

Activities for Educators

 **PLAY AGAIN**



WELCOME

Dear Educators,

We hope this guide will inspire you and your students to critically examine the issues raised in the PLAY AGAIN film, and enrich your connections to the natural world. Discussion questions are provided to spur spirited and thought-provoking conversations. The main activities can be used with the film or alone. They offer creative ideas for exploring these topics in greater depth in classroom, home-school, or after-school settings. Descriptions of additional activities allow you to tailor this material to specific subject areas at the middle and high school level, in simple ways that complement your existing curriculum.

A list of helpful resources is provided at the back of the guide. We update these resources on our website (www.playagainfilm.com), including links for educational sites and information on green jobs, so please check back often and share your ideas with us.

Thank you for helping young people define and improve their relationships with both screen technology and nature.

Meg Merrill, producer

Notes about this Activity Booklet

 Green leaves, like this one, signify “Teacher’s Tips.”

 Orange maple leaves, like this one, signify “Extension Activities.”



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COMING OF AGE IN A VIRTUAL WORLD

One generation from now most people in the United States will have spent more time in the virtual world than in nature. New media technologies have improved our lives in countless ways. Information now appears with a click. Overseas friends are part of our daily lives. And even my Grandma loves Wii.

But what are we missing when we are behind screens? And how will this impact our children, our society, and eventually, our planet?

More than seventy years ago, the first televisions became commercially available. The first desktop computers went on sale 35 years ago, and the first cell phones a mere 20 years ago. During their relatively short tenure these three technologies have changed the way we live. Some of these changes are good. Television can now rapidly disseminate vital information. Computers turned that flow of information into a two-way street. Cell phones enable unprecedented connectivity. And the merging of cell phones and the Internet has even allowed protest movements around the world to organize and thrive.

But for many people, especially children, screens have become the de facto medium by which the greater world is experienced. A virtual world of digitally transmitted pictures, voices, and scenarios has become more real to this generation than the world of sun, water, air, and living organisms, including fellow humans.

The average American child now spends six to eight hours with screen media each day, not including texting or schoolwork (Kaiser Family Foundation, 2010). Reflective thinking and creative motivation have decreased 36% since the 1980s (Kim, 2011). Rates of childhood obesity, asthma, depression, anxiety, and attention problems are on the rise. At the same time, a growing body of research is confirming what we have intrinsically known for millennia – nature is good for us!

Time in nature lowers stress hormones, blood pressure, obesity and symptoms of ADHD. It boosts test scores, self-esteem, social skills, cooperation, and creativity. Green schoolyards engage all of our senses and increase access to nature, especially for low-income students. (See Health Benefits to Children of from Contact with the Outdoors and Nature and Children's Nature Deficit - What We Know and Don't Know, Children and Nature Network, www.childrenandnature.org/research).

*"Television tells you 24 hours a day that you are the most important thing in the world. The natural world tells you just the opposite: you're a small part of something very large."
-Bill McKibben, PLAY AGAIN*



As schools race to provide students with the latest technological opportunities, more and more are mindful of what is sometimes left behind and how it will impact tomorrow's work force. Many future jobs have not even been invented yet. Nature connection and outdoor education give students a head start in getting and creating those jobs, even those that involve developing new technologies. Because what is the most critical informant of technology? You got it - NATURE. Awesome technologies often mimic the natural world. So if you want to prepare students for college, career and citizenship - get them outside.

Nature connection is becoming more relevant across professions. Urban planners, inventors, business leaders, economists, scientists, artists, engineers, doctors and many others are finding that a connection to and knowledge of the natural world is essential in today's rapidly changing world.

It's an exciting time to be alive. Digital technology is here to stay and with it a host of blessings and challenges. We have a choice. We can disappear down the digital rabbit hole or - we can balance meaningful educational technology with hands-on, outdoor learning.

Educators can ensure that time in nature is not an isolated event, but a regular practice for all children, regardless of race or income. Schools all over the world are joining the movement. They are:

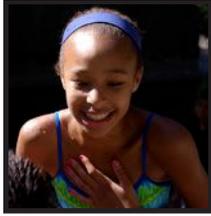
- Taking regular field trips to local parks and natural areas.
- Greening schoolyards with gardens and outdoor classrooms.
- Integrating nature connection across all subjects and grades.

Together we can raise a new generation of creative problem solvers, inventors and thinkers who will value natural resources and protect the places they love.

FILM OVERVIEW



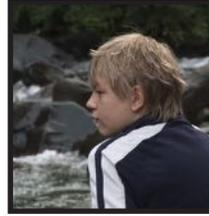
Taylor



Paige



Kristen



Aleks



Soapy



Kris

PLAY AGAIN begins by introducing us to six Portland-area teens who spend significant portions of their day in front of screens. Kris (14) is on the computer playing complex video games 12-15 hours a day. Taylor (13) sends hundreds of texts. Aleks (13) loves video games and TV. Paige (13) and her cousin Kristen (14) say they are watching TV, texting, or using cell phones “most of the time.” Soapy (15) is a former gamer who plans to change his habits and start training for the Navy.

All of the teens agree, for various reasons, to leave their electronics behind and join leaders from Trackers NW on an outdoor adventure. As the film points out, kids today spend an average of 90% of their time indoors. They are filled with what one expert calls “ear-to-ear brilliance” but they haven’t had much opportunity to interact with real living places and real living things.

The teens begin their trip by pitching tents in a remote forest. They build campfires, hike, sing, make bows and arrows, swim in cold rivers, make their own sweat lodge, and prepare and cook their own food. Each teen describes both positive and negative responses throughout the trip. Taylor says at the start that she doesn’t really miss texting, and that it’s nice to talk directly to other people. Paige is thrilled to try something she’s never done before and enthusiastically learns campfire songs on guitar and ukelele. Aleks and Kris both talk about how much less power and control they feel in nature compared

to when they’re playing video games. Aleks seems to appreciate the way everything feels more real. Kris finds the physical exertion exhausting. Kristen and Paige agree that one of the nicest aspects of the trip has been not worrying about what you’re wearing or how you look.

After the trip, the kids are asked to try a screen fast for as long as they can. By day 7, Paige is surprised at how painful it has been. On day 8, Soapy says he’s not craving games but the immediate access to information that computers provide. Kris lasts three days. Taylor is suspended from school and immediately returns to texting. Aleks does not even try the fast.

Still, the teens describe changes brought by the whole experience. Soapy believes his life was transformed by Trackers NW, where he is now a leader-in-training. He is still on course to enlist with the Navy Seals. Aleks has since taken a camping trip and caught three fish. Taylor has drastically reduced her texting habits and is now on her school basketball team. Paige and Kristen are busy with their indoor after-school activities, but Kristen says she’s still determined to get her family outdoors more.

Following the individual stories of these six teens introduces us to a collective story about our ongoing negotiation with electronic media in our world.



DISCUSSION QUESTIONS

Use the following questions for class discussion or as writing prompts.

Film Review

- What was this film about?
- What did you observe about how each of the teens used screen technology? “Taylor sends hundreds of texts per day; Kris and Aleks play hours of video games; and so on.”
- What do you think about the statistics and trends the film shared concerning how much time young people today spend in front of screens? In nature? “The average American child spends about 7.5 hours a day behind screens; kids spend 90% of their time indoors.”
- The film describes concerns people have about youth today growing up without strong connections to nature. What do you think about those concerns?
- What did you think about the teens’ camping trip? What parts did they find rewarding? What parts did they find challenging?
- After the camping trip, the teens were asked to go on a screen fast. What was this? How did it work for each of them?
- Did any of the young people seem changed positively or negatively by their experiences in nature? Describe some of these changes.

For Further Reflection

- Which teen in the film did you relate to most, and why? Did the teens in the film spend more or less time in front of screens than you or people you know?
- What are the benefits of screen time? What are negative consequences? Do you have any concerns about the content young people are exposed to during screen time or about the time they spend in front of screens?
- The film makes connections between our screen time and consumerism—what we buy and how much we buy. How does this play out within your family or with your friends? How do you think consumption is related to our environment?
- Suppose your school received a grant for \$10,000 for computer technology/instruction and outdoor education/“green school” projects. What percentage would you allocate to each? Why?
- Do you think people your age spend enough time in nature? What about younger kids? What is one thing your school or community could do to increase the time children and adults spend outside?

QUOTE ME ON THIS!

GREEN TIME AND SCREEN TIME

ACTIVITY 1

Overview:

Line up based on how strongly each statement corresponds to your views about screens and nature.

Objectives:

Students will begin identifying their attitudes and values regarding technology (screen time) and nature.

Standard Requirements:

See "Common Core Standards" on pg 46

Materials:

None

Time:

15-30 Minutes

What to Do:

1. Assign one side of the room as "Strongly Agree," the middle as "neutral," and the other side as "Strongly Disagree." Have students stand in the middle of the room.
2. Read one of the statements (found at the end of the directions) out loud and make sure students understand what it means.
3. Ask students to align themselves according to their views about the statement. Use the room or schoolyard as a spectrum; students can stand anywhere along the line, depending on how strongly they feel.
4. Discuss their choices, either as a class or in small groups. Ask questions such as, How comfortable are you with where you are standing? Where would you rather be standing? What would it take to get there?
5. After the discussion, have students realign themselves based on where they'd ideally like to stand. If necessary, discuss their changes.
6. Have students return to the neutral middle of the classroom and repeat the process with the next statement.

 **Were you unable to show Play Again in class? Make your own quotes based on the general issues raised in the film!**

Statements from Play Again:

- "If I'm in a bad mood, I just stay on the computer as long as possible."
- "To picture myself without my phone is depressing. I'd feel lonely."
- "Video games are more entertaining than playing outside."
- "When I play video games, I feel like I'm in charge, I have the power, because I almost always win."
- "Being a nature person gives me a lot of respect for myself and for nature, because nature was here before us, it's like respecting your elders."
- "Instead of controlling it, I feel like the technology controls me."
- "My main goal after school is to finish my homework so that I can play video games."
- "I don't really agree that our generation is disconnected because you can still be connected to people online when you're at home and can't really go anywhere else."

 **Do the activity outside! Have two trees or structures represent the two ends of the spectrum, and go from there!**

MAP YOUR SCHOOLYARD

GREEN TIME AND SCREEN TIME

ACTIVITY 2

Overview:

Create a map of your schoolyard from memory, and then compare it to the real place.

Objectives:

Students will begin to pay more attention to nature around them and, to the extent to which it is accessible and appealing.

Standard Requirements:

See “Common Core Standards” on pg 46

Materials:

- Clipboards and Paper
- Pencils or Pens

Time:

30-45 Minutes

What to Do:

1. Close shades and pass out clipboards and 2-3 pieces of paper to each student. Begin by having students create a map of everything they can remember about the physical environment of their schoolyard. Where is the building in relationship to the street? What is the groundcover (asphalt, grass, woodchips) in different areas? Where are the trees? What kinds of trees are they? If they’ve ever seen a bird or other animal outside, make a picture of it somewhere on the page. They do not need to worry about getting the scale exactly right. You just want to find out how much attention they have paid to nature around their school. Give students about 10-15 minutes to complete their maps.

 **Once they’ve seen the schoolyard, encourage students to discuss what they would add to enhance nature connection. What are some easy ways to make it a more “green” schoolyard.**

2. Leave the maps inside and take the students, with their clipboards and blank paper, outside. Have them map what they see. Where are the trees, shrubs, flowerbeds, and so on? Do they see any insects, birds, or mammals? Are there other natural features to include?
3. Return to class. Have students compare their two maps. What was difficult about this

activity? Why did they remember certain details and not others? This conversation can be an interesting starting point to see how different kids spend their time (indoors versus outdoors, looking at screens versus observing the living world, and so on).

4. Discuss nature in your lives. Ask students to define “nature.” Now ask students to think about the presence of nature in their lives. Are we part of nature? Is nature at their doorstep? In their town? Hopefully they will realize that getting outside for a walk, sitting under a tree, planting a flower box, and watching pigeons are all ways of connecting with nature. Many people also enjoy connecting to nature in bigger green spaces – parks, gardens, woodlots, and so on. Does your community have those kinds of places? Where are they?

 **Give Extra Credit to students who talk to the school board about getting their ideas for a greener schoolyard implemented.**



COMMUNITY GREEN MAPPING

GREEN TIME AND SCREEN TIME

ACTIVITY 3

Overview:

Analyze the accessibility and appeal of green spaces in the surrounding community.

Objectives:

Students will begin to pay more attention to nature around them and to the extent to which it is accessible and appealing to residents of different ages and in different neighborhoods.

Standard Requirements:

See "Common Core Standards" on pg 46

Materials:

- Large map of the community surrounding your school
- Pens and stickers

Teacher Resources:

For research about the advantages of playing in unstructured areas, see www.childrenandnature.org/research/

Time:

1-2 Hours

What to Do:

Day 1: Have students create a map of green spaces in your community (small corner parks to city gardens to larger natural areas). Begin by looking at a city map- either a paper copy or an online map. Do these maps already show green spaces? Small parks and large ones? Have the students work in pairs to investigate a portion of the map. Print out hard copies of their sections or hand out whole city maps to each team. They should:

- Locate the green spaces in their map section.
- Mark those green spaces on their maps.
- Look to see how accessible these green spaces are to nearby neighbors (for example, does a major road divide a green space from neighboring residences?).
- If possible, spend a little time observing park usage and/or talking to neighbors about what they think of these green spaces.

Day 2: On an assigned day, have the teams compile their results. Place a large city map on a table and give the teams time to add their information to it (with green markers, pencils, or stickers). If parks are already marked, have students add details about their parks (for example, is it wild space, soccer fields, or basketball courts?) Post the map where everyone can see it. Then discuss the following:

- Are green spaces evenly distributed across the town?

- Did anyone find green spaces that were not easily accessible to nearby residents?
- Did the distribution and access to green spaces seem fair? You might introduce the concept of environmental justice (trying to ensure equal access to environmental goods and burdens, such as pollution, among residents of all incomes and ethnicities) and ask if students are concerned about environmental justice in their community.
- Did anyone find green spaces that weren't used much? What was the reason? (Answers may include concern for safety, inaccessibility, preference for private yards, lack of interest in the outdoors, busy lives)
- Where were the most popular green spaces located? Who was using them? Why did they seem to be successful? Were the people in them connecting to nature (e.g. is playing in a paved skateboard park "connecting to nature?")? (See Teacher Resources)
- How could improvements be made to green spaces in your community?
- If you were going to add a green space to the community, where would you add it on the map and why?

 **Encourage students to share their green space maps and findings with local planning boards and community groups. Invite public discussion about how to make parks more accessible and appealing.**

SCREEN AND NATURE JOURNAL

GREEN TIME AND SCREEN TIME

ACTIVITY 4

Overview:

Keep a daily journal tracking your time in front of the screen and your time in nature.

Objectives:

Students will be able to describe and think more deeply about their relationship with technology and with nature, and articulate how their time with each makes them feel.

Standard Requirements:

See "Common Core Standards" on pg 46

Materials:

- Pencils, pens, or colored pencils
- Journals or journal binders and journal questions (pg 5) for each student

Time:

30 Minutes for Introduction; 20 Minutes/Day of Homework

What to Do:

1. Introduce journals. Pass out the journals to each student and go over the questions. Have them fill out the journal, estimating screen time and nature time for the previous day, as well as how much time they spend, on average, each day in front of screens vs. in nature.
2. Share results. How many screen time hours did students estimate they had the previous day? How many hours in nature? (You might tally and graph these results as a class.) What kinds of things did they gain from each experience?
3. Introduce ongoing journaling. If possible, have the students continue to fill out the journals every day for at least one week, including both school days and weekends. You might have them turn in sections of the journals for periodic review. They can invite other family members to do a journal as well. Make sure to do one yourself!
4. Incorporate screen fasts into your unit. Ask the students to commit to taking a complete break from texting, video games, TV, social networking, and computer time. Let them help define the parameters. For example, will texts from parents or school-related computer work be allowed? Tell them this is an experiment and their results will be more interesting and relevant if they are completely honest. Discuss how you will explain the fast to family and friends, deal with challenges, and support each other. During the fast, the students may leave some sections of their screen journal blank and instead record what they did/learned/felt in the absence of screen time. What was hardest to give up? Easiest? What was most surprising? What did they do with their time? Remind students that if they did not reach their screen fast goal it is not necessarily a failure if they use it as an opportunity to reflect and think. Consider sharing your results with the PLAY AGAIN team in a class video or project.

 **Turn the screen fast into a fundraiser to bring more green spaces or nature education onto campus!**

5. Incorporate nature time into your unit. Look for ways to get your students outdoors during your class period as a way to increase their engagement and interest in nature.
6. Discuss journals. At the end of the agreed-upon time period share observations, thoughts, and feelings. Encourage non-judgmental conversation and consider setting goals individually or as a class for both screen time and green time.

 **POSSIBLE SCREEN TIME JOURNAL QUESTIONS:**

1. What kind of screen time did you have today? Include the time, technology (phone, TV, game system, computer), and the the activity (Facebook, video-chat, texting, gaming, research, filmmaking). For example: "Computer- School Research- 1 hour."
2. How would you rate the value of each activity in terms of fun, creativity, educational value, or social connection? (This can be a class activity as well)
3. What was your total amount of screen time today?
4. Describe at least one thing you thought about, or learned about yourself, or the world, during your screen time.
5. Describe your feelings during and after screen time.
6. Draw a picture of the most interesting screen you saw today.
7. If you could change one thing about your time with screens today, what would it be?

 **POSSIBLE NATURE TIME JOURNAL QUESTIONS:**

1. What kind of nature time did you have today? Include location, activity, and time. For example: "My Neighborhood- Walk- 15 minutes."
2. How would you rate the value of each activity for your emotional, spiritual, intellectual, or physical health?
3. What was your total amount of time in nature today?
4. Describe at least one thing you thought about, or learned about yourself, or the world, during your time in nature.
5. Describe your feelings during and after your time in nature.
6. Draw a picture of the most interesting thing that you saw in nature today.
7. If you could change one thing about your time in nature today, what would it be?

SILENT CONVERSATIONS

GREEN TIME AND SCREEN TIME

ACTIVITY 5

Overview:

Silently write your responses to different statements posted on the walls around the room.

Objectives:

Silent conversation is a good way to draw out thoughts from a group without singling out individuals. This activity encourages students to honestly talk about screen time and green time.

Standard Requirements:

See "Common Core Standards" on pg 47

Materials:

- Large pieces of paper
- Wall Prompts
- Pens or markers

Time:

30-45 Minutes

What to Do:

1. Before class: Post prompts visually on large sheets of paper around the room (or outside!). The quote, word, or question should be centered in the middle of the paper, with room around it for students to respond.
2. In class: Distribute markers or pens to the class. Have each student stand in front of a piece of paper. Ideally, there should only be one student at each paper.
3. Respond to the prompts. Give students a minute or two at each paper, and then have them rotate to a new one. Give students a chance to respond at every piece of paper in the room. Encourage them to be completely honest about their answers.
4. Discuss responses. Once students have had a chance at each paper, have one individual read or summarize each prompt. Discuss the answers. Did most students have similar mindsets? Why do you think there was disagreement in some of the answers? What do the responses to the prompt tell us about the mindset or lifestyle of this class? Do you think other classes would have had similar responses? Would your parents?

 **To allow multiple students to answer prompts at the same time, hand out post-it notes to students. Have students write their responses at their desk, and then go stick them on the corresponding prompt. This is also a good way to use the same prompts for multiple class sections.**

Suggested Wall Prompts:

- Is screen time or green time a bigger part of your life?
- If you had to choose between a day in nature or a day with your favorite screens, which would you choose? Why?
- What or who do you feel most connected to?
- What technology rules would you set for your kids?
- What can you do to encourage younger children to spend more time outside?
- Wilderness vs. Urban Nature
- "We ourselves feel that what we are doing is just a drop in the ocean. But the ocean would be less because of that missing drop."
-Mother Teresa
- Technology
- Where I feel free
- I am lonely when...
- "A society is defined not only by what it creates, but by what it refuses to destroy." -John Sawhill. What defines our society?

 **Use the suggested wall prompts on the right, or create new prompts to fit the issues you're discussing in class.**

▶ THE OTHER FOUR SENSES

GREEN TIME AND SCREEN TIME

ACTIVITY 6

Overview:

See how sight influences our perception of the world, and how taking it away allows us to experience things in a whole new way.

Objectives:

Students will begin to recognize the major role that sight plays in their perception of their surroundings, and how the absence of sight allows them to see the natural world in a more detailed light.

Standard Requirements:

See “Common Core Standards” on pg 47

Materials:

- An outdoor area
- Blindfolds

Time:

30-60 Minutes

What to Do:

1. Get outside. Take students outside and have them stand or sit as silently as possible with their eyes closed. Count to three and have students point towards two noises they hear. Did the majority of students point to natural or man-made noises? How many students pointed to their classmates?
2. Open your senses. Have students once again sit quietly with their eyes closed. Talk them through paying attention to what they are hearing, smelling, and feeling (e.g. the way the air feels against their skin, air temperature, how much water is in the air, the feel of the ground, etc.). As humans, we tend to let our eyes dominate our awareness, but really, we have many senses to help us perceive the world around us.
3. Experience nature in a new way. Separate students into partners and give each pair a blindfold. Have students take turns being blindfolded and led by their partner to some natural object (e.g. a bush, a tree, a rock, etc.), which they will feel carefully and then describe with adjectives. Do this for 2-3 objects and then switch. Once both students have had a turn, have them remove the blindfold and show each other the objects they blindly examined. How did their sightless adjectives differ from how they normally perceive the objects? Were they able to identify the other objects using their other four senses?



▶ ADDITIONAL ACTIVITIES

GREEN TIME AND SCREEN TIME

- Have every student pick a favorite place outdoors to sit quietly for the first five minutes of each class. (Write down your observations – do you notice any change in attention or behavior?)
- Try a daily or weekly nature walk, including time for sketching and writing.
- Give homework assignments that require kids to go outside to explore, observe, and play.
- Give extra credit for participation in special community nature activities (such as Audubon’s Annual Bird Count or a local park clean-up).
- Venture out into local parks in teams and conduct observations or interviews to determine who uses the park, what they do, and when they go. Ask people in the neighborhood why they do or do not spend time in local parks. Is there something your class or neighborhood group could do to make the parks more appealing?
- Research the life expectancy of electronic items you’ve bought in the last year (e.g. cell phones, iPods, microwaves, etc.). How do they compare to the life expectancy of the same items ten years ago? Twenty years ago? What does this say about consumerism in our society and our reliance on material goods?
- Create a service project to help a particular population spend more time in nature, such as pre-schoolers, teenagers, low-income families, or the elderly. What were the barriers to time in nature for your group?

Assign extra credit for students who implement their service project in the community.

- Create a short film documenting the relationship between kids and nature, or a related issue, then send a link to your film to the PLAY AGAIN team at playagainfilm@gmail.com. Some films will be chosen for inclusion on the PLAY AGAIN website and/or Facebook page!
- Create a set of guidelines for younger kids (toddlers, preschoolers, or young elementary-aged kids) about what kinds of electronic media content they should and should not be watching, and how many minutes is acceptable each day. How did you make your guidelines? What information or research might help you make or support your recommendations? Consider sharing your results with parents and teachers.
- Think about your consumption habits. Make a list of the things you have bought, or have been given this year. What was their monetary value? Do you still use them? How have they influenced your life, positively or negatively? Why/why not? How do they make you feel now?
- Study green school grounds, then design and create a model for natural play/learning spaces in your schoolyard. Consider a vegetable garden, a butterfly or hummingbird garden, or natural learning areas with stump seats and tables.

Overview:

Learn how to calculate the amount of carbon emissions your car produces.

Objectives:

Students will understand the greenhouse effect and global climate change. They will also begin to recognize how personal actions can have an impact on climate change.

Standard Requirements:

See "Common Core Standards" on pg 47

Teacher Resources:

See Greenhouse effect at www.epa.gov/climate-students/basics/today/greenhouse-effect.html.

Materials:

- Computer with internet access

Time:

30-45 Minutes

What to Do:

Day One:

1. Introduce the greenhouse effect and global warming. Discuss the four major greenhouse gases and where they come from. Discuss cars and how fuel economy influences global climate change. Have students brainstorm what features of their cars will influence the fuel economy (e.g. engine size, weight of the car, fuel type, etc.).
 - Next, have students calculate the total emissions that week for each vehicle
Example Calculations: 209 total miles x 0.00074 tons/mile = 0.15466 tons.
 - This may not seem like a very large number, so have students convert it to pounds to get a more comprehensible number.
Example Calculations: 2,000pounds/ton x 0.15466 tons = 309.32 pounds in only one week of driving!
2. Assign homework. Have students collect the following information for each of the cars in their household (keep the data for each car separate):
 - Model Year
 - Manufacturer and Model
 - Engine Size/Transmission Type
 - Annual Greenhouse Gas Emissions data for this type of car- found by going to <http://www.fueleconomy.gov>
 - Odometer Reading Day 1 and Day 7
 - Total Mileage for the Week

Day Two:

1. Introduce total emission calculations. Have students calculate the total emission for each car in their household. Use the emissions data from <http://www.fueleconomy.gov>, which assumes that each car is driven 15,000 miles per year. Translate this number into tons/mile
Example Calculations: 11.1 tons/year x 1 year/15,000 miles = 0.00074 tons/mile for this specific vehicle.
 - How do emissions totals compare in the class? What was the range of emissions in the class and what is the class average?
 - How can our families reduce total greenhouse emissions?
 - Compare the class average with the emissions of a hybrid or electric car. What is the difference? Would students buy a hybrid car for themselves? Why or why not?



Have students calculate their ecological footprint by taking the test at <http://www.myfootprint.org> or at www.footprintnetwork.org/calculators/

NAME: _____

<u>CAR #1</u> Model Year:	
Manufacturer and Model:	
Engine Size:	
Transmission Type:	
Annual Green Gas Emissions: <ul style="list-style-type: none">• Found at http://www.fueleconomy.gov	
Odometer Reading Day 1:	
Odometer Reading Day 7:	
Total Mileage for the Week	

<u>CAR #2</u> Model Year:	
Manufacturer and Model:	
Engine Size:	
Transmission Type:	
Annual Green Gas Emissions: <ul style="list-style-type: none">• Found at http://www.fueleconomy.gov	
Odometer Reading Day 1:	
Odometer Reading Day 7:	
Total Mileage for the Week	

SCHOOLYARD TREE INVENTORY

MATH, SCIENCE, AND BIOMIMICRY

ACTIVITY 8

Overview:

Get outside and identify trees, while learning how to record, analyze, and draw conclusions from scientific data.

Objectives:

Students will be able to observe, identify, measure, record, and mathematically analyze scientific data associated with trees. Students will also gain a greater understanding of the trees in their schoolyard and what makes them unique.

Standard Requirements:

See "Common Core Standards" on pg 47

Materials:

- Baggies and tags (to keep track of trees and samples)
- Tree identification book (or use resources below)

Time:

3-4 Hours

Teacher Resources:

Biological Diversity Information

- Biological diversity describes the variety of life on Earth. Since life first appeared on Earth 550 million years ago, the diversity of life has increased due to species migrations, evolution, and environmental changes. Biological diversity is important for a healthy ecosystem. Research shows that an area of land with numerous plant species is more productive and has a higher chance of surviving drought, pests, and other hardships than an area with only a few species.
- **Biological diversity** is measured in two ways: richness and evenness. **Richness** is measured by the number of different species in a specific area. **Evenness** is measured by the abundance of individuals within a species. Richness and evenness are then combined into biological diversity, using Simpson's Index.

Calculating Simpson's Index of Diversity

Index of Diversity: $D = [n(n-1)] / N(-1)$

- Where D =Diversity, N =total number of trees of all species), and n =total number of trees of each species.
- Simpson's Index of Diversity ranges from 0 to 1, where 0 is no diversity and 1 is infinite diversity.

For Example:

Species	Number (n)	$n(n-1)$
Red Maple	4	$4*3=12$
White Oak	2	$2*1= 2$
Holly	9	$9*8=72$
Total	15	86

$$N(-1)=15*14=210$$

$$\text{Index of Diversity} = 86/210 = 0.41$$

$$\text{Simpson's Index of Diversity} = 1-D$$

$$1-0.41 = \underline{0.59}$$

Tree Identification Resources

- <http://www.arboday.org/trees/what-tree/?TrackingID=908>
- <http://www.oplin.org/tree/>
- Have students download "vTree" on their smart phones for handheld identification tools
- <http://forestry.tennessee.edu/treedid.htm> for leaf identification



If the students find low biodiversity in a certain area of their campus, consider planting trees with the students to increase the biodiversity!

What to Do:

Day One: Collection

1. Introduce the topic of biological diversity and discuss why it is important in natural systems (see Teacher Resources on pg. 13 for information). Explain that the project will involve an inventory of all trees on the school grounds, followed by a calculation of the measure of biological diversity represented by the trees.
2. Hypothesize. Have students write a hypothesis about which area of their schoolyard has the most biological diversity.
3. Go outside. Divide the school ground into sections, and assign a team of students to each. Have students tag and number all of the trees in their section, and collect samples from each tree. Samples should include a branch with leaves (so that they can identify the arrangement of the leaves on the branch), and fruiting structures or flowers if they are present. Samples should be placed in a plastic bag that is numbered to match the tree they came from.

Day Two: Identification

1. Have each team identify the trees in their section using their samples and identification tools. Once the samples have been identified, have students record the samples' common and biological names.
2. Using the samples from the identified trees, have students do leaf rubbings on a sheet of paper. On the paper, include the location of the tree, the common and biological names of the tree, and any other distinguishing features (for example, does the tree produce nuts? Is it native to the area?).



Have students use the leaf rubbings to make a notebook or poster about the trees in their area. They can use additional research, or closer observation (for example, have students measure the diameter of the tree trunk or the height of the tree) to find more information on each of the samples they identified.

Day Three: Math

1. Introduce Simpson's Index. Have students count the total number of trees growing in their assigned area. This should equal the total number of samples collected. This number will be identified as N (N =the total number of trees of all species). Next, have them count the number of individuals in each tree species they identified. This number will be identified as n (n =the total number of trees of each species).



Add to the notebooks or posters throughout the year. Visit the trees in fall, winter, and spring to see how their appearances change with the weather.

2. Calculate the amount of diversity in each area using Simpson's Index (see Teacher Resources above). Once students have calculated the Simpson's Index for their area, have them compare their data with the data of others in the class. Which area has more biological **richness**? Which area has more biological **evenness**? Which area is the most **biologically diverse**? How do the results compare to students' original hypotheses.

Overview:

Create a radio broadcast/podcast based on a scientific article.

Objectives:

Students will learn how to read and summarize a research article, and how to present their information to the general public in a way that others can easily understand.

Standard Requirements:

See "Common Core Standards" on pg 47

Teacher Resources:

Find research articles at www.sciencedaily.com/

Materials:

- Summary Organizer worksheets (see pg 15)
- Research Articles

Time:

2-3 Hours

What to Do:

1. Introduce research articles. Separate the class into groups of 2-3 students, and then assign (or let them pick) research articles from the database. Explain to students that they will be responsible for creating a radio broadcast/podcast about the article. Possible scenario ideas for their presentation may include:
 - Radio report of the research
 - Discussion between two scientists
 - News report- breaking news about the research
 - An interview with the author of the research article
 - Song/rap/poem written from the article
 - Broadcast from the perspective of the plant or animal being studied
 - Broadcast made by the plant or animal being studied
 - Their very own idea!
2. Explore the articles. Have students read and summarize their article using the Summary Organizers (on pg. 15). Once summarized, have teams decide on a scenario. The script should be roughly 200 words.
3. Once practiced, have groups present their radio broadcasts/podcast for the class!

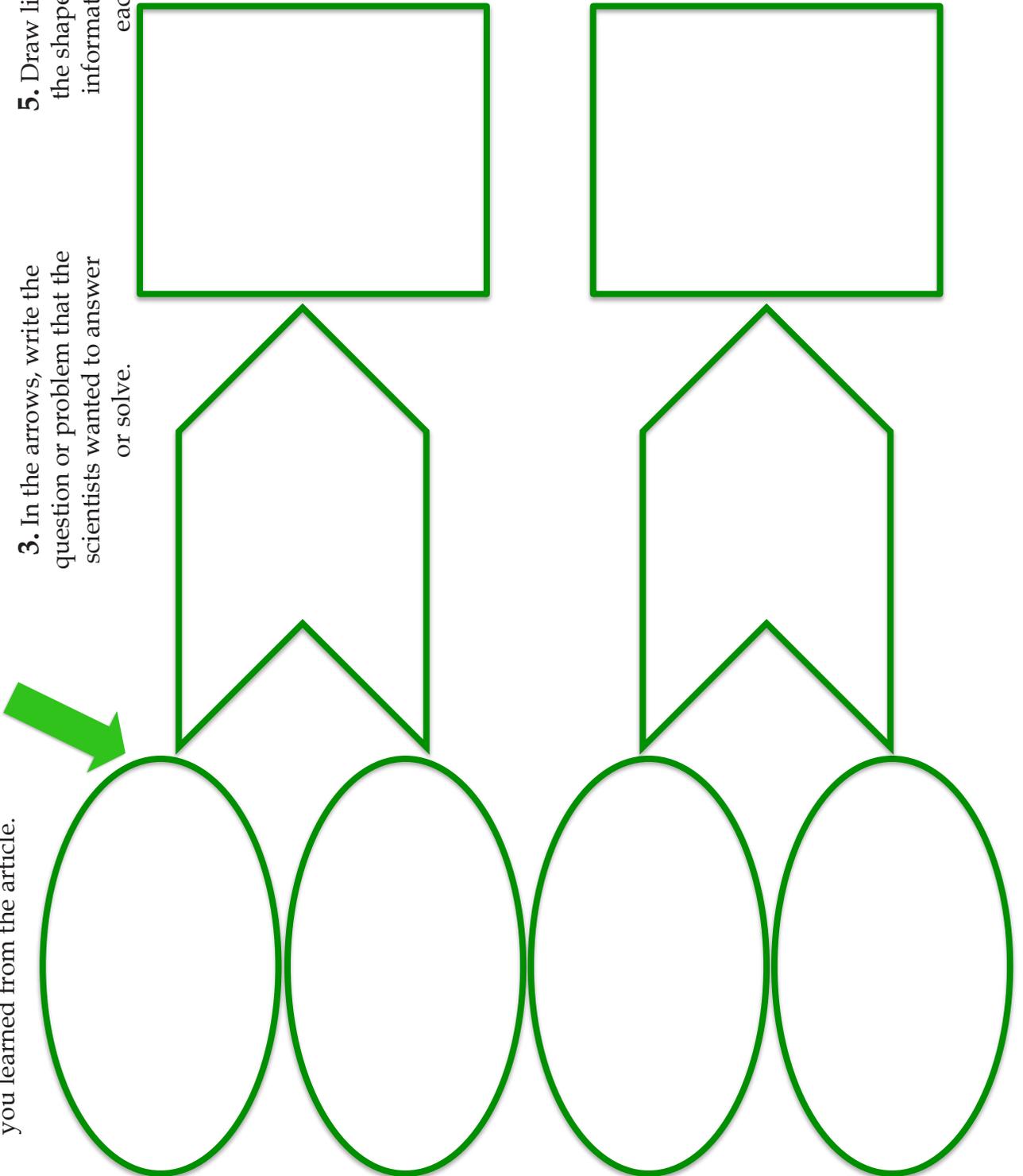
Picking articles based on a topic students are currently studying, or are especially interested in, will give them a better understanding of research articles.

To make the presentations more fun, take a day to film the projects and then have a class viewing party.



Nature Broadcast Graphic Organizer

- 1. In the ovals, write four things you learned from the article.
- 2. Place a star by the two that are most interesting.
- 3. In the arrows, write the question or problem that the scientists wanted to answer or solve.
- 4. In the squares, write any questions that you still have.
- 5. Draw lines connecting the shapes that contain information related to each other.



RESEARCH FOR A SOLUTION

MATH, SCIENCE, AND BIOMIMICRY

ACTIVITY 10

Overview:

Look at challenges facing the human race and, using knowledge of biomimicry and research skills, come up with biomimicry-inspired ideas to combat these challenges.

Objectives:

Students will gain knowledge about the challenges facing humanity, and will strive to find new and unique solutions.

Standard Requirements:

See “Common Core Standards” on pg 48

Materials:

- Internet

Time:

- 45-60 Minutes for in-class work
- 30-60 Minutes for presentations

What to Do:

1. Discuss biomimicry. Explain the concept of biomimicry and give examples that students may recognize in their daily lives. For examples, see Activity 12. Introduce the challenge prompts given in the Teacher Resources, and talk about what each prompt entails.
2. Assign challenges. Place students in groups and have each group pick a prompt from the Teacher Resources. Give the group time to brainstorm a creative way to combat the challenge using biomimicry.
3. Present ideas. Have each group present the solution they came up with. Discuss each idea as a class. Is it a possible solution? Do students have alternate solutions for the challenge?

 **If students are having a hard time getting the creativity to flow, encourage them to explore the “Basic Inspiring Organisms” library: <http://ben.biomimicry.net/curricula-and-resources/youth-curricula/week-long-units-ms/week-long-unit-basic-inspiring-organism-library/>**

Teacher Resources:

Possible Challenge Prompts:

- How could you create color without using toxic pigments or dyes?
- How could you remove carbon dioxide from the environment? (Climate Change)
- How could you provide clean drinking water in dry environments?
- How would you keep food production high without the use of pesticides?

Definition of Biomimicry

- “Bio” means life and “mimicry” means to imitate. So biomimicry literally means to imitate life, or to imitate nature and the living world around us.
- Biomimicry is the act of observing nature in action and using that knowledge to inspire new ideas. What would nature do? It is actually nature that inspires some of the best technologies.
- Biomimicry is used by people in many different fields. Most commonly, it is used by engineers and architects in their designs.

TED Talk on Biomimicry

- http://www.ted.com/talks/janine_benyus_biomimicry_in_action?language=en
- (You may want to allow students to brainstorm their own ideas before watching videos such as this one)

Overview:

Create a presentation for the class to expand their knowledge about a new plant or animal.

Objectives:

Students will gain public speaking experience, while learning valuable information about the natural world.

Standard Requirements:

See "Common Core Standards" on pg 48

Teacher Resources:

- Full list of Endangered Species at www.fws.gov/endangered/

Materials:

- List of plants and animals for students to choose from (optional)

Time:

5-10 Minute presentations per student

What to Do:

1. Introduce the classroom naturalist. Each week, a new student will be selected to be the classroom naturalist. This student is responsible for preparing a 5-10 minute presentation about a plant or animal, which they will present to the class at the end of the week. Topics for the presentation can include any plant or animal native to the area, or a topic of your choice.
2. Evaluation. When the naturalist gives their presentation, grades (if you choose to grade this activity) should be based on organization, preparation, and topic comprehension. Encourage students to be creative in their presentations and make them as fun as possible.

 **Consider keeping the naturalist presentations on a bulletin board, on a website, or in a binder so that students can go back and look at the information again and again.**

Presentation Ideas:

- Find a list of animals and plants that are native to your region, or allow students to present on their favorite plant or animal.
- Encourage students to find animals and plants that are on the endangered species list (see Teacher Resources above). In addition to teaching their classmates about the plant or animal, they can also provide a way to save it.
- Have each student present on their favorite nature space. This may include a park, beach, camping site, or hike. Encourage students to bring an address or map to show the class where their favorite nature is so that other students can visit it.
- Encourage students to bring in a "found object." "Found objects" may include: plants, tree bark, pine cones, leaves, etc.

 **Have a "Naturalist Day," on which your students present their plants and animals to other classes.**

IS IT BIOMIMICRY?

MATH, SCIENCE, AND BIOMIMICRY

ACTIVITY 12

Overview:

Learn about different items that were created using biomimicry, and then use your imagination to come up with new nature-inspired designs.

Objectives:

Students will define biomimicry, identify it, and come up with unique ways to use it in their design for a new product.

Standard Requirements:

See "Common Core Standards" on pg 48

Materials:

- Biomimicry worksheet for students on pg 19
- Paper and colored pencils or markers

Time:

45-60 Minutes

What to Do:

1. Discuss biomimicry. Explain what biomimicry is, and give a few examples of how it has been used in the design of items they have seen. For example, an airplane wing is based on a bird's wing, and sonar navigation in submarines is based on echolocation used by bats.
2. Identify biomimicry. Pass out worksheets (found at the end of the activity) to students to fill out in groups or individually. When they finish, go through the answers as a class.

 **As students are working on their ideas, continually review what biomimicry is. Remember, an object can use biomimicry without actually using natural items.**

3. Use biomimicry. Have students come up with ways to enhance their schoolyard. Then see if they can use biomimicry to make their plans even better. For example, how can you redesign the water fountains to make them more sustainable and use less water? Leave a few minutes at the end of class for students to share their ideas.

 **Pick one of the ideas suggested by the students to make into a reality! Work together to design and implement the idea and see how it enhances the schoolyard.**

Teacher Resources:

Definition of Biomimicry

- Let's break biomimicry down into more understandable parts. "Bio" means life and "mimicry" means to imitate. So biomimicry literally means to imitate life, or to imitate nature and the living world around us.
- Biomimicry is the act of observing nature in action and using that knowledge to inspire new ideas.
- Biomimicry is used by people in many different fields. Most commonly, it is used by engineers and architects in their designs.
- American biologist Janine M. Benyus was one of the first people to study biomimicry. She argued that every structure that uses biomimicry should follow the nine rules of nature (seen below).

Benyus' Nine Rules of Nature

1. Nature runs on sunlight
 2. Nature uses only the energy it needs
 3. Energy fits form to function
 4. Energy recycles everything
 5. Nature rewards cooperation
 6. Nature banks on diversity
 7. Nature demands local expertise
 8. Nature curbs excess from within
 9. Nature taps the power of limits
- More on Benyus' Nine Rules of Nature can be found at: <http://science.howstuffworks.com/life/evolution/biomimicry1.htm>

NAME: _____

IS IT BIOMIMICRY?

Part One: In the blank next to the item reply “yes” if it is inspired by biomimicry and “no” if it was not. If you answer yes, take an educated guess about what the item may have been modeled after.

Example:

Airplane Wing: Yes, after a bird's wing

1. Ipod: _____
2. Sonar Navigation: _____
3. Computer Printer: _____
4. Soft cushion for a chair: _____
5. Solar cell (for solar energy): _____

Part Two: Fill in the blanks with the animal or plant that you think inspired the following inventions.

1. Airplanes modeled after _____ and _____
2. Adhesives for microelectronics and space applications inspired by the powerful adhesion abilities of _____ and _____
3. Water filters are designed like _____ to let certain things pass through while keeping other things out.
4. Bulletproof vests are made out of fibers based on _____
5. Ice picks used by mountain climbers are designed after the beak of a _____
6. Swimsuits used in the Olympics are based on _____
7. Velcro is based on _____
8. Torpedoes swim like _____

IS IT BIOMIMICRY?

Part One: In the blank next to the item reply “yes” if it is inspired by biomimicry and “no” if it was not. If you answer yes, take an educated guess about what the item may have been modeled after.

Example:

Airplane Wing: Yes, after a bird’s wing

1. Ipod: (No)
2. Sonar Navigation: (Yes, after bats and dolphins)
3. Computer Printer: (No)
4. Soft cushion for a chair: (No)
5. Solar cell (for solar energy): (Yes, after leaves)

Part Two: Fill in the blanks with the animal or plant that you think inspired the following inventions.

1. Airplanes modeled after BIRDS and SHARKS
2. Adhesives for microelectronics and space applications inspired by the powerful adhesion abilities of GECKOS and LIZARDS
3. Water filters are designed like CELL MEMBRANES to let certain things pass through while keeping other things out.
4. Bulletproof vests are made out of fibers based on SPIDER WEBS
5. Ice picks used by mountain climbers are designed after the beak of a WOODPECKER
6. Swimsuits used in the Olympics are based on SHARK SKIN
7. Velcro is based on BURRS
8. Torpedoes swim like TUNA FISH

BIOMIMICRY SHELTER

MATH, SCIENCE, AND BIOMIMICRY

ACTIVITY 13

Overview:

Apply biomimicry to the design of a sustainable shelter.

Objectives:

Students will gain a greater understanding of biomimicry and how it can be used to improve living standards.

Standard Requirements:

See "Common Core Standards" on pg 48

Materials:

- Internet

Time:

- 30 Minutes for introduction
- 45-60 Minutes for presentations

What to Do:

1. Assign biomes. Discuss biomes and the unique characteristics of each as a class. Assign each student a biome to work with. Based on what they know about the biome, have students design a shelter fit for human habitation.
2. Assign design guidelines. Have the student designs meet certain standards. The habitation should incorporate biomimicry examples discussed in class (see Activity 12), and should strive to be completely sustainable.
3. Final presentations. On the day that they habitations are due, students should present two articles. First, students should have a basic sketch or model of their shelter. This should include notes about what each structure is and what problem it solves. Secondly, students should have a written explanation, which is used as a defense of their design. The written defense should include the following:
 - Biome description and what problems architects/engineers face when building in the climate.
 - What observations or biomimicry ideas were used in the designing of the habitation and how were they implemented in the final design?
 - Reflection: what are the design flaws in the shelter? What parts do you think will work well? Explain. How realistic do you think it would be to build this shelter (considering costs, technology, etc.)?

Teacher Resources:

Definition of Biomimicry

- Let's break biomimicry down into more understandable parts. "Bio" means life and "mimicry" means to imitate. So biomimicry literally means to imitate life, or to imitate nature and the living world around us.
- Biomimicry is the act of observing nature in action and using that knowledge to inspire new ideas.
- Biomimicry is used by people in many different fields. Most commonly, it is used by engineers and architects in their designs.

Definition of a Biome

A biome is an area on earth's surface that is defined by certain abiotic factors (abiotic factors are non-living factors). These include climate (temperature and precipitation), relief, geology, and soils. A biome is NOT an ecosystem. Within each biome, there are certain plants and animals that have adapted to live in that biome's abiotic environment. If you look at the biome more closely, you'll notice that different plants or animals within the biome have similar adaptations, but are not the same.

*"What they do not VALUE
they will not PROTECT,
and what they do not
protect they will LOSE."
-Charles Jordan, PLAY AGAIN*

NATURE EXAMINATION

MATH, SCIENCE, AND BIOMIMICRY

ACTIVITY 14

Overview:

Learn about the various cycles and functions seen in nature by getting outside and matching information cards to plants and animals around the schoolyard.

Objectives:

Students use critical thinking to determine the functions of different organisms in nature.

Standard Requirements:

See "Common Core Standards" on pg 48

Materials:

- Pre-made function cards
- Hat or basket to hold function cards

Time:

45-60 Minutes

What to Do:

1. Preparation. Write the functions from the Teacher Resources on individual notecards.
2. Get outside. Have each student pick a function card at random. Then give students 3-5 minutes to find plants, animals, or objects in the prescribed outdoor area that fit the description on the card.
3. Discuss findings. As a class or in small groups, have students walk around the schoolyard on a "biomimicry field trip." When the class or group is close to a student's discovery, have that student stop the group and share his or her findings with the class. Have each student explain how the biological element meets the function on their notecard. When everyone has had a turn to share their findings, gather for a group discussion. How is this different from the way you usually look at nature? What value do you think it has?



For extra fun, have students write their own function cards to place in the hat.

Teacher Resources:

Function Cards

- Attach
- Balance
- Buffer (e.g., from impact)
- Collect (e.g., water, sunlight, etc.)
- Communicate
- Connect
- Cool down
- Create color
- Create flow
- Cycle elements (e.g., nitrogen, carbon, sulfur)
- Decompose
- Flexibility
- Grind
- Hold onto
- Insulate (to keep heat up or down)
- Manage
- Move fluids
- Orient
- Protect
- Recycle
- Stabilize
- Stick together
- Store
- Strengthen
- Withstand wind

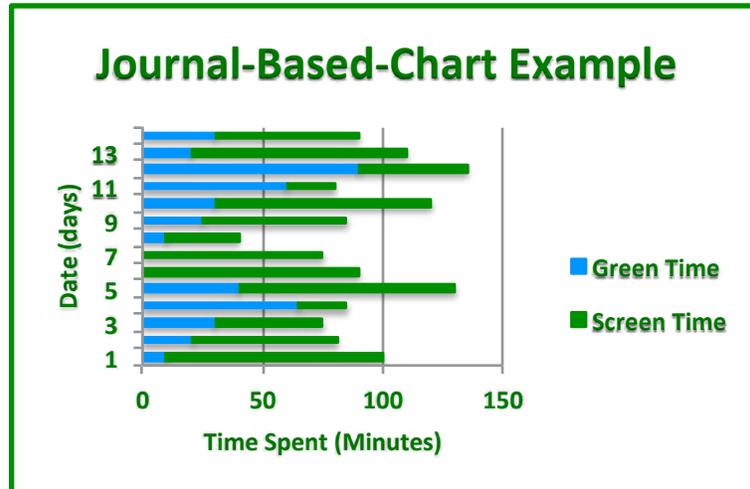


Tell students to keep their function a secret until the very end. Then give all of the students the same function (e.g. stabilize) without telling them. During the "field trip," students will begin to see how nature can achieve the same function through many different means.

▶ ADDITIONAL ACTIVITIES

MATH, SCIENCE, AND BIOMIMICRY

- Have students time their daily minutes in nature and their daily minutes in front of screens. Use this information for comparative data, as well as for practice with visual aids such as bar graphs, line graphs, and so on. See example below:



- Use triangulation techniques to gauge the height of your schoolyard trees.
- Go to a nearby stream and see how fast sticks travel downstream. Depending on their level, students may be able to design this project themselves: Set up a marker a certain distance downstream from a bridge. Drop sticks in the water and time how long it takes for them to reach the marker. Distance divided by time equals rate ($r = d/t$).
- Encourage students to expand their natural history skills by creating a profile of their schoolyard ecosystem. Collect rocks, identify plants, consider climate and water flow, and so on. If possible, find out what eco-region you live in and whether or not the species and materials you've documented are native to this region.
- Have students design research projects focused on the connections between nature and kids' well-being. Are there any correlations between time in nature and numbers of health-related absences from school? Do students who take a 15-minute walk in a park before an exam perform any differently than classmates who don't? You can get ideas for the kinds of research that has already been done at www.childrenandnature.org/research.
- Take part in an existing wildlife tracking program, such as Journey North, which tracks migrating monarch butterflies, or Cascadia Wild's Wolverine Tracking Project, which tracks wolverines through Oregon.

Overview:

Get outside and write poetry from the perspective of different organisms in nature.

Objectives:

Students will learn about numerous facets of nature, and will learn to view the world from the perspective of different plants and animals.

Standard Requirements:

See "Common Core Standards" on pg 49

Teacher Resources:

See "Types of Poetry" on pg 42

Materials:

- Pencil and Paper

Time:

45-60 Minutes

What to Do:

1. Discuss poetry. Introduce students to several different types of poetry, such as haiku, allegory, ode, narrative, imagery, free verse, etc.
2. Get outside. Have students settle into their own space, and take notes on what they observe using all of their senses. Encourage them to use different perspectives to expand their perception of nature (e.g., how does an ant view the grass? A dog? A human? A tree?).
3. Write poems. Give students prompts that encourage them to write from a different perspective (e.g., write from the standpoint of a butterfly. If you were a tree, what would you see and feel?). Once you present them with a prompt, give students 5-10 minutes to write a poem using the style of their choice.

 **Give one prompt from the perspective of a human to help students compare their daily viewpoint with the perspectives they've examined.**

4. Discuss. Give students the opportunity to read their poems to the class. Once students have shared, discuss the activity. Was perspective poetry harder to write? What have you learned about how perspective alters your views? Which perspective was most difficult to write about? Easiest?

Poetry Examples:

Looking Up

By Radha Singh, Grade 4

All humans are giants to me.
I am an ant so small.
The grass blades are trees I like to climb.
The clouds are huge fluffy cotton balls.
I hear the giants shouting.
They are loud.

Looking Down

By Barbara Urban, Grade 6

I see the grass reaching up to me,
But there is so much that I can't see.
The ants are running to and fro,
But where they go, I'll never know.
The grass is green and very small,
Or maybe I'm just really tall.

Overview:

Read a research article that interests you and learn how to write a short “tweet” to get the main points of the article across in an interesting, concise manner.

Objectives:

Students will increase their reading comprehension, summarization, and explanation skills for research articles.

Standard Requirements:

See “Common Core Standards” on pg 49

Teacher Resources:

Find research articles at www.sciencedaily.com

Materials:

- Research articles for students
- Pencils and Paper

Time:

1-2 Hours

What to Do:

1. Introduce research articles. Have students pick and read a research article from one of the resources above. Tell students that their job will be to summarize each section of the article. Their summarization will take the form of a “tweet,” consisting of no more than 140 characters, including punctuation and spaces.
2. Explore and share the research articles. Students will read each section of their research article (Introduction, methods, results/findings, discussion), and then write a tweet about each section. After all sections have been “tweeted,” hold a class discussion to share tweets. Have the class give feedback to each student: did they understand the experiment based on the tweets? What questions did they have about the information?
3. Discuss technology. Talk about the ways that technology can be used to share information. This activity had students write short tweets to share the information gleaned from research articles. How successful was this method of communication? What are some positive ways that technology can be used to share information? What are the strengths, challenges, and limitations of short social networking-type tweets? How is this mode of communication changing society, in both positive and negative ways? What are some other ways to spread important information in today’s world?

“Tweet” Example

Chinese scientists discovered a new species of dinosaur, related to the *T. rex*. Nicknamed “Pinocchio rex,” *Q. sinensis* has an extended snout with narrow teeth!

Overview:

Learn about plants and animals on the Endangered Species List, and then write a letter to humanity from their standpoint.

Objectives:

Students will gain a better understanding of the impact humanity has on other species, and analyze their views on how far humanity should go to save endangered plants and animals.

Standard Requirements:

See "Common Core Standards" on pg 49

Teacher Resources:

- Handout example on pg 27
- Full list of Endangered Species at www.fws.gov/endangered/

Materials:

- Pens and pencils
- The internet, or handout on species

Time:

60 Minutes

What to Do:

1. Discuss the impact humans have on the environment. Give a list of several plants and animals that are affected by humanity and why it is altering their lifestyles.
2. Pick an organism of interest. Have students pick out a plant or animal from the Endangered Species List that they're interested in. In groups or individually, have students put themselves into the lives of the organism they chose. Ask them to write letters to the human species, describing what their lives used to be like and how things are changing. What would they ask humans to do or not do?

 **Encourage students to use the internet or resources in the classroom to learn more about the plight of their organism.**

3. Discuss the activity. Have students share their letters with the class, and then hold a discussion. If these plants and animals are dying because of us, how far should humans go to save them? Is having two polar bears in a zoo still saving the species?

 **Don't have internet? Make handouts for students about endangered species in the area and have them do the activity based on the handout. See a sample handout on the next page.**

Examples of Situations to Discuss:

- Lonesome George, a Giant Tortoise, was kept in captivity for over three decades, while scientists tried to breed him with females of similar species. George died alone, in captivity, in 2012, marking the extinction of his subspecies (<http://news.nationalgeographic.com/news/2012/06/120625-lonesome-george-tortoise-last-extinct-galapagos-science-animals/>)
- Protected seals and sea lions in Oregon are being removed (and sometimes killed) to protect endangered salmon. Is it okay to kill one animal to save another? (http://www.oregonlive.com/business/index.ssf/2014/04/6-california_sea_lions_killed.html)
- Due to their endangered status, more tigers are found in captivity than in the wild. If we breed tigers in zoos and they no longer exist in the wild, are we really saving them? (<http://www.tigers-world.com/tigers-in-captivity/>)

 **Look at other species on the Endangered Species List. What human action is responsible for their decline? What can you, as a class or individually, do to help the species survive?**

Kauai Cave Wolf Spider

(Adelocosa anops)

Aka: Pe'e Pe'e Maka 'Ole,
No-eyed Big-eyed Wolf Spider

Status: Endangered
Listed since 2000

Description: The Kauai Cave Wolf Spider is a member of the wolf spider family. It is unique in that it has no eyes at all, just black patterns where its eyes should be. The adult reaches up to 0.75 inches in length. Its carapace is reddish-brown, its abdomen is silver, and its legs are beige to pale orange. It has three large teeth for biting its prey. Instead of catching its prey in a web like most spiders, the Kauai Cave Wolf Spider chases its prey down and catches it.

Habitat: The Kauai Cave Wolf Spider is only found in the caves and crevices of Koloa, Kauai. Its main prey is the endangered Kauai Cave Amphipod. Females carry their egg sacs in their mouth until the babies hatch. The newly hatched offspring then ride around on their mom's back until they are old enough to leave and hunt for themselves. Not much else is known about these interesting cave dwellers.

Conservation: The main threat to the Kauai Cave Wolf Spider is habitat loss and deterioration of its cave habitat. This loss is usually caused by human development and agriculture. They are also threatened by the use of chemical or biological pest controls, which are used to kill other insects. The US Fish and Wildlife Service has several caves under protection, and is working to restore more caves where the spider dwells.



Overview:

Read famous poems about nature, discuss them, and then write original poems about your own perception of nature.

Objectives:

Students will learn to analyze poetry, and will gain practice working with different poetic styles.

Standard Requirements:

See "Common Core Standards" on pg 49

Teacher Resources:

See poem handout on pg 29

Materials:

- Copies of poems for students
- Pencils and Paper

Time:

45-60 Minutes

What to Do:

1. Poetry Discussion. Begin with a discussion about the poems, and when they were written. Encourage students to discuss how life may have been different for the authors, many of whom were writing over 75 years ago.
2. Have students read each poem, and then answer the following:
 - List three things the author said that you think are important.
 - Why do you think this poem was written? What was the author trying to tell the reader?
 - What evidence in the poem helps you understand why it was written? Quote from the poem.
 - Write a question to the author that is left unanswered by the poem.
 - How do the author's views or relationship with nature relate to or differ from your own?
3. Discuss the poems. Have students talk about their answers in small groups, or as a class. Could this poem have been written today? Why or why not? Do you agree or disagree with the author's views in this poem?
4. Write poetry. Have students write a poem based on their own relationship with nature. They can be shape poems, rhyming, free verse, or any other style (see "Types of Poetry" on pg 42). How does the style of their poetry relate to the message of their poem? In the next class period, have students volunteer to share their nature poems with the rest of the class!

 **Read a poem, like the one below, to get the students in a poetry mindset!**

Our Forests by Charles Allen

A safe retreat from summer's heat
Fresh green on winter's snow
Our forests stand in stalwart band
To greet the folks who know.
To weary souls they're restful goals
On nerves distraught with care
They spread a balm of soothing calm
No doctor can prepare.
Quite free to all who heed the call,
Supreme in scenic lure,
Their verdant arms outflung with charms
Inviting, safe, secure.

▶ NATURE POETRY

Man in Stream by Rosanna Warren (1953)

You stand in the brook, mud smearing
your forearms, a bloodied mosquito on your brow,
your yellow T-shirt dampened to your chest
as the current flees between your legs,
amber, verdigris, unraveling
today's story, last night's travail...

You stare at the father beaver, eye to eye,
but he outstares you- you who trespass in his world,
who have, however unwilling, yanked out his fort,
stick by tooth-gnarled, mud-clabbered stick,
though you whistle vespers to the wood thrush
and trace flame-flicker in the grain of yellow birch.

Death outpaces us. Upended roots
of fallen trees still cling to moss-furred granite.
Lichen smolders on wood-rot, fungus trails in wisps.
I wanted a day with cracks, to let the godlight in.
The forest is always nocturne, but it gleams,
the birch tree tosses its change from palm to palm,

and we who unmake are ourselves unmade
if we know, if only we know
how to give ourselves in this untendered light.

Crossings by Ravi Shankar (b. 1975)

Between forest and field, a threshold
like stepping from a cathedral into the street-
the quality of air alters, an eclipse lifts,

boundlessness opens, earth itself retextured
into weeds where woods once were.
Even planes of motion shift from vertical

navigation to horizontal quiescence:
there's a standing invitation to lie back
as sky's unpredictable theater proceeds.

Suspended in this ephemeral moment
after leaving a forest, before entering
a field, the nature of reality is revealed.

The Magic Change by Mrs. Dewey S. Wright

I do not know my world today,
The summer sun has gone away,
The touch of fall is in the air,
It can be seen now everywhere.
Close here at hand some poplars rise
And rear their heads up to the skies.
But yesterday their clothes were green,
But now today – a golden sheen.
A magic hand has dealt to vine
I knew so well in summer time,
A color one can scarce describe
And stand close there by its side
The sumac that could not withstand
The artist with the faultless hand.
He with deft touch from foot to head
Has changed it to a crimson red.
The only things familiar now
Are standing on the mountain's brow,
The little pines so green and fair
Will not be changed by frosty air.

The Bargain of Forest and Stream by A. G. Jackson

The streams and the woods made a bargain,
That as long as the waters ran,
As long as the trees grew skyward
They'd follow this helpful plan:
The trees would shelter the rivers
And hold their flood-waters back.
The rivers would nourish the forest
And see that it ne'er would lack.
You never will have a river,
Steady and sure in its flow,
Unless in its upper reaches
Trees verdant and helpful grow.
And ne'er will you find a forest,
Wide and refreshing and grand,
Unless it is nourished by rivers
That flow through, renewing the land.
And man, who destroys the timber,
Leaving the mountain slopes bare,
Wonders what dried up the rivers
That once ran steadily there.

Overview:

Create a diagram showing the key communities you relate to on a daily basis.

Objectives:

Students will begin to think about their relationships with both technology and nature.

Standard Requirements:

See “Common Core Standards” on pg 49

Materials:

- Pens and pencils
- Paper

Time:

30 Minutes

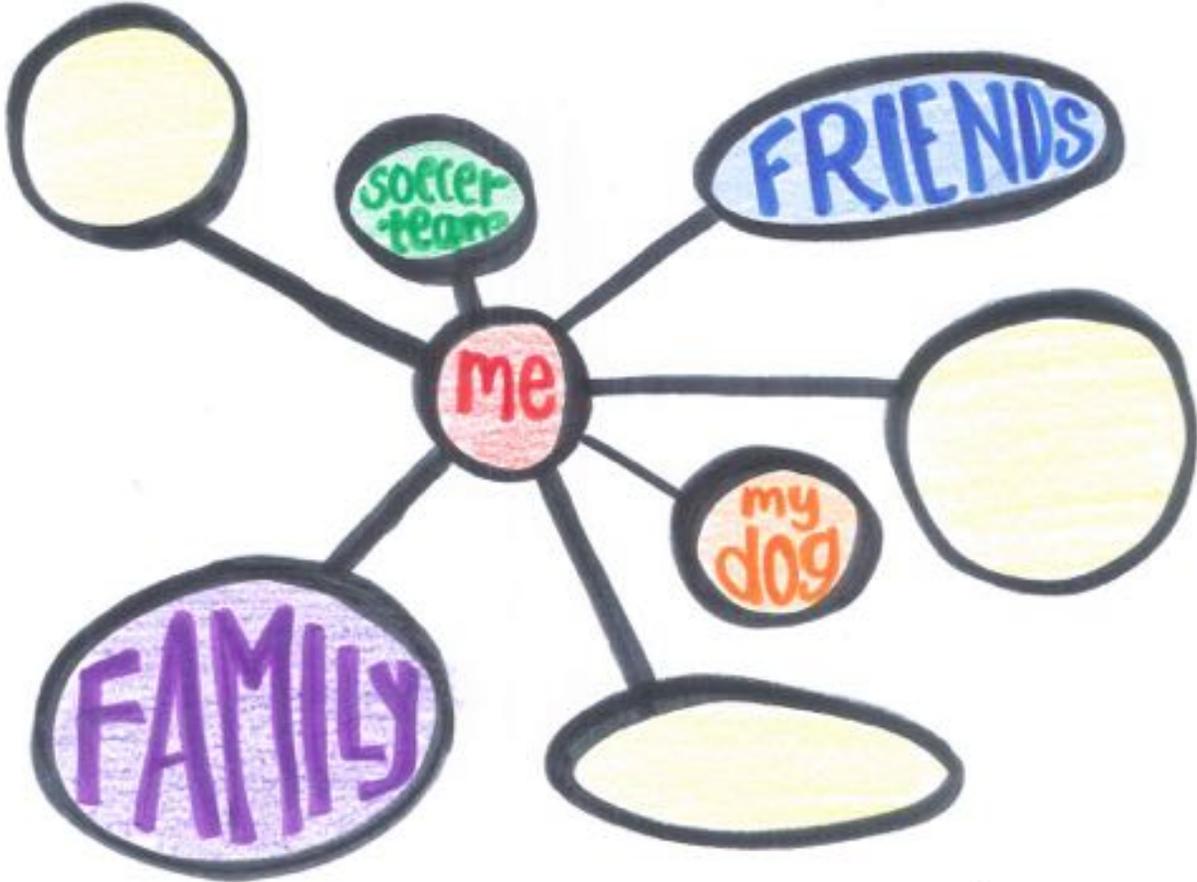
What to Do:

1. Make diagrams. Begin by asking students to take out a piece of paper. Have them draw a dot in the center labeled “me.” Then have them make circles around that dot showing their important relationships – communities or things they interact with on a regular basis. If necessary, you can give them a few examples: one circle for close friends, another for family, another for teammates, and so on. Encourage them to think about the patterns among the circles. Are they different sizes? Are they separate or do some overlap?
2. Discuss the diagrams. Invite students to talk about their diagrams and the circles they drew. What were some of the communities or groups the students identified? Did anyone include an online community? Did anyone make technology its own relationship? Did anyone make a circle for nature? Ask students to add both technology and nature now, if they didn’t before, using their circles to indicate the relative importance of these relationships to their lives.
3. Discuss technology. Where did the students put technology on their diagrams? Was it a separate circle? Small or large? Explain that, as the film showed, a lot of people are interested in how much time people of all ages – not just teens – spend in front of screens – computers, TVs, smart phones, and more. What they wonder is: What are we missing when we’re behind screens? Does there come a point when our relationship with technology becomes unhealthy or all-consuming? If so, what can we do about it?
4. Discuss nature. Ask students how they represented nature in their diagram. Do they have any meaningful connection to natural places? Wildlife? If they do not, does that mean that nature is no longer relevant to their lives? If so, should we strive to make it a part of our lives once more? Explain that, as the film showed, we are utterly dependent on natural systems for our water, oxygen, food, climate stability, and more. Nature – our biosphere – is the circle within which our entire lives take shape, but that doesn’t necessarily mean we have a conscious relationship with it.

 **Drawing a sample diagram on the white board, such as the ones provided on the next page, can help students visualize the activity. However, make sure that kids know that they can either follow the diagram’s design, or create a style of their own. The goal is the take-home message!**



Explain that you’ll use some of the other activities in this study guide to invite your students to develop more personal ties to nature right around them.



SCREENS FAMILY TOOTH
ME SCHOOL
SPORTS NATURE
BOOKS FRIENDS COLLEGE
PETS GAMES SIBLINGS

Overview:

Make a personal timeline of your relationship with nature and create your own nature autobiography.

Objectives:

Students will be able to articulate their own changing relationship with the natural world.

Standard Requirements:

See "Common Core Standards" on pg 50

Materials:

- Paper
- Pencils or pens
- Ruler
- Scrapbooking materials (such as photos, magazines, scissors, glue sticks, and markers)

Time:

45-60 Minutes

What to Do:

1. Begin by having the students divide into teams of two. Tell them to think about one of their very first memories of being outside in nature. Then have them take turns telling that memory to their partner.
2. Have the students write down their first memory and see if they can evoke any additional details of setting, emotion, and experience. Encourage students to recall the experience with all of their senses – sound, sight, touch, taste, smell.

 **Consider having students use stream of consciousness writing- one continuous piece of prose that ignores punctuation, grammar, and spelling in the interest of getting the ideas out.**

3. Create a nature timeline. Now pass out paper, pencils, and rulers. Have students divide their paper evenly into sections representing 3-6 different time periods in their lives, such as school years: pre-school (0-4); elementary (5-11); middle (11-14); high school (14-18). Then have them jot down key memories of how they spent time in nature in each time period. For example, what did they do on a regular basis (backyard games, nature collections)? What were their most memorable experiences (fishing trips, camping trips, getting lost)? With whom did they go outside (friends, parents, grandparents)? Where did they go (backyards, parks, beaches, national parks)? How did they feel (happy, free, fearful, pensive)?

4. Have the students brainstorm strategies to help them remember as much as possible about their relationship to nature. (For example, they can talk to friends or parents, walk by their old schoolyards to see if it helps jog their memory, look at photographs or videos, and so on). Tell students they don't have to worry about neatness or completeness on this timeline. The goal is to get them thinking about major aspects of their relationship to nature.



- **If students struggle to come up with memories, try working in groups to create more interesting, collective timelines.**
- **Collaging or drawing the timelines may increase students' excitement about the activity.**

5. Once students have completed their timelines, have a discussion as a class, or in small groups. Have students talk about how their time in nature has evolved. Did time spent in nature increase or decrease? Why? How did the activities change over time?

 **Include a future section in the timeline, for students to list new nature activities they want to try in the future. For extra credit, have students complete one of the activities in their future section and give a short presentation about it in class.**

ACTIVITY 20 CONTINUED

Have students interview older members of their community about their childhood experience of nature. Where did they go? How much were they supervised? What did they do? Students can do something as simple as interviewing parents and other adults they see regularly. Or, match students with a retirement community and talk to elders. Afterward, have the students write up the results, present them to the class, create a tape-recorded interview, or even do a short film about their subjects. Then encourage them to discuss what they learned. Did elders have more access to natural areas when they were younger? More freedom to roam? More time? Was anyone envious of the older people's experiences?

Encourage students to create a nature autobiography using their timelines to represent their relationship with nature over time. Some options for formats include:

- A written memoir
- A scrapbook (emphasis on photographs, sketches, maps, and other materials)
- A creative timeline (using words, symbols, artwork, and other strategies. Use a long scroll of paper to maximize options.)
- A short film (describing their relationship with nature using animation or personal video clips)

Have students share their autobiographies with one another in brief presentations. Consider creating a display at the school or public library that invites the public to take part in this discussion of young people and nature.



DIORAMA YOUR NATURE ADVENTURE

ART AND HUMANITIES

ACTIVITY 21

Overview:

Create dioramas based on memories of time spent in nature.

Objectives:

Students will be able to articulate the details of a specific time that they interacted with nature.

Standard Requirements:

See “Common Core Standards” on pg 50

Materials:

- Shoeboxes (brought by students)
- Colored paper
- Scissors, glue, and rulers
- Colored pencils or markers

Time:

- 60 Minutes for work
- 60 Minutes for presentations

What to Do:

1. Preparation. Give students several days to find a shoebox and write down at least one memory of a time they spent in nature. It can be a camping trip with their parents, a hiking trip with friends, or an exploration into their backyard as a child- the possibilities are endless.
2. Divide the class into pairs, and have each student share their nature memory with their partner.
 **If students cannot think of a nature memory, encourage them to make a diorama about an activity they hope to do in the future.**
3. Write down the memory. Once they have shared with their partner, have the students write down this memory and see if they can evoke any additional details of setting, emotion, or experience. Encourage students to recall the experience with all of their senses—sound, sight, touch, taste, smell. What was the weather like? What animals did they see? What trees or shrubs were around?
4. Explain the concept of a diorama. Encourage students to be as detailed and creative as they can be with their diorama. The goal is to successfully display their memory of time spent in nature, not to fit within restrictive boundaries.
5. Take the diorama home. To avoid using too much class time, have students finish their dioramas for homework. After several days, have students bring their dioramas back to class for presentations. Allow each student to explain their nature memory and how the diorama represents it.
 **Display the dioramas in the classroom, in the library, or somewhere around campus for others to see!**

▶ ADDITIONAL ACTIVITIES

ART AND HUMANITIES

- Assign students a book with a strong evocation of a natural landscape. Have them discuss details about the outdoors, the characters' relationship to nature, and the sense of place in the book. Encourage them to explore connections to their own local experiences and landscape. For ideas about books with a strong outdoor component, see www.listal.com/list/nature-literature.
- Have your students read an autobiographical essay or book by a great naturalist (such as E.O. Wilson, Hal Borland, Annie Dillard, Robert Michael Pyle, Wangari Maathai, Louise Erdrich, Rachel Carson, Gary Paul Nabhan, Henry David Thoreau, John Muir, Terry Tempest Williams, or Jane Goodall), or an autobiographical essay or book by a great technical mind (such as Steve Jobs or Bill Gates). How much time did this person spend in nature as a child? What did they do? How similar or different was this experience from your own childhood? Have the students write their own autobiographical essay about their relationship to nature.
- Have your students write an editorial about kids and nature, with a specific focus on screen time. What do they have to say about this issue? What should adults know about this topic? What should they do? Students should be encouraged to use resources from the guide and additional resources to strengthen their articles with facts.

 **For extra credit or as a fun extension activity, have students send their editorials in to the local newspaper.**

- Assign *My Side of the Mountain* by Jean Craighead George or *Hatchet* by Gary Paulsen. Then have your students write their own story about a teenager who spends a month alone in the wilderness. How would he or she survive?
- Create an outdoor sculpture or mural focusing on local nature. Look at the work of Andy Goldsworthy and watch the amazing film about him, entitled *Rivers and Tides* (2001). Or create art out of trash! (See www.recycling-revolution.com/recycle-crafts.html.)
- Move art class outdoors with nature sketching or plein air landscape painting.
- Have the students spend several sessions taking photographs of nature in your school neighborhood or around the specific topic of kids and nature. Select the strongest images from each student for a photo exhibit. Students can also check out the work of photographers such as Dudley Edmondson (Black & Brown Faces in America's Wild Places at raptorworks.com) and John Shaw (www.johnshawphoto.com).

Overview:

Pick a plant to learn about, grow, and present to the rest of the class and the school.

Objectives:

Students will gain appreciation for nature and gain valuable public speaking practice.

Standard Requirements:

See "Common Core Standards" on pg 50

Materials:

- Plastic pot for each student (or group)
- Soil to fill pots
- Seeds for each student (or group)

Teacher Resources:

- Planting a garden on pg 41

Time:

- 30 Minutes for planting
- Several minutes each class to water plants
- 60 Minutes for plant presentations

What to Do:

1. Plant seeds. Give each student (or group of students) a plastic pot and a handful of seeds. Students may either pick their own seeds or be randomly assigned a plant. Get outside and work with students to fill their pots with dirt, seeds, and water. Make sure students' pots are labeled so that they keep track of their own project.
2. Monitor growth. Take a few minutes at the beginning of each period to have students water and prune their plants. Encourage students to do research about gardening and how to best take care of their plant.
3. Learn more about the plants. Encourage the students to learn about their specific plant (origins, breeding habits, benefits, uses, etc.) and then display the information in an exciting fashion (poster, pictures, poem, etc.). Creativity is welcome!
4. Once the plants are fully grown, have an "Indoor Garden Open House!" Invite other classes and members of the community to come to your classroom and walk around to see each plant and hear the presentations by the students.

 **See if a local nursery will donate plastic pots and seeds. It will save your class money and get the community involved in class projects.**



Overview:

Do research about the biome you live in to ensure that you're growing plants that are in their optimum climate region.

Objectives:

Student will learn how biomes affect plants, and will begin to see the considerations that go into creating a successful garden.

Standard Requirements:

See "Common Core Standards" on pg 50

Materials:

- School garden (optional)
- The Internet

Time:

45-60 Minutes

What to Do:

1. Introduce biomes. Explain to students what a biome is and how it is indicative of the climate of the area. Talk about the features associated with your biome.
2. Research your biome. Using the resources above or others found on the internet, have students determine which plants grow best in their biome. What about these plants make them successful in this particular climate region? Are any of these plants native to your region specifically?
3. Pick plants for the garden. Compile a list of plants based on the results of the students' research. As a class, pick plants for the garden. Should you pick plants that produce beautiful flowers or useful fruits and veggies? Do the plants grow year round, or should they be planted during a specific month or season? Encourage students to be involved in this process so that they are excited about the process of growing the garden.

Teacher Resources:

Definition of a Biome

A biome is an area on earth's surface that is defined by certain abiotic factors (non-living factors). These include climate (temperature and precipitation), relief, geology, and soils. A biome is NOT an ecosystem. Within each biome, there are certain plants and animals that have adapted to live in that specific abiotic environment. If you look at the biome more closely, you'll notice that different plants or animals within the biome have similar adaptations, but are not the same.



Based on the information you've gathered about biomes, decide which biome your school is in. Pick plants for your garden that will thrive in your biome's specific environment. For example, don't plant a cactus in a tropical forest biome! It's not adapted!

Major Biomes on Earth:

- Tropical Forests: Located near the equator, tropical forests are hot and humid. They contain over half of the world's plant and animal species, which means they have the largest biodiversity.
- Savannah or Tropical Grasslands: Containing mainly grass, scrubs, and scattered trees, the savannah is extremely hot and humid. This biome is characterized by its two distinct seasons: a dry season and a rainy season.
- Desert: This biome is hot and dry, with very little rain. The world's largest desert is the Sahara Desert.
- Coniferous Forests: This biome is defined by its abundance of conifers, or evergreen trees! The climate of coniferous forests is cool with moderate rainfall.
- Tundra: This biome surrounds the north and south poles. It is extremely cold, with temperatures often reaching about -500F in the winter. The tundra covers about 1/5th of the Earth's land surface, yet supports only a few plants and animals.

These are the most abundant biomes, but there are many not mentioned here. For a complete list, visit <http://www.bbc.co.uk/nature/habitats>

Overview:

Do research about plants that are native to the area and grow those plants in a garden.

Objectives:

Students will learn the importance of native growth and will begin to see the considerations that go into creating a successful garden.

Standard Requirements:

See "Common Core Standards" on pg 50

Materials:

- School garden (optional)
- The Internet

Time:

45-60 Minutes

What to Do:

1. Introduce native plants. Explain to students what makes a plant native and why certain plants grow more successfully in certain areas. Talk about the features of your area and the native plants associated with it.
2. Research native plants. Using the resources above or others found on the internet, have students determine which plants grow best in your area. What about these plants make them successful in this particular region? Are any of these plants native to other regions as well?
3. Pick plants for the garden. Compile a list of plants based on the results of the students' research. As a class, pick plants for the garden. Should you pick plants that produce beautiful flowers or useful fruits and veggies? Do the plants grow year round, or should they be planted during a specific month or season? Encourage students to be involved in this process so that they are excited about growing the garden.

Teacher Resources:

Importance of Native Plants

Native Plants evolved with native wildlife, so everything from the shape and structure of the flower to the chemical content of the leaves is tailored to the feeding habits of native insects, birds, and animals. Even the bloom time of the plant

correlates with the pollinator cycles in the area. The production of fruit and berries are in sync with the bird and animal life cycles in the area to maximize the potential for seed dispersion. All of this is possible thanks to hundreds of generations of coevolution.

Due to this coevolution, the native plants are vital for the ecosystem as a whole. If the native plants disappear, so does the wildlife that depends on them. For example, if a native plant is removed or killed, the insects that usually rely on the plant for food may starve. When the insect population suffers, the birds that eat the insects aren't able to feed their young, and so the baby birds do not survive. The mammals, which rely on the plant's fruit for food, are also hurt, and their populations suffer because there is not enough food to feed the entire population.

When gardeners use native plants, they are helping to restore the natural ecosystem of the area and expanding native biodiversity.

Resources for Finding Native Plants

- <http://www.wildflower.org/plants/>
- <http://www.pollinator.org/guides.htm>

Resources for Finding Books

- <http://findnativeplants.com/>

Resources to Find Native Nurseries Near You

- <http://www.plantnative.org/>

Overview:

Observe the plants and animals found around the schoolyard, then discuss the ways that they are all interconnected.

Objectives:

Students will begin to understand the complex interconnectedness of nature.

Standard Requirements:

See "Common Core Standards" on pg 50

Materials:

- Pencils and Paper/flashcards
- Ball of string

Time:

45-60 Minutes

Part One:

1. Get outside. Have student walk around the schoolyard and make a list of everything they see: bugs, fungus, soil, plants, people, animals, etc.
2. Using the lists gathered by the students, assign every student an organism or resource. Tape a piece of paper with the name of the item in large writing to their chest.

 **You can also make your own list (e.g. animals in the ocean) for more web-making fun. For an extra challenge, add sunlight and water to the list.**

3. Get connected. Have students stand in a circle, and give a ball of string to one student. Have the student throw the ball, while holding onto the end, to a student whose organism is connected to them and explain how they are connected (e.g. I am a hawk. I threw the ball to the pine tree because I like to make my nest in its branches).
4. Make a web. Continue the process until the students have a web of string in the center of the circle. Each student can receive the string multiple times, and if they get stumped, they can ask for help from their neighbors. Make sure each student catches the string at least once.

 **Include hints on the back of the student's organism name tags about how they relate to the ecosystem (e.g. you are a hawk. You eat small animals and live in trees).**

5. Break the web. Once students have a solid web, pick one student to drop his string. This will cause the web to wilt. Once the student's string is dropped, have everyone he was connected to drop their string as well. As more students drop their string, they will begin to see how the system crumbles when plants and animals are removed.
6. Discuss interdependence. Explain the concept of interdependence and how it can be seen in every aspect of the natural world- including the schoolyard! Encourage students to consider how the addition or removal of one plant, animal, or resource can alter the balance of the entire ecosystem.



Silent Interdependence. Take students to an open area, such as a field. Once there, have each student (without speaking or pointing) pick two partners by making eye contact with two of their classmates. When you tell them to go, have students move around until they are standing an equal distance from each of their partners. If their partners keep moving, they must keep moving! Once the class has come to a halt, move one or two students to a new location. Then have the class move themselves again. How did the moving of one student effect the rest of the class? How can you relate this to nature and the ecosystem?



ADDITIONAL ACTIVITIES

SCHOOL GARDENS

- Build a schoolyard garden – or even outdoor planters – and use these to explore topics such as soil, hydrology, local climate, and pollination. All while spending quality time outdoors.
- Encourage your students to research innovations in green science and technology. You can help them get inspired by showing them this short video clip on the topic of biomimicry (new technologies that draw inspiration from nature) www.ted.com/talks/lang/eng/janine_benyus_biomimicry_in_action.html or this longer clip of green chemist John Warner at vimeo.com/15922167.
- Conduct an energy audit of your school. Study green technologies as well as simple strategies that can help you reduce your energy consumption. If some ideas seem impractical or unrealistic, ask what would need to be done to make this vision happen.
- School garden activities are endless. Check out your library or the web for more ideas.
- Create a mason jar terrarium to show students how our Earth is a closed-loop system. Consider adding pollution or man-made materials to see how they influence the balance in the jar. For detailed instructions, go to <http://thescienceclassroom.org/how-to-make-your-own-self-contained-ecosystem-biosphere/>

▶ TEACHER RESOURCES

HOW TO PLANT A GARDEN

Planting Preparation

1. Pick the type of pot you are going to use. You can start seedlings in open flats, in individual sections of a container, or in pots. Individual containers are preferable, because the less you disturb the roots the better. If you are hoping to eventually move the plants to an outside garden, peat pots are ideal because they can be planted right into the garden with the plant.

 **You can recycle milk cartons and plastic containers as seed-starting pots. Just be sure to poke drainage holes in the bottom of each one.**

2. Pick a soil. It is recommended that you use a potting mix (which can be purchased at any store with a gardening section). Plain soil has a tendency to be too hard for new roots to puncture, and may contain toxins or organisms harmful to the seeds. If your plants are going to be indoors, consider using a soilless potting mix.

3. Make the potting mix damp all the way through. At the time of planting, the potting mix should be about the dampness of a wrung-out sponge. It should stick together when handled, but should not drip.

 **Seeds contain all of the nutrients they need to grow, so fertilizer is not needed until the first true leaves of the plant are seen.**

Planting Seeds

1. Fill pots about two thirds full with potting mix. Don't smash soil down. Tap pot on table-top to get soil to settle, and then gently firm down with your hand. Follow instructions on seed packet for planting, and refer to the following for additional information.

 **Make sure to read the seed packet before planting seeds, as some seeds need special preparation before they are planted.**

2. Dig out a hole for your seeds. In general, the hole's depth should be twice the diameter of the seed. It's better to plant too deep than too shallow because you want the roots to have room to expand and grow.
3. Place three to five seeds in each hole. Not all seeds will germinate, so multiple seeds ensure at least one successful germination.
4. Cover the hole and gently pat the soil down. You want to get rid of air pockets around the seed without applying too much pressure. Once done, sprinkle more water over the covered hole.
5. Keep your pot in a warm, dry, draft-free area until the seedlings emerge. Once the plant emerges, make sure the plant has sunlight and water.

Plant Growth

1. Once the seedling begins poking through the soil, it will straighten up and unfurl two leaves. These are actually the cotyledons, leaf-like structures that are part of the seed and serve as food for the plant until true leaves are formed.
2. As the seedling grows, the cotyledons will wither and the first "true" leaves will form. This is when your seedling begins actively photosynthesizing. At this point, you may want to give your seedling some supplemental food (fertilizer) to help it grow.
3. If more than one seedling is growing in the same pot, it may be beneficial to cut off all but the strongest seedling. Don't try to pull out the extra seedlings, since this might hurt the roots of the seedling you are keeping.

▶ TEACHER RESOURCES

TYPES OF POETRY

Haiku

A haiku poem is of Japanese origins. It is a verse consisting of three unrhymed lines of five, seven, and five syllables, (5, 7, 5) or 17 syllables in all. Haiku poetry is usually written in the present tense and focuses on nature and the seasons.

A Haiku by Richard Wright
Whitecaps on the bay:
A broken signboard banging
In the April wind.

A Haiku by Shiki
Toward those short trees
We saw a hawk descending
On a day in spring.

Free Verse

Free verse is a form of poetry in which the content is free of traditional rules (e.g. fixed meter or rhyme).

Soonest Mended by John Ashbury
Barely tolerated, living on the margin
In our technological society, we were always having to be rescued
On the brink of destruction, like heroines in *Orlando Furioso*
Before it was time to start all over again.
There would be thunder in the bushes, a rustling of coils,.....
The whole thing might not, in the end, be the only solution.....
Came plowing down the course, just to make sure everything was O.K....
About to receive this latest piece of information.

Ode

And ode is a poem which praises or glorifies a person, place or thing.

Great Barrier Reef by Jeremy Martin
Pacific beauty, garland of shimmering pastels
Textures and colors astound, deep in your ocean heart
Your court is larger than any kingdom on Earth
And hosts grand balls and parties,
Shimmering schools of fish dance in unison
Anemones gather by the thousands
Each more vibrant than the next
Grand plumes of algae sway like great banners
In the streets of your endless coral cities,
Lost happily in orange towers
All fathoms deep, cradled by warm currents
Erupting and tumbling and breathing,
The jealous coast watches, the winds bow down
Salt and scales glitter like stars in your sky
Oh magnificent belle of Queensland!
All Hail The Great Barrier Reef!

▶ TEACHER RESOURCES

TYPES OF POETRY

Narrative Poetry

Narrative poetry tells a story, often using the voices of a narrator and characters to enhance the plot. The entire story is in metered verse, and can be short or long depending on the story.

Annabel Lee by Edgar Allan Poe

It was many and many a year ago,
 In a kingdom by the sea,
That a maiden there lived whom you may know
 By the name of Anabel Lee;
And this maiden she lived with no other thought
 Than to love and be loved by me.

...

For the moon never beams, without bring me dreams
 Of the beautiful Annabel Lee;
And the stars never rise, but I feel the bright eyes
 Of the beautiful Annabel Lee;
And so, all the night-tide, I lie down by the side
 Of my darling- my darling- my life and my bride,
In the sepulcher there by the sea-
In her tomb by the sounding sea.

Limerick

Limerick poems originated in Limerick, Ireland. Limericks have a set rhyme scheme of a-a-b-b-a, and a syllable structure of 9-9-6-6-9.

The Man from Aruba Jim Dupy

There once was a man from Aruba,
Whose favorite hobby was scuba.
Every day he would wish,
He could spear a big fish.
But settled instead for canned tuna.

▶ GENERAL RESOURCES

Books

Ecological Literacy: Educating Our Children for a Sustainable World by David Orr (Sierra Club Books, 2005).

Endangered Minds: Why Children Don't Think – and What We Can Do About It by Jane Healy (Simon and Schuster, 2011).

Failure To Connect: How Computers Affect Our Children's Minds – and What We Can Do About It by Jane Healy (Simon and Schuster, 1999).

The Geography of Childhood: Why Children Need Wild Places by Gary Paul Nabhan and Stephen Trimble (Beacon Press, 1995).

Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder by Richard Louv (Algonquin Books, 2008).

Natural Playscapes: Creating Outdoor Play Environments for the Soul by Rusty Keeler (Exchange Press, 2008).

The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder by Richard Louv (Algonquin Books, 2011).

Place-Based Education: Connecting Classrooms with Community by David Sobel (The Orion Society, 2004).

National Organizations

The Children and Nature Network works to promote positive connections between children and the natural world for their health and the health of the planet. Visit www.childrenandnature.org/ and click on the links at right for Natural Families, Natural Teachers, and Nature Rocks (devoted specifically to family-friendly activities).

The Center for a New American Dream has a wealth of resources for educators and all citizens to create pathways to healthier consumption, including a 300-page educator's guide called Smart Consumers (see below).

The North American Association of Environmental Education is a membership organization for anyone who helps others learn about the environment:
www.naaee.net.

The National Wildlife Federation offers resources on how and why to create schoolyard habitats at www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife/Schoolyard-Habitats.aspx.

▶ GENERAL RESOURCES

Curricula and Activity Guides

Coyote's Guide to Connecting to Nature by Jon Young, Evan McGown, and Ellen Haas (Owlink Media, 2010). A big book loaded with ideas, stories, games, and activities to help connect young people to nature.

The Digital Literacy and Citizenship Curriculum, created by the independent nonprofit organization Common Sense Media, is designed to empower students to think critically and make informed choices about how they create, communicate, and treat others in our ever-evolving, 24/7 digital world. The curriculum, which is organized by grade level (K-12), is available for free at www.common Sense Media.org/educators/curriculum.

Smart Consumers: An Educator's Guide to Exploring Consumer Issues and the Environment (Center for a New American Dream and World Wildlife Fund, 2004). A comprehensive, interdisciplinary guide that helps middle school students learn more about how their consumer choices affect the environment and how they can make a difference by buying differently. To obtain a print copy, contact newdream@newdream.org.

Classroom Earth, a program of the National Environmental Education Foundation, is an online resource designed to help high school teachers include environmental content in their daily lesson plans: www.classroomearth.org.

Project Learning Tree (PLT) is an international environmental education program that uses the forest to increase students' understanding of our complex environment. Projects in states around the country, including Maine: www.plt.org.

"What do you need? What do you want?" (http://www.ecoliteracy.org/sites/default/files/uploads/shared_files/CEL_needs_and_wants_activity.pdf). Designed by the Center for Ecoliteracy, this project was designed to help participants distinguish between personal needs and wants, and consider how things are used or wasted. See more activities by the Center for Ecoliteracy at <http://ecoliteracy.org/>.

The National Inquirer provides a number of environmental activities for grades K-8 that are set to Common Core Standards. For a list of their activities, visit <http://www.naturalinquirer.org/Lesson-Plans-v-42.html>.

The Children and Nature Network offers valuable information for training and education natural leaders. For more information about their programs, visit <http://www.childrenandnature.org/naturalleaders/>.

PBS.org links their television special, "POV: Borders" to an in-depth environmental education lesson plan for middle school and high school teachers. For more information on "Point of View: Environment" lesson plans, visit <http://www.pbs.org/pov/borders/2004/educators/index.html>.

▶ COMMON CORE STANDARDS

The following activities from the “Play Again” curriculum titled have been aligned to grades Social Studies Content Standards and English Language arts Common Core State Standards.

Activity #1

Standards: Integration of Knowledge and Ideas: Anchor Standard 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Assessment: Text Types and Purposes: Anchor Standard 1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Students respond in writing to the following: With which statement did you most disagree and with which statement did you most agree? Explain.

Activity #2

Standards: Comprehension and Collaboration: Anchor Standard 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.

Assessment: Production and Distribution of Writing: Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. Students create a letter to the school board or read it at a school board meeting.

Activity #3

Standards: Presentation of Knowledge and Ideas: Anchor Standard 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Assessment: Integration of Knowledge and Ideas: Anchor Standard 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. Students compare their maps to one another’s via gallery walk. Students compare and contrast ideas in quad small groups.

Activity #4

Standards: Text Types and Purposes: Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences

Assessment: Review journals at the end of unit to interpret narrative style writing elements in writing. Students will use the journal to write a final story about their experience with the screen time and screen fasting.

▶ COMMON CORE STANDARDS

Activity #5

Standards: Conventions of Standard English: Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Assessment: Teacher observes students discussions in table groups. Rubric is used to check proficiencies in conventions.

Activity #6

Standards: Vocabulary Acquisition and Use: Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

Assessment: Students produce a picture, media presentation, song or writing about how sight impacts their decisions. Within their artifact of learning, they will use three new vocabulary words in various ways and explain why they chose those words.

Activity #7

Standards: Key Ideas and Details: Anchor Standard 1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Assessment: In groups of two, students produce a poster with their ecological footprint.

Activity #8

Standards: Range of Reading and Level of Text Complexity: Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

Math: 5.OA.A Write and interpret numerical expressions.

Assessment: Math: 5.OA.A Write and interpret numerical expressions. Grades 4-8 Students will calculate the amount of diversity in each area using Simpson's Index.

Activity #9

Standards: Text Types and Purposes: Anchor Standard 2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Assessment: Research Paper. Teacher reviews and creates rubric to determine proficiency levels of informative writing.

▶ COMMON CORE STANDARDS

Activity #10

Standards: Comprehension and Collaboration: Anchor Standard 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Assessment: In their journals, students will write how they feel about biomimicry.

Activity #11

Standards: Knowledge of Language Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Assessment: Students become naturalists and give an oral presentation to class about their plant or animal. Teachers will use a graded rubric looking for components of writing.

Activity #12

Standards: Craft and Structure: Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

Assessment: Students write poems and read aloud to class. Teacher reviews scoring of rubric and scores poems.

Activity #13

Standards: Range of Reading and Level of Text Complexity: Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

Assessment: Teacher reviews tweets and rubric scoring guide with students ahead of time.

Activity #14

Standards: Text Types and Purposes: Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

Assessment: Create rubric with 4 point writing scale on organization, ideas, conventions, voice, sentence fluency word choice and presentation.

▶ COMMON CORE STANDARDS

Activity #15

Standards: Integration of Knowledge and Ideas: Anchor Standard 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

Assessment: Students present their letters to whole class or smaller groups. Other students rate their letters using a scoring guide.

Activity #16

Standards: Craft and Structure: Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

Assessment: Students will write their own poems. Teacher will evaluate reading aloud to class using grading rubric on the following word choice, voice and ideas.

Activity #17

Standards: Comprehension and Collaboration: Anchor Standard 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Assessment: Teacher walk around and check for participation. Exit ticket out the door: students write three new things they learned from their discussions.

Activity #18

Standards: Presentation of Knowledge and Ideas: Anchor Standard 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Assessment: Students will present timelines to small groups. Teacher will grade timelines after presentations. Grading rubric will be given to students ahead of time looking for organization and ideas.

Activity #19

Standards: Research to Build and Present Knowledge: Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Assessment: Students will grow plants and present information about caring for the plant. Rubric will be given to students ahead of time. Teacher will determine areas for grading for specific task.

▶ COMMON CORE STANDARDS

Activity #20

Standards: Vocabulary Acquisition and Use: Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

Assessment: Ticket out the door: Definition of a Biome.

Activity #21

Standards: Key Ideas and Details: Anchor Standard 1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Assessment: Teacher develop research rubric grading to be reviewed with students before project begins.

Activity #22

Standards: Integration of Knowledge and Ideas: Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Assessment: Students will be graded on maintenance and upkeep of terrariums.

Activity #23

Standards: Integration of Knowledge and Ideas: Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Assessment: Students will be graded on maintenance and upkeep of terrariums.

Activity #24

Standards: Integration of Knowledge and Ideas: Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Assessment: Students will be graded on maintenance and upkeep of terrariums.

Activity #25

Standards: Integration of Knowledge and Ideas: Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Assessment: Students will be graded on maintenance and upkeep of terrariums.



This study guide was developed by Taylor Rudow. Thank you to the following individuals for making this study guide possible: Sara St. Antoine, Senior Writer at the Children and Nature Network, Barbara Brock, Hannah Quimby, Jason Lenox, Art Director at Lenox Reign Creative, and Thomas Joseph Doherty.



To order PLAY AGAIN DVDs and educational licenses, please visit www.PlayAgainFilm.com.

Join us at www.facebook.com/PlayAgainFilm

At a time when children play more behind screens than outside, PLAY AGAIN explores the changing balance between the virtual and natural worlds. Is our connection to nature disappearing down the digital rabbit hole?

This moving and humorous documentary follows six teenagers who, like the “average American child,” spend five to fifteen hours a day behind screens. PLAY AGAIN unplugs these teens and takes them on their first wilderness adventure – no electricity, no cell phone coverage, no virtual reality.

Through the voices of youth and leading experts including journalist Richard Louv, sociologist Juliet Schor, environmental writer Bill McKibben, educators Diane Levin and Nancy Carlsson-Paige, neuroscientist Gary Small, parks advocate Charles Jordan, and geneticist David Suzuki, PLAY AGAIN investigates the consequences of a childhood removed from nature and encourages action for a sustainable future.



PLAY AGAIN

PLAY AGAIN is directed by **Tonje Hessen Schei**,
produced by **Meg Merrill**, and edited by **David Bee**.

"This film tells its story effectively by letting children speak... the focus remains on contemporary childrens' experience in their own words. Play Again can serve as a compelling catalyst for discussion and action to limit screen time and the commercialization of childhood and to increase childrens' free play outdoors and access to nature- not just through distant wilderness adventures but also through schoolyard gardens and nearby nature."

*-Louise Chawla,
University of Colorado,
Children, Youth, and
Environments Journal*

"I did not expect the documentary, "Play Again" to be fun. I expected to learn more dire statistics about the effect of technology and media on kids. The film does not sugar-coat the situation, but I learned about the resiliency of kids and the miracle of the instinctual human response to nature. It's a brilliant exploration of the effect of a childhood removed from nature... this film is inherently hopeful."

*-Robbie Knight,
Denver Green Streets*



Winner
MICKIE EDWARDS AWARD
Cinema Verde
2011



Winner
AUDIENCE AWARD
EarthVision
Santa Cruz
Film Festival
2011



Winner
YOUTH IN FOCUS
Princeton
Environmental Film
Festival
2011



Winner
AUDIENCE AWARD
Portland Women's
Festival
2011



Winner
Jury Award
for Best Documentary
FICMA
BARCELONA
2010



Winner
Best Educational Film
EKOFILM
PRAGUE
2010



Ground Productions

PMB 205, 4110 SE Hawthorne Blvd, Portland, OR 97214

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