacy and Stewardship and Extension Capacity for Youth Water Programming in the North Central Region* indicate that focused, local, and scientific observations of watersheds may be the best way to get students connected to potential water quality issues happening in their own communities. This knowledge of the precise happenings in their communities may excite some youth to civic action and peer-to-peer leadership to problem solve an issue. The authors go on to suggest that mobile, digital technologies become integrated in research-based educational programming (Million, et al. 2016) in order to promote science education, workforce development, and team leadership in students. They chose to test youth attitudes regarding technology and the outdoors to provide much needed feedback to determine the best course of action in youth development with regards to scientific environmental education.

While several resources currently exist for teaching Environmental Education in 4-H Youth Development programming, there is very little in that curriculum that addresses digital tools for exploring the environment (University of Minnesota-Extension, 2010). A curriculum such as *Exploring Your Environment: Ecosystem* Services or *Exploring Your Environment: Earth's Capacity* published and developed by the University of Minnesota 4-H Youth Development are great traditional environmental education offerings that could be enhanced with connections to digital tools. The objective of the Project EARPOD study was to evaluate the suitability and potential of one method of digitally enhanced curriculum to connect youth to environmental education by assessing youth's confidence and interest in learning in the outdoors while using technology as a lens.

Objectives

Project EARPOD sought to determine how incorporating technology in outdoor educational programming would affect students' confidence and interest in the use of technology and of the outdoors. Likert (1932) developed a widely-used survey technique that provides a series of statements regarding a particular topic and allows the respondent to self-assess their level of agreement to each statement on a sliding scale. Project EARPOD researchers chose to use a Likert-type survey instrument due to its insightful look at respondent attitudes and comparative power of attitudes before and after a given intervention. They evaluated the learner program objectives by distributing identical pre and post assessments to participating students via the Qualtrics Survey Platform or in paper form both before and after EARPOD intervention. The research questions, which are listed below, provided students with various statements relating to the use of technology and the outdoors. The survey allowed participants to self-assess their personal level of agreement with each statement by responding with: strongly disagree, disagree, neutral, agree, or strongly agree.

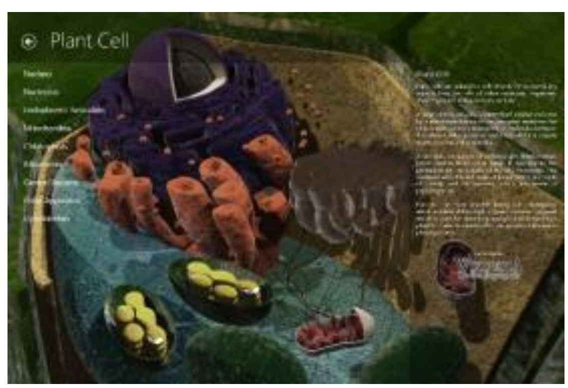
- I know about different types of technologies
- I like to be outside
- I like to use technology
- I know how to use different technologies
- I like to use technology outside
- I can use technology to learn
- I care about nature
- I use technology at home
- I can use technology to have fun

- I like to look at birds
- I like to look at plants
- I want to learn more about technology

These survey questions were developed by the Upham research team and were aimed at a fifth grade reading comprehension level. The simple statements provided various ways of looking at the research study's main questions: are students confident in using technology outdoors, do students believe they can use technology as a learning tool, and do students have an interest in observing the outdoors. The researchers compared pre and post responses from individuals to determine if any change occurred for each individual.

Methods

The Project EARPOD study relied on a 90-minute lesson that expressed the importance of making scientific observations while being outdoors. This lesson contained a 30-minute "classic observation" portion that used analog tools such as hand lenses and field guides, followed by 30 minutes of a "technology enhanced observation" portion that utilized digital microscopes and Microsoft Surface Pro 3® tablets with associated apps (Celestron MicroCapture Pro and Corinth Micro Plant). See Figures 1 & 2, for screenshots of the Corinth Micro Plant app. The lessons were presented in such a way that students developed their own inquiries to explore the



Figures 1 & 2: Screenshots of the Corinth Micro Plant app. Students were able to zoom into the structure and function of a generic tree. Students explored and learned about details of the cellular structure and function of plant cells by tapping different organelles.

environment while making science-focused observations with the resources that were provided in each portion. Each of the classic and technology enhanced portions concluded with the students producing a scientific sketch that included labeled drawings and notes of their observations.

Schools involved in the Project EARPOD study were selected based upon the Wisconsin Department of Public Instruction's news release (2014) that described each Wisconsin school district's level of participation in the free and reduced lunch program. Using the student population's participation in this program as a proxy for poverty and "at-risk" for low school performance, the researchers gave participation preference to those school districts who were at or above the state average of 43.3% student enrollment for the 2013-14 school year. In the final push to achieve the commitment to affect 240 youth by the end of the calendar year, researchers engaged school districts that were slightly below the state average, yet still in areas of need. See Table 1 for a summary of the participating schools and 4-H groups with total student and adult headcounts for each group.

Before the EARPOD lesson, students were asked a series of 12 questions relating to their feelings of technology, environmental observation, and the role of technology in the outdoors, listed above. The researchers purposefully stated survey questions using a positive tone: *"I like to be outside," "I like to use technology," "Technology can be effectively used outside,"* etc. in order to make analyzing responses and changes in responses straightforward. Responses were collected on a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree) for each question. After the lesson, the researchers asked the students the same questions in order to quantify any differences in confidence and attitudes. Researchers tracked individual responses by school-issued student identification number and compared individual responses before and after the lesson and activities.

Data was cleaned for analysis by omitting 1) student responses that did not have both a before and after response and 2) student responses that did not complete all questions. Central tendencies of student responses before and after the lesson were calculated with Microsoft Excel. Differences in mean, median, and mode for each question provided insight with respect to the level of interest in technology and the environment before and after EARPOD. With the cleaned data set, researchers performed paired t-tests to determine if the differences in means were statistically significant for each assessment question.

The Lyndon Station Elementary Case Study and Appendix A show the reader how EARPOD interventions were conducted with the students. The case study is provided to explain what happened when EARPOD was conducted with Lyndon Station Elementary students onsite at Upham Woods. Appendix A consists of the EARPOD lesson plan as it was used when La Escuela Fratney, of Milwaukee Public Schools, visited Upham Woods.

Date	School/Group	Age Range	Youth	Adults
10/27/2015	Camp Salem Elementary	12 -- 13	62	1
9/28/2015	Lyndon Station Elementary	7 -- 9	28	2
11/11/2015	La Escuela Fratney	7 -- 9	32	3
11/20/2015	Rusch Elementary	8 -- 9	34	2
12/11/2015	Black Hawk Elementary	8 -- 11	77	5
12/12/2015	4-H Group in Oshkosh	9 -- 14	12	7
		Total	**245**	**20**

Table 1. Overview of group type and location, youth age range, youth participant numbers, and adult observer numbers for each participating group. Grand totals for youth and adult participants are displayed in the bottom row.

Lyndon Station Elementary Case Study

Project EARPOD researchers met with Lyndon Station Elementary near the flagpole at Upham Woods on September 28, 2015. The students gathered around in a large circle and played the “Five-Second Survey” game, which consisted of asking the youth to look around them for five seconds and observe everything they could. After the students observed everything around them, researchers asked the students to close their eyes while they were quizzed on the attributes of their surroundings such as “point to an object that is red” and “point to an object that has a straight line.” The goal of the Five-Second Survey was to get students thinking about the importance of making scientific observations of the world around them.

The adults read the *Adult Observer Informed Consent form (Appendix B)* and filled out an *Adult Observer Pre-survey (Appendix C)* in paper copy. It was confirmed that the students had already taken the electronic pre-survey for participants before arriving. The student *Youth Assent Form for Technology Project Evaluation (Appendix D)* was read aloud to the students. Then, the group split in half, with approximately 15 students and two adults per group. These two groups were to assigned to travel to opposite ends of the Riverbed Trail. While walking, the students talked in pairs about what they already knew about trees and what they wondered about trees, and they also made observations. Each group stopped a couple of times on the way to their destinations to quickly discuss some answers and observations and prompt additional questions. Once they had arrived at their Riverbed Trail destinations, the groups began to discuss trees, and more specifically leaves. Both groups began with the "I Notice, I Wonder, It Reminds Me of..." (INWR) scientific observation activity, which was developed by BEETLES (2015). The students were asked to look around to individually locate an oak leaf to make observations about and share with four other students.

After this activity, the EARPOD lesson differed for the two larger groups that were at different locations along the trail. One group went on to study the leaves with the use of technology, specifically a Microsoft Surface Pro 3, Celestron Digital Microscope and Microsoft application Corinth Plant. This allowed them to get a closer look at the “bumps” or “lines” that they observed and see features that they could not have otherwise seen with the naked eye (e.g. cellular structure, bacteria etc.). The other group used hand lenses to make closer observations about their leaves during using an INWR activity. Then, they used dichotomous keys to identify the types of leaves that they had found.

Both the technology enhanced and classic observation groups ended with students taking time to journal about their observations. Students sketched features they thought were interesting and noted what they learned during the lesson. After journaling was complete, the groups swapped, allowing all students to participate in both the technology enhanced and classic observation sections. For consistency, the same instructors taught the same program both times. After both programs were complete, each group returned to the flagpole, sharing observations and things that they learned with a partner along the way. Once all were gathered around the flagpole, the entire group shared personal discoveries as a concluding activity. Researchers informed the adults in the group that they would receive post-surveys for their class to complete and return within the next week.

Results

Table 1 indicates total number youth and adults reached by the Project EARPOD study. The study was conducted with youth, ages seven through 14. Although a total of 245 youth and 20 adults participated in the study, not all of the students completed both pre and post assessment. Student responses that did not have a pre and post matchup were omitted from the final analysis. Additionally, students from Camp Salem Elementary took a slightly different version of the assessment due to their higher age, which omitted an additional 62 responses from the overall group analysis. In total, 136 students that took the exact same assessment had both pre- and post-responses in which every question was answered. Those results were analyzed as mentioned in the Methods section. The time elapsed between when the pre assessment was taken and when the post assessment was completed was at most one week. In many cases, the pre and post assessment was completed by the students immediately before and immediately after the lesson delivery. This short time frame between administering the pre and post assessments and the delivery of the lesson allowed the researchers to draw conclusions regarding the differences between the assessments as a result of the lesson content and method of student engagement.

Broad changes in students' attitudes and confidence were noted. First, there was an increased total number of students who chose "strongly agree" for many questions. The most common (modal) response of all the questions in the post assessment was "strongly agree." With the majority of students strongly agreeing with the research questions, which were framed in positive tones, researchers concluded that utilizing digital technologies in the EARPOD scientific observation lesson helped change students' perspectives in positive ways. See Table 2, for the complete summary of results including the question prompt, the average student response, the modal response for each question, and the differences of the mean and mode between pre and post results.

When asked if they knew about different types of technologies before the lesson, most students agreed. After the lesson the most common response was "strongly agree." When a paired t-test was performed looking at the difference between the pre and post results, a significant difference was found, indicating that students' confidence in knowing different types of technologies had increased as a result of this lesson. A similar story was true for the prompt "I know how to use different technologies." Interestingly, when students were prompted with the statements, "I like to use technology outside" and "I like to look at birds," the average response was "neutral" before the lesson, and changed to "strongly agree" following the lesson. These results indicated that by using technology tools in an outdoor setting, youth's perspectives on using technology outdoors had quickly shifted. Similarly, the interest in viewing nature increased as a result of this lesson from a "neutral" most common response to "strongly agree" in the case of "I like to look at birds."

	Mean			**Mode**			**T-Test**
Assessment Questions	Pre	Post	Diff	Pre	Post	Diff	p value
I know about different types of technologies*	3.81	4.15	0.34	4	5	1	<0.001
I like to be outside	4.39	4.48	0.09	5	5	0	0.236
I like to use technology*	4.25	4.46	0.21	5	5	0	0.017
I know how to use different technologies*	3.76	4.11	0.35	4	5	1	<0.001
I like to use technology outside*	3.40	3.99	0.59	3	5	2	<0.001
I can use technology to learn	4.33	4.44	0.11	5	5	0	0.12
I care about nature	4.57	4.52	0.04	5	5	0	0.53
I use technology at home	4.38	4.51	0.13	5	5	0	0.098
I can use technology to have fun*	4.35	4.54	0.20	5	5	0	0.024
I like to look at birds*	3.53	3.87	0.34	3	5	2	<0.001
I like to look at plants*	3.57	3.97	0.40	5	5	0	<0.001
I want to learn more about technology	4.15	4.29	0.15	5	5	0	0.123

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

*Accepting a 95% confidence interval, questions that have statistically significantly different post assessments when compared to pre assessments are also labeled.

Implications

EARPOD met students on their home turf: a technology rich environment. By using digital technology to enhance outdoor observation, study results showed that students developed a heightened interest in the use of technology outdoors as well as an increased interest in observing plants and birds. Students' confidence in knowing about and using mobile technology also increased. The Project EARPOD study suggests that incorporating technology in science education can enhance student's self-reported confidence and interest in digital tool use and observation.

There are many conclusions that the researchers have drawn from the results of this study, including insight on scaffolding and curiosity building techniques. When focusing a lesson on scientific observation of one's surroundings, it appeared to be important to start with broad scale observations of color, shape, and texture to allow a general context within which students could make more focused observations. Scaffolding observational resolution is also related to scaffolding observational techniques. For instance, each student started a hand lens for personal observation. This made it possible for each student to explore any aspect of the tree they wanted, allowing them to create their own authentic narrative in which they were invested. Then, with peers nearby to share with, students could individually focus on their chosen portion of the tree in the hand lens, and transfer that skill of focusing from the hand lenses to the digital field microscopes in a team member approach to enhance scientific observation. By starting with something that was almost intuitive to use, and moving toward a tool they had never used, students could scaffold their own observational skills while educators introduced additional tools that enhanced observation and clarify concepts.

School groups in this study focused on plants but also reported an increase in the eagerness to look at and learn more about birds. This suggests that when scientific observation skills are taught to students, much more than observational skills are heightened. An attitude of curiosity is nurtured with careful and precise observation, resulting in students scrutinizing additional components of their environment more closely. This finding alone implores outdoor educators everywhere to teach their students how to become better observers rather than focusing on teaching them how to name, memorize, or categorize. The results of this study suggest that after a student practices scientific observation of one organism, they will increase their curiosity in other aspects of the natural world and, perhaps, their place within the whole environment.

As noted above, this study involved the use of a tablet app to allow students to learn about the cellular structure of broadleaf trees. Educational apps come and go, and are usually platform-specific. Because of this, educators must constantly be aware of this changing educational environment and be ready to adapt to the tools and resources available.

Empowering youth with the tools and responsibility to examine their surroundings using mobile technologies should be incorporated by outdoor educators who aim to engage the next generation of students in scientific observation. By encouraging youth to take and use technology outside, educators can capitalize on their learners' existing way of thought while honing their observation skills in original ways.

The next steps for extending this project into a repeatable model include generalized curriculum and volunteer training. Generalized curriculum, or that which is situated in a 'grab and go' format will be designed to support the deeper version of the lesson presented here. A 20 to 30 minute grab and go module will be used to build interest and familiarity with the topic, supporting what would later be a longer lesson. Volunteer training -or training the trainer- is another next step for extending the impact of this research. A cohort of trained staff did this research project. This training included instruction on the curriculum, evaluation and the digital enhancement of the lesson. In total, this training took two hours and could be combined with a longer training session on environmental education methods and/or approaches to effectively using technology in youth development.

Research, evaluation, and future studies should look at other ways to engage the youth of today in scientific observation and measure the amounts of knowledge gained through classic inquiry-based instruction and digitized inquiry-based instruction. Additionally, future study is warranted in a broader range of content topics as well as age groups. This study, however, provides a viable starting point for educators looking to bring their environmental education into the digital age.

Potential Impact for Educators and Collaborating Educator Feedback

Educators who partnered on this project found it to be of value and see a future for its growth. For educators who infuse hands-on learning into their curriculum, the EARPOD project allows educators to see how the confidence of the youth grows – using the digital technology to magnify an item found in nature, draw it and tell about it to their peers. When the student connects the nature item to the enlarged photo on the tablet, it allows them to see the structural makeup in a much more scientific mode. They can see the individual cells and begin to understand how they can use digital technology to study nature and learn more about it. Students have the opportunity to increase their interest in learning about nature, increase presentation skills and work together in a teamwork setting. One partnering educator reflected that, *"The EARPOD project will be a great resource for youth, especially in middle school and high school classes, after they have had some natural resource background. Students will begin to connect the sciences of cellular structure to organisms found in their own backyard. In the long run, students will begin to connect how we treat our environment to what is able to live there – and become aware of environmental education on a deeper level."*

The technology utilized through Project EARPOD is highly versatile and easy to use, making it ideal for any environmental education setting. Facilitators do not necessarily need to have a strong background in environmental education in order to effectively deliver a Project EARPOD based curriculum. Because of this, many user groups could successfully implement a technology based environmental education program including scouts, 4-H, YMCA, Boys and Girls Clubs, youth camps, church groups, schools, etc. The EARPOD technology fits into Agriculture Education curriculums, Science curriculums, Environment Ed Curriculums and Social Studies Curriculums (as an added resource or stand-alone concept). In the era of individualized IEP's, the EARPOD concept will be a great resource for educators to have. There are a vast number of potential applications of the technology from more simple, such as basic exploration of a nature space, to more complex, such as conducting an energy audit of a building or a climate change study.

One of the EARPOD implementation sessions was held in a county Science, Technology, Engineering, and Mathematics (STEM) event. The educator hosting reflected that *"As a 4-H Youth Development Educator, I have witnessed the enthusiasm for discovery that was present during Project EARPOD activities when youth were able to engage in hands-on learning, both digitally and traditionally. After hosting a local environmental education day to 4-H members in Winnebago County, the use of EARPOD curriculum and DOTS* [Digital Observation Technology Skills] *kits proved to capture young people's interest in exploring the outdoors. This interest shows a need to offer these types of programs in a non-classroom setting again in the future - which is where 4-H has a captive audience!"* The use of these curriculums at a local level has helped spark enthusiasm to promote attendance at 4-H camps and other environmental education events. 4-H can provide an opportunity for young people to explore further educational interests which may not be found in their school, and Project EARPOD was one experience to offer as an outlet to additional learning.

In regards to future use, Project EARPOD could be successful inside and outside of school settings, at camps, and in one-time offered activities. The opportunity for young people to get outside, use technological resources, and work together in small groups bridges a tech savvy population with the consistent scientific wonder that lies in nature. Given the relationship with educators and naturalists through UW-Extension from Upham Woods Outdoor Learning Center, there is further opportunity to utilize practical experience (such as that detailed in this paper) as a resource and the tech tools that can be borrowed and utilized in a local setting. Further trainings could be offered to train additional facilitators, such as afterschool coordinators and 4-H volunteers, to broaden the reach of the successful curriculum that Project EARPOD maintains.

Meeting our students where they are at in addition to valuing prior experience and the knowledge that each individual brings to the classroom is an important aspect of "culturally responsive teaching." Many of our children arrive with skills in using technology to play, but not to learn. By thoughtfully putting technology into their experience as budding scientists, educators at all levels build on a platform that many children are already comfortable with (tablet technology and apps it supports) and expand their experience as observers in nature.

The tools also enable a teacher-as-facilitator role and put the student at the center of their experience and learning. Numerous students presented with a seemingly simple task of leaf observation and plant identification discovered in short order that their focused careful observations led them to dive deeper and begin to pose questions about organisms they noticed or ecological phenomena they may not have seen before as well as big topic questions that current scientific communities are grappling with now. Moving forward, EARPOD and like programs offer an introductory experience for educator and student alike that lends itself to applications in larger scale student-led inquiry projects given more time and access to materials and teachers willing to continue to carry on in the role of facilitator.

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Appendix A: Basic Lesson Plan for EARPOD

MATERIALS:

- Pens/pencils, paper, clipboards (1/student)
- Hand lenses (1/student)
- Microsoft Surface Pro tablets with appropriate software (Celestron MicroCapture and Corinth Microplant) (3)
- Celestron Handheld Digital Microscopes (3)
- Tree field guides/ Dichotomous keys (3)

OBJECTIVES:

- Students will formulate scientific observations and develop questions regarding trees
- Students will be able to use a dichotomous key to identify a tree based on its leaves
- Students will explore microscopic details of trees, leaves, and bark with digital field microscopes with accompanying Microsoft Surface Pro tablets
- Students will be able to navigate the Corinth MicroPlant app to learn about cellular details of plants

INVITATION (large group, near flag pole) (5 minutes)

1. Look at the students and tell them, "We are going to be like scientists today. Share with a person next to you one thing you think a scientist does." (Allow 1 minute of sharing).
2. Solicit two different opinions in a large group. If it doesn't come up, explain that making observations is really important to science.
3. Tell students: "It helps us to ask questions about the world around us. We are going to play a quick game that will help us to keep our minds sharp and making good observations."
4. Play Five-Second Survey (as described in the methods section, above)
5. Read the *Youth Assent Form for Technology Project Evaluation (Appendix IV)* which states that participation is voluntary, and the answers to their assessment will not be shared, nor will their participation in or opting out of the study affect their current or future Upham Woods experience.
6. Distribute pre assessments in order to determine the baseline knowledge, confidence, and interest that students have with regards to technology and nature observation.

EXPLORATION/APPLICATION/REFLECTION (60 minutes total, 30 minutes for each part (Classic Observation/Technology Enhanced Observation) - Stay as large group and head to observation location.

1. Ask students to make observations out loud in pairs while walking. (E.g. I notice… statements.)
2. Ask students to share what they already know about trees. When students share, ask them to provide some evidence. (E.g. Why do you know/think that?)
3. Invite students to ask questions out loud in pairs while walking. (E.g. I wonder… statements.)
4. Ask students to tell the people around them what their object reminds them of. (E.g. It reminds me of… statements.)
5. Explain that students are about to investigate one part of a tree--the leaves--to learn as much as they can, just like scientists do.

6. Classic Observation:

   In three smaller groups, find similar leaves to observe.

   - Facilitate the "I Notice, I Wonder, It Reminds me of…" (INWR) activity. Have students make as many observations as possible using the sentence prompts: I notice… I wonder… It reminds me of… (BEETLES, 2015).
   - Group share some discoveries.
   - Distribute hand lenses and dichotomous keys, and ask students to use them to learn even more about their leaves/trees. Try tree ID.
   - Distribute journals, and invite students to create a scientific sketch of their leaves. Remind students that a scientific sketch includes drawing the object and notes about everything they now understand.

5. Technology Enhanced Observation:

   In three smaller groups, find similar leaves to observe.

   - INWR again, make as many observations as possible—use lobed or toothed leaf.
   - Group share some discoveries.
   - Distribute tablets and digital microscopes, explain appropriate use of technology (handle with care, making sure the members of their small group can see the screen when in use, sharing the scientific tool with all the members of their group, etc).
   - Have students use the digital field microscope (Celestron Handheld Digital Microscope) and then the Corinth Microplant app to learn more about their leaf.
   - Distribute journals, and invite students to create scientific sketches of their leaves. Remind students that a scientific sketch includes drawing and notes about everything they now understand.

6. Distribute postassessments in order to determine the new level of knowledge, confidence, and interest that students have with regards to technology and nature observation.

CONCLUSION: Walk and Talk (10 minutes, includes some travel time)

Have students respond to the following questions, changing partners after each question:

- What is something interesting you observed about one of your leaves?
- What is something you learned today?
- What else do you want to know about leaves?

Appendix B: Adult Observer Informed Consent Form

Upham Woods Outdoor Learning Center, Department of Youth Development, UW-Extension, Adult Observer Informed Consent

The "Engaging Digital Natives Outdoors" project is an experimental program being conducted by Upham Woods during 2015. The project is designed to help staff at Upham Woods and the University of Wisconsin-Extension better understand how using technology affects youth's experiences in the outdoors. We seek to learn whether using Microsoft Surface's and other technologies during camp has a positive effect, a negative effect, or no effect on youth's feelings of *connection* to, level of *engagement* with, and *understanding* of nature. Upon completion of the research study, results will be disseminated through a variety of methods which may include: conference presentations, published journal articles, internal UW-Extension articles, internal Department of Youth Development reports, and other written or oral formats. In agreeing to participate, you will be contributing to an important and valuable study.

While at Upham Woods, you will be observing youth participating in different programs offered by Upham Woods. Some of these programs will include technology; some will not. After observing a program several times with different groups of students, you will be asked to complete an evaluation of the program using a Qualtrics Survey. The Qualtrics Survey utilizes answers which will be on a sliding scale ranging from strongly disagree to strongly agree and will ask questions regarding your opinions on technology and the outdoors. It will also ask general demographic questions such as age, race, and gender. You may decline to answer any question.

There is no penalty or reward for participating in the project evaluation process. Your ability to come to camp in the future will not be affected in any way by participating or not participating in the study. You have the right to withdraw from the evaluation process at any time without penalty.

Results from all evaluation tools will be kept confidential to the extent allowed by law. Your responses will be combined with the responses of all other adult participants. You will not be individually identified on any report prepared. If you have questions, please contact the Upham Woods Program Director, Max Myers, at 608-254-6461, ext. 202 or max.myers@ces.uwex.edu

If you do NOT wish to participate in the evaluation process, you may opt out by informing the Contact Teacher at your school before the evaluation process begins. Or you may check the box below and return to your Contact Teacher. You will be excused from the evaluation process before it begins. If you do choose to opt out you will still be allowed to come to Upham woods. Not opting out implies your consent to participate in this study. A copy of the Human Subjects Protection Approval Form is on file in the UWEX Provost and Vice Chancellor's Office, 432 N. Lake Street, Room 521, Madison, WI 53706.

Check this box if you would like to opt out (if you do not wish to opt out, leave blank) ☐

Name: ____

Signature: ____ Date: __________________

Appendix C: Adult Observer Pre-survey

ID #: ____

Question:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The youth have an understanding of different types of technologies					
The youth like to be outside					
The youth have the skills to use different types of technology					
The youth have an appreciation for nature					
The youth are eager to learn about technology					
The youth enjoy making observations about their outdoor surroundings					
The youth have a strong connection with nature					
The youth are thoroughly engaged with nature					
The youth have an adequate understanding of nature					
The youth can use technology for entertainment					
The youth can use technology to learn					

Demographic questions:

Race

Gender

Affiliated School

Appendix D: Youth Assent Form for Technology Project Evaluation

Youth Assent Form for Technology Project Evaluation

(To be read to students at the beginning of the evaluation process)

The “Engaging Digital Natives” project is an experimental program this fall at Upham Woods. We seek to better understand how using technology affects your experiences in the outdoors. If you decide to participate, you will be contributing to an important and valuable study!

The evaluation will take place online through a Qualtrics Survey. The survey firsts asks basic demographic questions like your age, race, and gender. The second part of the survey asks you specific questions about your **opinions** on technology and the outdoors. There are **no right or wrong answers**. The evaluation is **not a test**, but a survey to help us understand what your reactions are to the program you just participated in.

The Qualtrics survey should not take more than 15 minutes to complete. You will only have to answer the questions in part 1 (the basic demographic questions about you and your age, race and gender) once. You will take the second part of the survey twice. Once before your time at Upham woods, and once after your time at Upham woods.

There are no right or wrong answers and the surveys are **not tests.** You can choose to not answer any question at any time. You are not being graded and your participation is completely **voluntary**. There is **no penalty or reward for participating** in the project evaluation process. Your ability to come to Upham Woods in the future will not be affected in any way by participating or not participating in this study. If you decide to participate and then change your mind, you have the **right to withdraw** from the evaluation process at any time without penalty.

Before you complete the surveys, you will be given a code to enter. At the end of the second survey, the codes will be destroyed. We will have no way to connect the code to you as an individual person. Your responses will be combined with the responses of all other participants. You will not be individually identified on any report prepared.

WHAT NOW?

If you do not agree to take part in this study, please let your teacher know when you go to take your first survey and they will not require you to take it. You will still be allowed to participate in all the programming at Upham Woods, however, you will not be counted in the evaluation process and will not be a part of the study.