



The Nature of Teaching An Engaged Approach to K12 Education

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Why Nature?

**NATURE
DEFICIT
DISORDER**



- Youth lack of exposure to nature
- Most youth time spent in schools
- Lack of educational STEM resources
- Reduced funds for teacher professional development
- Extension can provide free professional development for expert designed interdisciplinary STEM standards-based curricula

Benefits of Nature

Intellectual

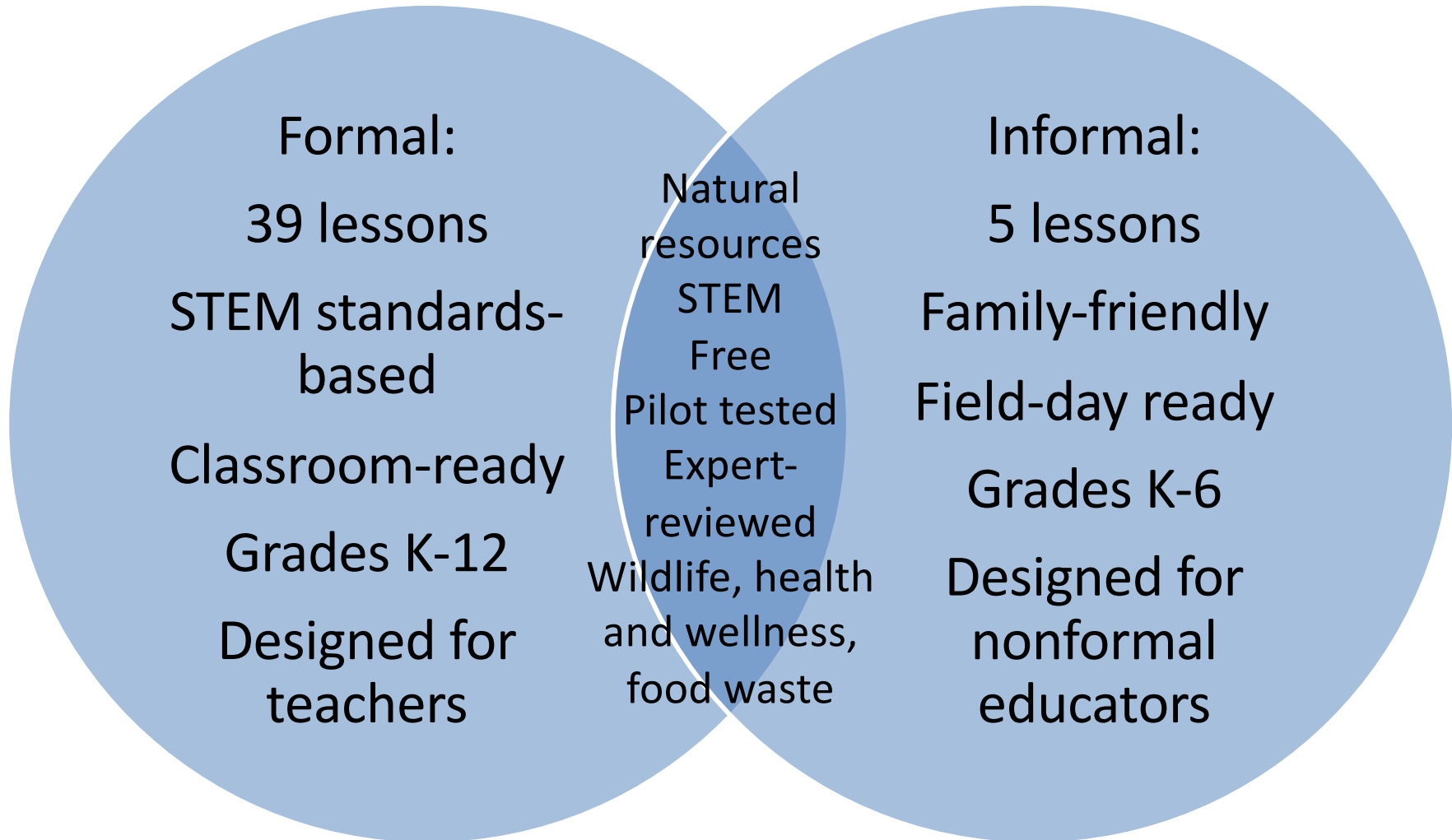
Emotional

Social

Spiritual

Physical


The Nature of Teaching: Curriculum



Getting to Know: Formal Curricula

PURDUE Extension

FNR-417-W
EXPERT REVIEW



The NATURE OF TEACHING WILDLIFE

UNIT 1

Animal Diversity and Tracking

Animal tracks are useful to reveal the diversity of organisms within different environments.

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OVERVIEW

Animal Diversity and Tracking LESSON PLAN

ESTIMATED TIME

Three 30-90 minute lessons

VOCABULARY

- Habitat
- Unguligrade
- Generalist
- Stride
- Specialist
- Straddle
- Plantigrade
- Gait
- Digitigrade
- Track

UNIT OBJECTIVES

Students will be able to:

- Identify wildlife species using tracks
- Recognize that animal diversity can be high even when we do not see the animals
- Predict which species tracks they are likely to find based on habitat requirements
- Create molds of tracks and interpret animal behavior

LESSON STANDARDS

Lesson 1

Next Generation Science Standards
4-LS1-1

English/Language Arts

| | | | | |
|--------|--------|--------|--------|--------|
| RL.K.1 | SL.K.2 | SL.1.2 | RI.1.7 | SS.4.1 |
| RL.K.2 | RI.1.1 | RI.2.1 | SI.3.1 | SI.4.2 |
| RL.K.3 | RI.1.2 | RI.2.2 | SI.3.2 | SI.5.1 |
| RL.K.4 | RI.1.3 | SI.2.1 | RI.4.1 | SI.5.1 |
| RL.K.7 | RI.1.7 | SI.2.2 | RI.4.2 | SI.5.2 |
| SL.K.1 | SL.1.1 | RI.3.1 | RI.4.7 | |

Math

| | | | | |
|----------|----------|----------|----------|----------|
| K.CC.C.7 | K.MD.A.1 | K.MD.A.2 | 2.MD.A.1 | 3.MD.B.4 |
|----------|----------|----------|----------|----------|

Lesson 2

Next Generation Science Standards

| | | | | |
|----------|------------|------------|------------|---------|
| K-LS1-1 | K-2-RTS1-2 | 2-LS4-3 | 2-5-RTS1-3 | 4-LS1-2 |
| K-ESS1-1 | 2-LS4-1 | 2-5-RTS1-2 | 4-LS1-1 | |

Math

| | | |
|----------|----------|-----------|
| K.MD.A.1 | K.G.G.5 | 2.MD.D.10 |
| 2.MD.A.1 | 1.MD.C.4 | 3.MD.B.3 |

Lesson 3

Next Generation Science Standards

| | | |
|------------|---------|---------|
| K-2-RTS1-2 | 2-LS4-3 | 4-LS1-1 |
|------------|---------|---------|

English/Language Arts

| | | | | |
|--------|--------|--------|--------|--------|
| RL.K.1 | RI.1.1 | RI.2.2 | RI.3.7 | SI.4.2 |
| RL.K.2 | RI.1.2 | RI.2.4 | SI.3.1 | SI.5.1 |
| RL.K.3 | RI.1.3 | RI.2.7 | SI.3.2 | SI.5.2 |
| RL.K.4 | RI.1.4 | SI.2.1 | RI.4.1 | SI.5.4 |
| WS.2 | RI.1.7 | SI.2.2 | RI.4.2 | SI.5.1 |
| WS.3 | SI.1.1 | RI.1.1 | RI.4.3 | SI.5.2 |
| SL.K.1 | SI.1.2 | RI.1.2 | RI.4.4 | |
| SL.K.2 | RI.2.1 | RI.1.4 | SI.4.1 | |

Math

| |
|----------|
| 3.MD.A.2 |
|----------|

Lesson 4

Next Generation Science Standards

| | | | | |
|----------|------------|----------|---------|---------|
| K-ESS1-1 | K-2-RTS1-2 | K-ESS2-2 | 2-LS4-3 | 4-LS1-1 |
|----------|------------|----------|---------|---------|

Math

| | |
|---------|----------|
| K.G.G.5 | 3.MD.A.2 |
|---------|----------|

Lesson 5

Next Generation Science Standards

| | | | |
|----------|------------|----------|---------|
| K-ESS1-1 | K-2-RTS1-2 | K-ESS2-2 | 2-LS4-3 |
|----------|------------|----------|---------|

English/Language Arts

| | | | | |
|--------|--------|--------|--------|--------|
| WS.2 | SI.1.1 | SI.2.2 | WS.4.1 | WS.2 |
| WS.3 | SI.1.2 | WS.1.1 | WS.4.2 | SI.5.1 |
| SL.K.1 | WS.2.1 | WS.2 | SI.4.1 | SI.5.2 |
| SL.K.2 | WS.2.2 | SI.1.1 | SI.4.2 | |
| W.1.1 | SI.2.1 | SI.3.2 | WS.1 | |

Math

| | | | | |
|----------|----------|----------|----------|----------|
| K.CC.C.7 | K.MD.A.1 | K.MD.A.2 | 2.MD.A.1 | 3.MD.B.4 |
|----------|----------|----------|----------|----------|

TEACHERS' NOTES

Animal Diversity
and Tracking
LESSON PLAN

Animal tracks are an easy and fun way to identify which mammals and other wildlife can be found on your school property. You can use animal tracks and animal tracking to determine the distribution of wildlife species, the species diversity of an area, and also as a measure of the population size of mammals. For example, wildlife biologists with the Maine Department of Inland Fisheries and Wildlife use snow-tracking (following animal tracks in the snow) to determine where Canada lynx are found within the state.

Beyond identifying animals, animal tracks found in nature can tell a story about the animal's life and how it moves through your school property. Many features of animal tracks can help determine the species that left the track and help paint a picture of the animal's daily life.

FOOT TYPES

Mammals typically have 1 of 3 foot types: plantigrade, digitigrade, or unguligrade. Each type determines what part of the foot is left in the track and how the animal moves. Animals with a plantigrade type walk on the entire sole of their feet. Bears, raccoons, and humans all have a plantigrade foot type. Animals with a digitigrade type walk on their toes (digits). Coyotes, bobcats, and birds have a digitigrade foot type. Animals with an unguligrade type walk on the tips of their toes (i.e., toenails). Animals with hooves, such as white-tailed deer, moose, and bighorn sheep, have an unguligrade foot type.

Identifying animal tracks can be a fun way to introduce students to wildlife and the outdoors. Tracks can also be used as a way of telling a story about the animal's life and its adaptations to its environment. Many great resources are available online. Many mammal tracks found in Indiana are in the Common Mammals of Indiana publication available on the Nature of Teaching website.

STRIDE, STRADDLE, AND GAIT

The stride, straddle, and gait of an animal's track pattern help you identify animals and tell you what the animal was doing when it left the track. **Stride** refers to the distance between the heel of the front foot and the heel of the back foot when the animal moves. **Straddle** refers to the distance between the left track and the right track. Think of stride as the length between tracks and straddle as the width between tracks. **Gait** refers to the way the animal moves, such as walking, trotting, galloping, or bounding. You can determine the gait by looking at the pattern of tracks. The gait provides clues as to what the animal was doing when it left the track.



PARTS OF A TRACK

Knowing the parts of an animal track can help you pick out key characteristics and will aid in identifying the animal.

- 1 Nails or claws
- 2 Digits or toes
- 3 Metacarpal pads
- 4 Interdigital space
- 5 Hoof



LESSON 1 ANIMAL TRACKS



Animal Diversity
and Tracking
LESSON PLAN

This activity teaches students to identify animal tracks.



ESTIMATED TIME

30–40 minutes

PROCEDURE

1. Introduce the term "track" (a footprint made by an animal). Ask students where they are likely to find animal tracks (snow, mud, sand, riverbanks, etc.). Explain that tracks can tell a lot — what kind of animal left the track, how fast it was moving, the direction it was moving, and whether it was alone or with other animals.
2. Read *Big Tracks Little Tracks: Following Animal Prints* by M. Selsam (or any grade-level-appropriate book) to the class.
3. Introduce the following terms that describe foot types. (See Foot Types in Teachers' Notes).
 - a. Plantigrade: walking with the entire sole of the foot on the ground

- b. Digitigrade: walking on the toes

Ask students to give examples of animals with each foot type: plantigrade (e.g., bears, raccoons, and people); digitigrade (e.g., dogs and cats)

- c. Unguligrade: walking on tips of their toes (e.g., deer and moose)

4. Have the students examine a selected group of tracks from the *Natural History of Indiana Mammals* sheets. (Note: the tracks are not printed to scale here.) Make sure to have examples from each foot type. Have students take measurements of the length and width of each track, record their measurements on paper, and compare them to *Peterson Field Guide to Animal Tracks*.

Point out that tracks from the front feet often differ from those made by hind feet. Explain that taking accurate measurements of an animal track is an important part of identifying the animal that left it.

REQUIRED MATERIALS

- 1 pen or pencil per student
- Ruler
- *Natural History of Indiana Mammals* (FNR-413) by Robert N. Chapman and Rod N. Williams
- *Peterson Field Guide to Animal Tracks* by Olaus J. Murie, Mark Elbroch, and Roger Tory Peterson
- *Big Tracks Little Tracks: Following Animal Prints* by Millicent E. Selsam



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ACTIVITY SCENT STATION DATA SHEET

Animal Diversity and Tracking

Date: _____
 Observer(s): _____
 Scent Station #/Location: _____
 Weather Conditions: _____
 Habitat Type: _____



| DAY | SPECIES | # HIND FOOT | # FRONT FOOT | LURE | COMMENTS |
|-----|---------|-------------|--------------|------|----------|
| 1 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 2 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 3 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

ACTIVITY ANIMAL TRACKING DATA SHEET

Animal Diversity and Tracking

Date: _____
 Observer(s): _____
 Location: _____
 Weather Conditions: _____
 Habitat Type: _____



| SPECIES | FOOT TYPE | STRIDE (inches) | STRADDLE (inches) | GAIT |
|---------|-----------|-----------------|-------------------|------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

ACTIVITY HABITAT SKETCH

Animal Diversity and Tracking

HABITAT 1

HABITAT 2

HABITAT 3

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Be a Tooth Sleuth

Sleuth Mission
Determine what a mammal eats by looking at its teeth.

Objective
Determine which mammals are:

- Carnivores
- Herbivores
- Omnivores

What you need to know

Types of teeth

- Incisors**—small and chisel-like, used for ripping, gnawing, or scraping
- Canines**—long, stout, and conical; used for catching, puncturing, holding, and killing
- Premolars & Molars** (cheek teeth)—used for shearing, crushing, and grinding

Feeding Habits

- Carnivores**—eats animals, has large canines, has premolars and molars for shearing
- Herbivores**—eats plants, has premolars and molars for grinding
- Omnivores**—eats both plants and animals, has premolars and molars for grinding and shearing

Bobcat

- Canine teeth are large.
- Premolars have shearing surfaces.
- One very small molar is found on each side.

Raccoon

- Canine teeth are large.
- Premolars and molars have both shearing and grinding surfaces.

Skunk

- Incisors are very large and chisel-like for gnawing.
- Canine teeth are absent.
- Premolar and molars are flat with many folds.

Coon

- Canine teeth are large.
- Upper premolars have sharp shearing surfaces.
- Upper molars have flattened surfaces.

Virginia Opossum

- Ten very small upper incisors are found in the upper jaw.
- Canine teeth are large.
- Premolars and molars have both shearing and grinding surfaces.

White-tailed Deer

- Upper incisors and canine teeth are absent.
- Premolars and molars have tall cusps for grinding.



How to Construct a Scent Station - FNR-525-WV

All found at
www.purdue.edu/nature

Getting to Know: Informal Curricula

Lesson 5: Let's Go Outside

Target audience: K- 6th-grade youth

Time needed for station: 20 minutes

Volunteers needed to support station: one to two

Objectives

Youth will be able to:

- Describe the health benefits of being outdoors
- Connect with nature using guided imagery
- Complete the Family Nature Pledge Card and Nature Scavenger Hunt with their families

Materials

PROVIDED:

- Family Nature Pledge card (p. 23)
- Guided Imagery activity (p. 25)
- Nature Scavenger Hunt (p. 26)

NOT PROVIDED:

- Nature Connection Pyramid Poster (<https://naturekidsinstitute.com/optin18529868>)
- Benefits of Connecting with Nature (<https://www.extension.purdue.edu/extmedia/FNR/FNR-539-W.pdf>)
- Crayons
- Clipboards

Background Info

General description of how this activity connects families with nature and health:

Participants will learn together about the benefits of doing family activities in nature.

- Participants will connect health benefits with nature while participating in a guided imagery activity.
- Participants will take home a Family Nature Pledge Card to complete with their families. The pledge is to spend quality time with family members in nature through writing a SMART goal.
- Participants will take home a Nature Scavenger Hunt to complete with their families.

Nature is good for our families. When youth spend more time outside they are more physically active, have healthier

recommends that 60 minutes of unstructured free play for youth is essential to physical health.

Studies show that different environments can increase or decrease stress. Therefore, what a person sees, hears, smells, etc., changes not only their mood but also their blood pressure, heart rate, muscle tension, and immune system functioning.

Nature can heal

Natural settings, whether in real life or pictures, have been shown to reduce anger, fear, and stress, as well as increase pleasant feelings. A reduction in blood pressure, heart rate, muscle tension, and stress hormones are all reactions of the body to experiencing a natural environment.

Nature can relieve and refresh

Nature also helps people cope with pain. Trees, plants, water, and other elements of the natural environment are captivating and interesting to humans, so being in the presence of natural elements distracts people from pain. For this same reason, nature increases our ability to focus and be attentive. Natural environments serve as a break for people's minds, refreshing them to continue tasks again later. This is particularly helpful for youth with attention deficit hyperactivity disorder (ADHD).

Nature can connect

Time spent in nature connects people to one another and society. Research has shown that when people view nature scenes, the parts of the brain associated with empathy and love activate, but when they view urban scenes, the parts of the brain associated with fear and anxiety activate. Therefore, it could be argued that nature rouses feelings of connectedness with each other and the world around them.

Procedures

BEFORE THE WORKSHOP

Read the Benefits of Connecting with Nature publication as background information on the health benefits of nature (<https://www.extension.purdue.edu/extmedia/FNR/FNR-539-W.pdf>). Make a copy of the Guided Imagery Worksheet for each participant (p. 25). On card stock, print the Family Nature Pledge cards (p. 23), the Nature Scavenger Hunt, (p. 26), and the Nature Connection Pyramid Poster (<https://naturekidsinstitute.com/optin18529868>). Print one copy per participant.

Take the Family Nature Pledge

Let's Get Outside!

My family will spend some time outside every day.

My family will plan a weekly nature outing.

My family will plan a monthly outing to a park.

My family will plan an outdoor adventure this year.

Family Name: _____

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Take the Family Nature Pledge

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Family Name: _____

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NATURE SCAVENGER HUNT

The Nature of Teaching
PARTICIPANT SURVEY

DIRECTIONS: Check off the items as you see them.

| |
|-------------------------------------|
| 5 Types of Leaves |
| LEAF 1: |
| LEAF 2: |
| LEAF 3: |
| LEAF 4: |
| LEAF 5: |
| 3 Types of Birds |
| BIRD 1: |
| BIRD 2: |
| BIRD 3: |
| 4 Types of Woody Plants |
| WOODY PLANT 1: |
| WOODY PLANT 2: |
| WOODY PLANT 3: |
| WOODY PLANT 4: |
| 2 Types of Herbaceous Plants |
| HERB 1: |
| HERB 2: |
| Salamander |
| Frog |
| Mammal |
| Earthworm |
| Spider |
| Spiderweb |
| Acorn |

| |
|-----------------------------------|
| Walnut |
| Fungi |
| Animal tracks |
| Soft fruit |
| Moss |
| Smooth bark |
| Rough bark |
| Thorn |
| Vine |
| Feather |
| Nest |
| Wildflower |
| Fallen tree |
| Dead tree |
| Something scented |
| Crawling insect |
| Flying insect |
| Tree cavity |
| Scat |
| Poison Ivy |
| Virginia Creeper |
| Litter |
| 2 Types of Invasive Plants |
| INVASIVE 1: |
| INVASIVE 2: |

▶ Other nature observations from family members:

LESSON 5 LET'S GO OUTSIDE SURVEY

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PARTICIPANT SURVEY

There are no right or wrong answers to these questions. You do not get a grade for doing this test and won't receive a bad grade if you decide not to do it.

1 Please rate knowledge levels on the following topics before today and now.

| TOPICS | BEFORE TODAY | | | | | NOW | | | | |
|--|--------------|---|---|---|-----------|------------|---|---|---|-----------|
| | Not at all | | | | Very much | Not at all | | | | Very much |
| <i>For each question, use the following scale:</i> | | | | | | | | | | |
| I know nature is good for my health. | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| I know nature is good for relationships and stress relief. | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| I know how to do a guided imagery activity. | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| I know how to complete the Family Nature Pledge Card. | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |

2 What do you plan to do within the next 12 months?

- Nature scavenger hunts Guided imagery activities

3 I will share what I learned with others.

- Yes No

4 I like what I learned.

- Yes No

5 What did you learn?

The Nature of Teaching: Path to Success

2010-Teacher
focus groups

Teachers
pilot test
and
review
wildlife
lessons

2016-IBAT team is formed,
grad student hired, teacher
workshops held



The Nature of Teaching: Path to Success

2017-Partnership with
Maine IFW

2018-Project coordinator
hired, signature program





In Indiana, What is a Signature Program?

- Currently ANR requires 1/year
- Meet county needs and Extension strategic plan
- Delivered in multiple counties
- Pilot-tested
- Multiple sessions-min 6 hours
- Some measurable medium-term outcomes, collect state-wide data
- Potential to generate funds
- Developed by team of educators and specialists preferable



Benefits of a Signature Program

- Specialists and educators working together
- Educators can present outside of their focal areas
- Consistent evaluation metrics to report state-wide impact data

Next Steps

Sustainability

- Traveling totes
- Educator Guides
- IRB protocol
- Principal needs-assessment
- In-service professional development facilitated by educators
- Other states adopting



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Purdue.edu/nature