How to Engage Elementary Students in Science?

Newton USD 373 Grades K-4
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Session Outcomes

- Gain ideas on how to focus on science in grades K-4
- Learn about schedules in Newton USD 373
- Observe examples of NGSS lessons
- Observe examples of PLTW lessons
- Collaborate with colleagues about effective lesson design and delivery

How did Newton get to our current model?

- Need for additional plan time for K-4 classroom teachers
- Sought volunteers interested in teaching science as a “specials” class
- Created a schedule that guarantees 90 minutes of science weekly
- Provided initial additional planning time and training for teachers
- Meet monthly for a full day with each other to learn about NGSS lesson delivery

Talking Chips

Each person has two chips. Use one chip at a time to share with the group.

1. What do you currently do in your school?
2. What did you hear that might help you with ideas?
3. How might you be able to modify information learned today to fit your school/district?

Introduction to Project Lead the Way

https://www.pltw.org/

Favorite Courses

Energy: Collisions 2015 JNiehage
ENERGY: COLLISIONS 2015 JNIEHAGE
Not Showing Grade

Energy: Conversion 2015 JNiehage
ENERGY: CONVERSION 2015 JNIEHAGE
Not Showing Grade

Light and Sound 2015 JNiehage
LIGHT AND SOUND 2015 JNIEHAGE
Not Showing Grade

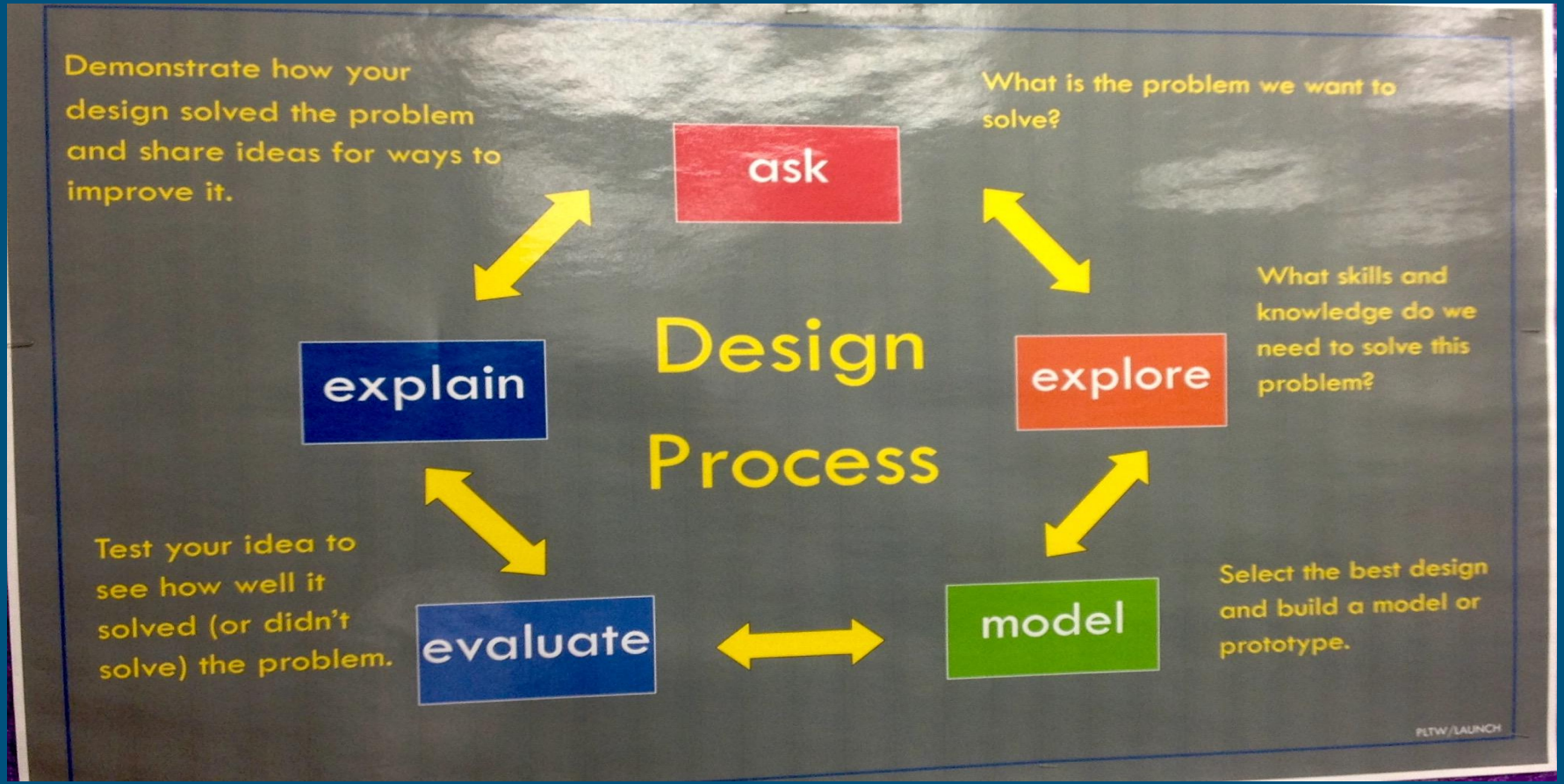
Light: Observing the Sun, Moon, and Stars 2015 JNi...
LIGHT: OBSERVING THE SUN, MOON, AND ST...
Not Showing Grade

Materials Science: Form and Function 2015 JNiehage
MATERIALS SCIENCE: FORM AND FUNCTION...
Not Showing Grade

Materials Science: Properties of Matter 2015 JNiehage
MATERIALS SCIENCE: PROPERTIES OF MATT...
Not Showing Grade

Favorites | All Courses

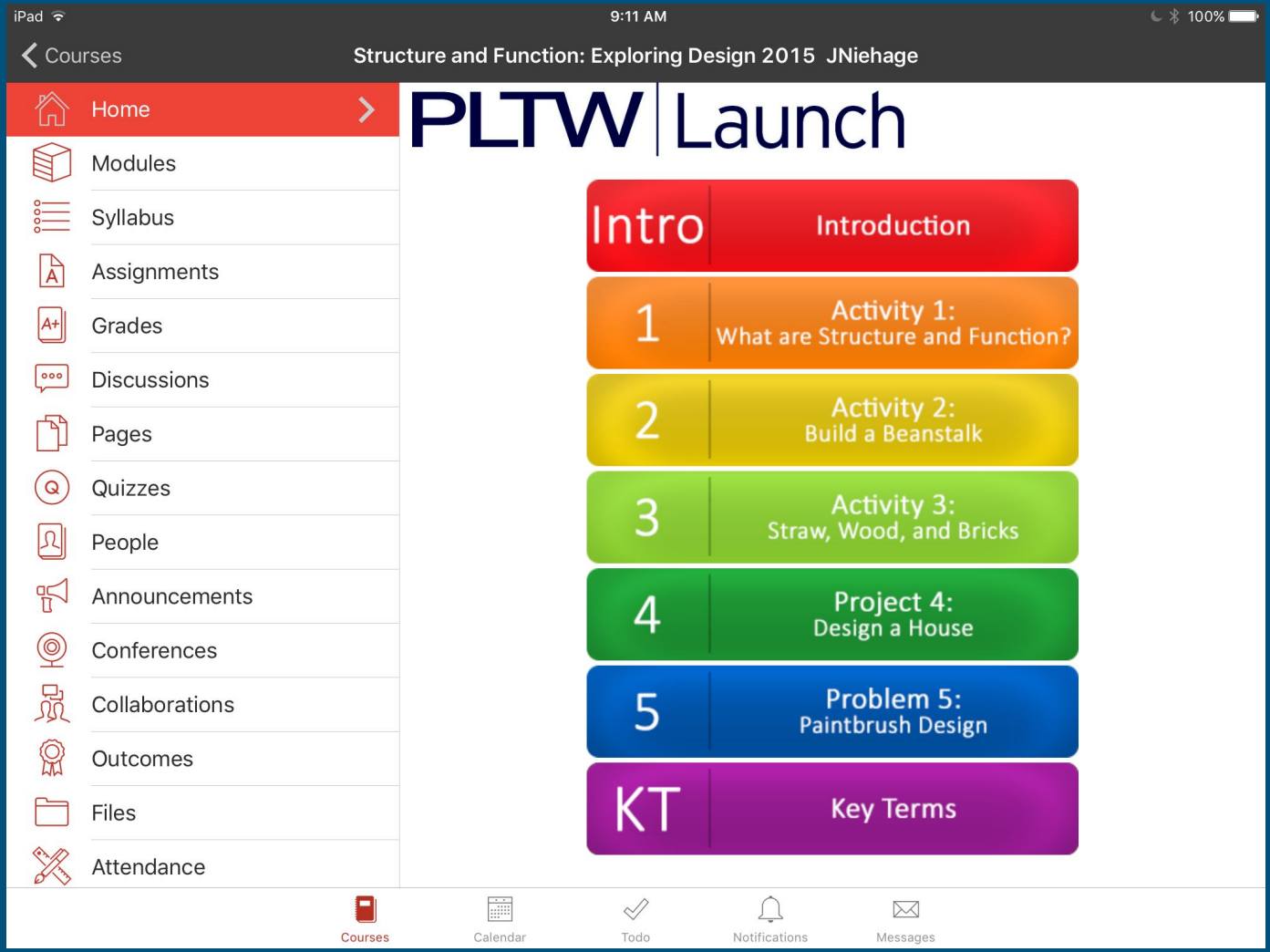
PLTW Design Model



Kindergarten Structure/Function

K-2-ETS1-1 Ask questions make observations and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS-1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it tfunction as needed to solve problem.


iPad
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Courses
Structure and Function: Exploring Design 2015 JNiehage
Home
Modules
Syllabus
Assignments
Grades
Discussions
Pages
Quizzes
People
Announcements
Conferences
Collaborations
Outcomes
Files
Attendance
PLTW Launch
Intro
Introduction
1
Activity 1:
What are Structure and Function?
2
Activity 2:
Build a Beanstalk
3
Activity 3:
Straw, Wood, and Bricks
4
Project 4:
Design a House
5
Problem 5:
Paintbrush Design
KT
Key Terms
Courses
Calendar
Todo
Notifications
Messages

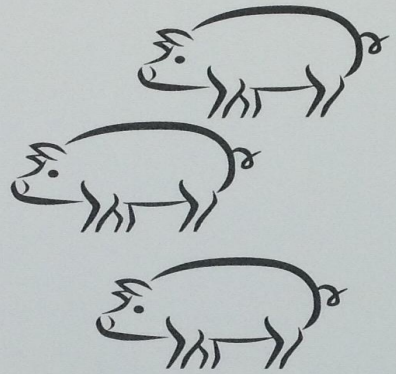
Each of the pigs houses has the same function. What are some differences in the structure of the houses?

Activity 1.3 Straw, Wood, and Bricks

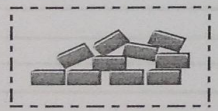
1.

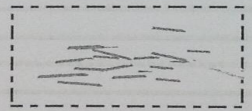
2.

3.



Directions: Cut out the boxes below. Glue them in the order that the wolf tried to blow down the houses. Then mark an X over any material that the wolf was able to blow down.





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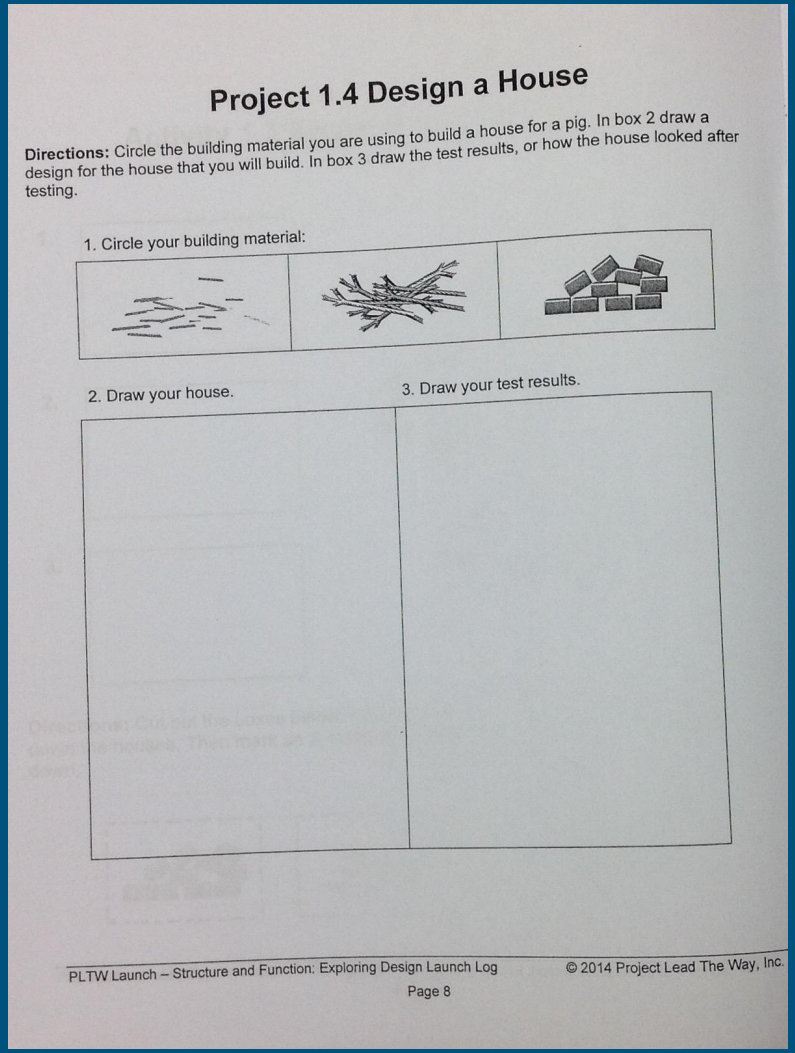
How do you know something has been designed by a person or a team of people?



Project 1.4 Design a House

Directions: Circle the building material you are using to build a house for a pig. In box 2 draw a design for the house that you will build. In box 3 draw the test results, or how the house looked after testing.

1. Circle your building material:

2. Draw your house.

3. Draw your test results.

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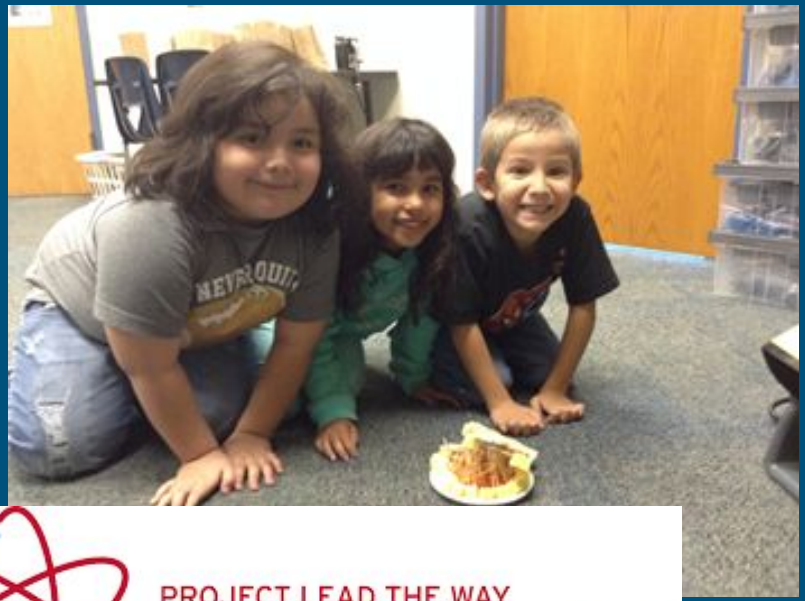
Kindergarten students from Mrs. Bartel's class building and testing their finished 3 Little Pigs House. (PLTW Module #2)



PROJECT LEAD THE WAY
PLTW

1st Grade PLTW Light & Sound

Each Module Covers Many Standards:

Next Generation Science Standards

- 1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- 1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
- 1-PS4-3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
- 1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

1st Grade PLTW Light & Sound

Also covers standards in other subject areas through Common Core State Standard Connections:

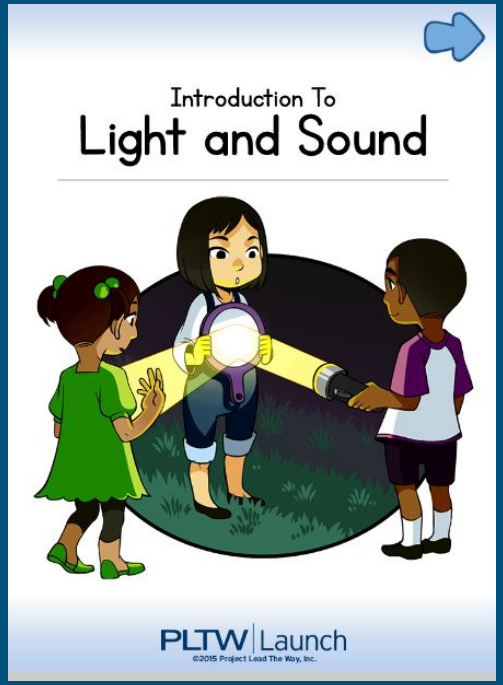
Common Core ELA

- W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
- SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
    - SL.1.1a Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
    - SL.1.1b Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
    - SL.1.1c Ask questions to clear up any confusion about the topics and texts under discussion.
- SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
- SL.1.6 Produce complete sentences *when appropriate to task and situation.*

Common Core Math

- **1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.**
- **1.MD.A.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.**
- **1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.**

1st Grade PLTW Light & Sound



Each module begins with a fictional story about three friends. The story helps to introduce the problem that students will be trying to solve at the end of the module.

1 - Review the Design Process

2 - Tuning forks, slinkies, stethoscopes, cups and string

3 - Flashlights and mirrors

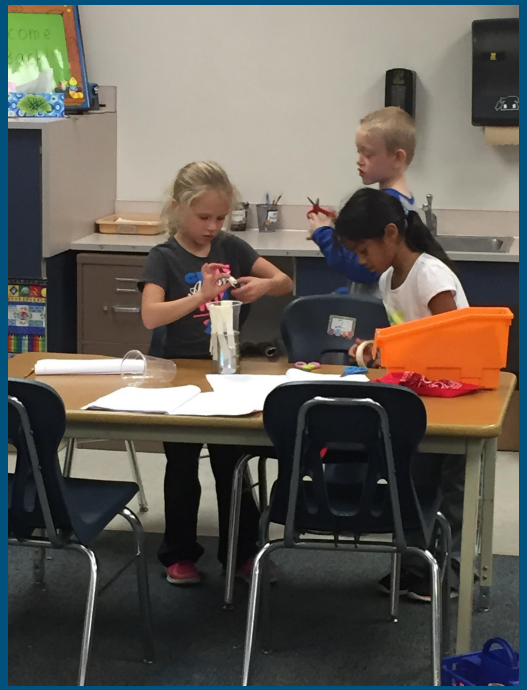
4 - Flashlights, colored lenses, spectroscopes

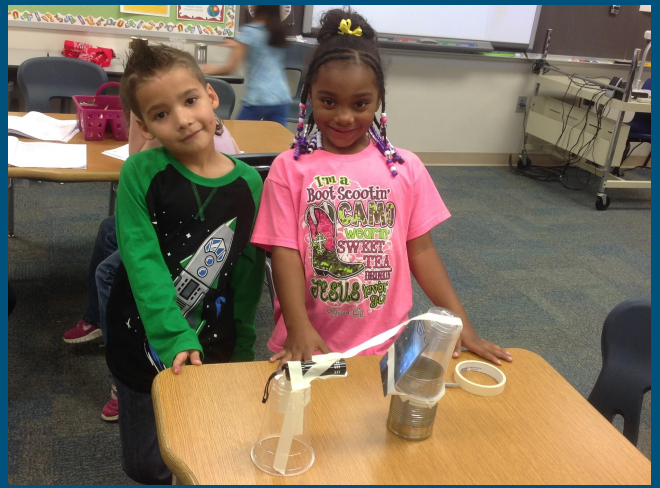
5 - Final Design Project - mirror, flashlight, two plastic cups, a metal water bottle, a bandana, and a roll of tape

PLTW | Launch

Intro	Introduction
1	Activity 1: Introduction to Light and Sound
2	Activity 2: Sound
3	Activity 3: Light
4	Project 4: Light Investigation
5	Problem 5: Communicating with Light and Sound
KT	Key Terms

1st Grade PLTW Light & Sound





1st Grade PLTW Light & Sound

Stand Up, Hand Up, Pair Up

- What can you take away from the Kindergarten and First Grade PLTW lessons?
- What ideas did it generate for you?
- What questions do you want to find out yet?

3rd Grade Inherited Traits

3-LS3-1 Heredity: Inheritance and Variation of Traits

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

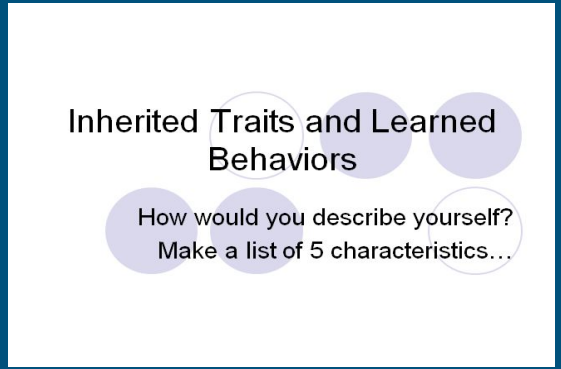
3-LS-2 Heredity: Inheritance and Variation of Traits

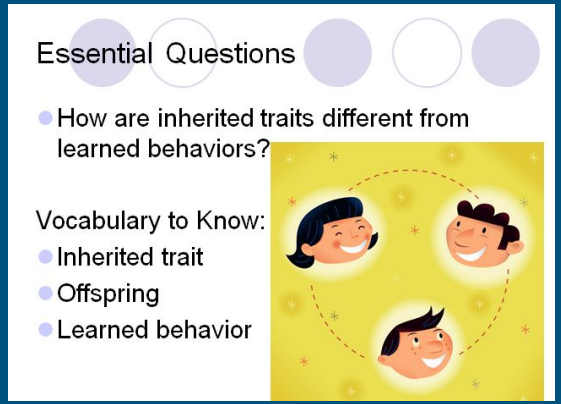
Use evidence to support the explanation that traits can be influenced by the environment.

Inherited Traits and Learned Behaviors

Introduction

- Give each student an index card before showing the PPT.
- Start with a hook to get them thinking!
- Introduce the Essential Question and New Vocabulary





The Inherited Traits of: _____

Trait	Me	Mom	Dad	Sibling
Dimples	Yes No	Yes No	Yes No	Yes No
Hitchhiker's Thumb	Yes No	Yes No	Yes No	Yes No
Tongue Roll	Yes No	Yes No	Yes No	Yes No
Longer Second Toe	Yes No	Yes No	Yes No	Yes No
Hand Clasping	Right Left	Right Left	Right Left	Right Left
Earlobes	Attached/Unattached	Attached/Unattached	Attached/Unattached	Attached/Unattached
Vulcan Hand Sign	Yes No	Yes No	Yes No	Yes No
Widow's Peak	Yes No	Yes No	Yes No	Yes No
Freckles	Yes No	Yes No	Yes No	Yes No
Cleft Chin	Yes No	Yes No	Yes No	Yes No
Naturally Curly Hair	Yes No	Yes No	Yes No	Yes No
Total Number:	____ **Yes** ____ **No**	____ **Yes** ____ **No**	____ **Yes** ____ **No**	____ **Yes** ____ **No**

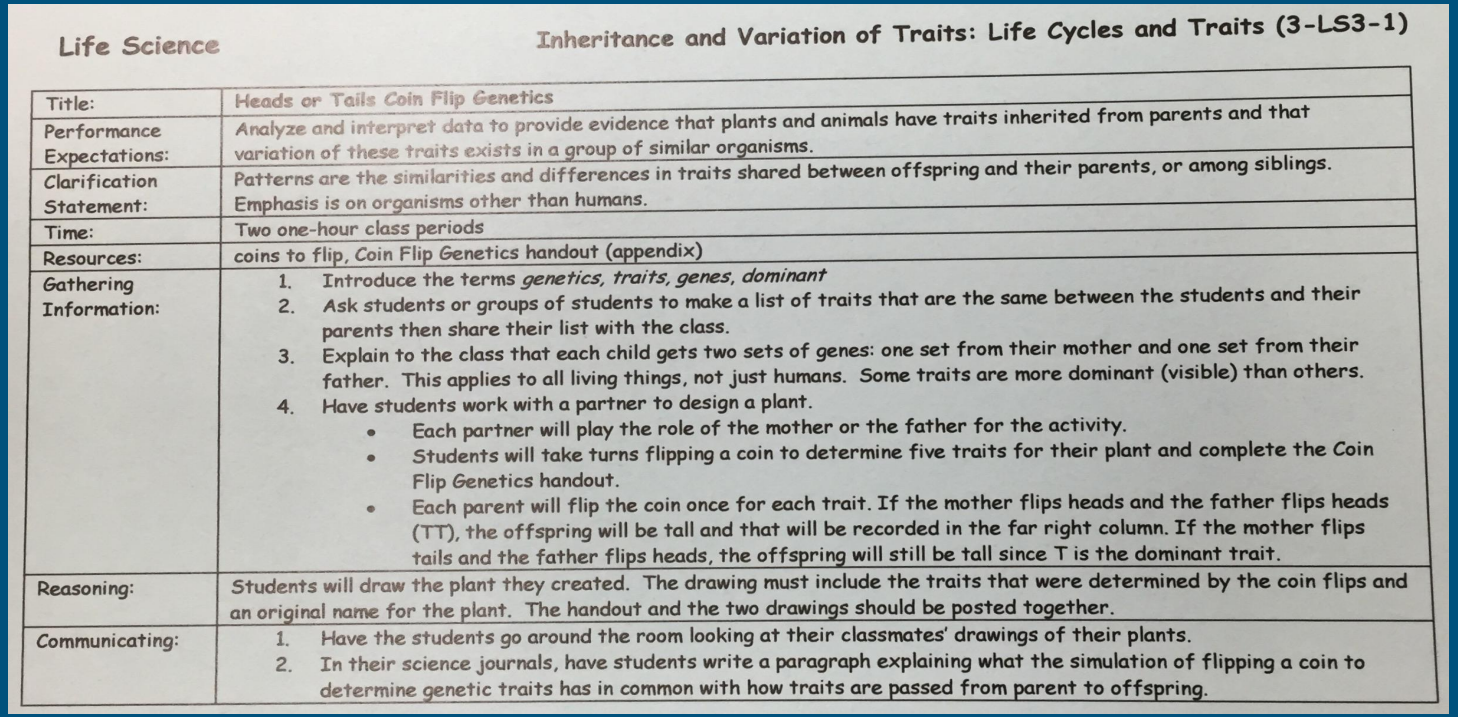
1. According to the results of the experiment, I am most like my mom/dad/sibling. (Circle One) We share _____ traits.

2. I look more like my mom/dad/one of my grandparents/another relative/other. (Circle One)

3. I act more like my mom/dad/one of my grandparents/another relative/other. (Circle One)

Inheritance and Variation of Traits

Activating Common Core Essentials (AC2E) Lesson



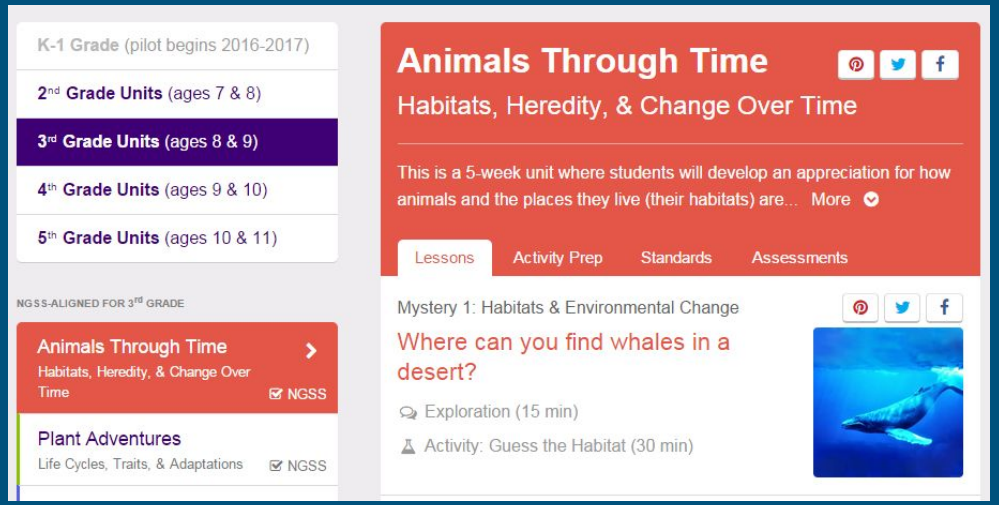
Life Science

Inheritance and Variation of Traits: Life Cycles and Traits (3-LS3-1)

Title:	Heads or Tails Coin Flip Genetics
Performance Expectations:	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
Clarification Statement:	Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.
Time:	Two one-hour class periods
Resources:	coins to flip, Coin Flip Genetics handout (appendix)
Gathering Information:	1. Introduce the terms *genetics, traits, genes, dominant* 2. Ask students or groups of students to make a list of traits that are the same between the students and their parents then share their list with the class. 3. Explain to the class that each child gets two sets of genes: one set from their mother and one set from their father. This applies to all living things, not just humans. Some traits are more dominant (visible) than others. 4. Have students work with a partner to design a plant. • Each partner will play the role of the mother or the father for the activity. • Students will take turns flipping a coin to determine five traits for their plant and complete the Coin Flip Genetics handout. • Each parent will flip the coin once for each trait. If the mother flips heads and the father flips heads (TT), the offspring will be tall and that will be recorded in the far right column. If the mother flips tails and the father flips heads, the offspring will still be tall since T is the dominant trait.
Reasoning:	Students will draw the plant they created. The drawing must include the traits that were determined by the coin flips and an original name for the plant. The handout and the two drawings should be posted together.
Communicating:	1. Have the students go around the room looking at their classmates' drawings of their plants. 2. In their science journals, have students write a paragraph explaining what the simulation of flipping a coin to determine genetic traits has in common with how traits are passed from parent to offspring.

Mystery Science

http://mysteryscience.com/animals/mystery-5/heredity-variation-selection/25?r=1334587

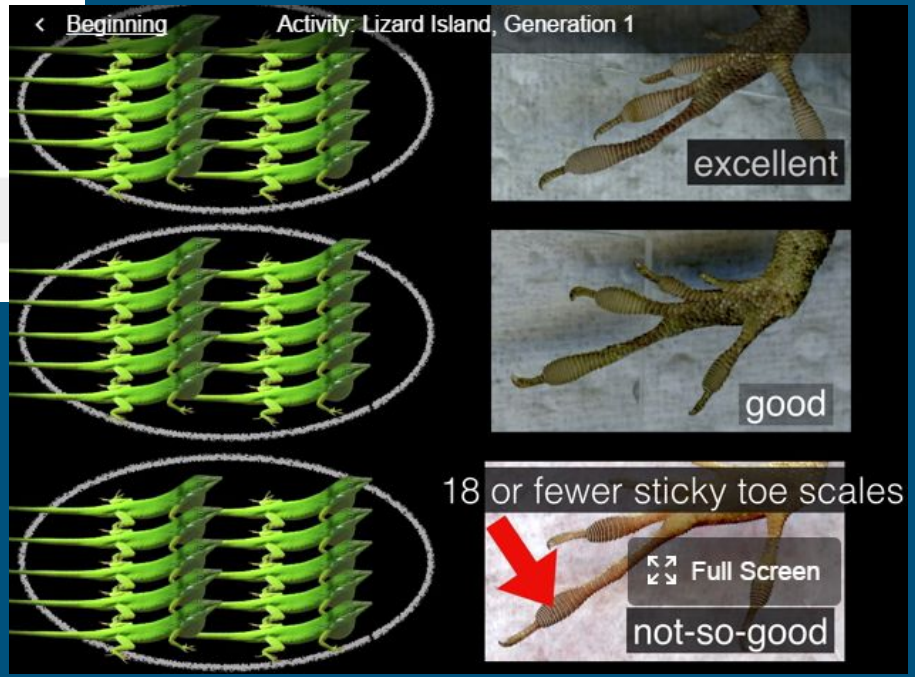


Predict: What do you think might have happened to the green anoles, once the brown anoles arrived in Florida and started to get hungry?

Reveal answer

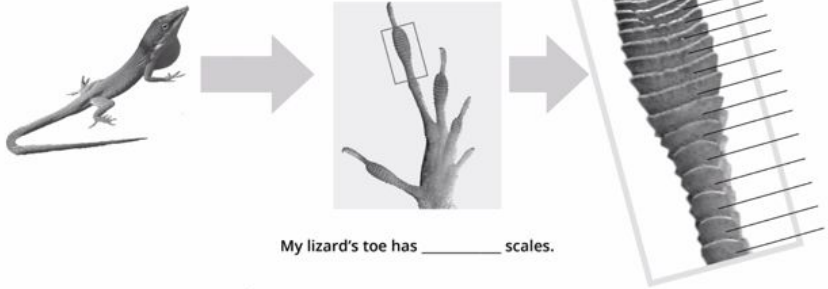
Predict: Not all of the green anoles are exactly the same. Which green anoles do you think the brown anoles are most likely to catch?

Reveal answer



ADOPT A LIZARD

Count the scales on the big toe.



My lizard's toe has _____ scales.

Circle the kind of climber this lizard is:

23 or more scales = **Excellent Climber**	19 to 22 scales = **Good Climber**	18 or fewer scales = **Not-So-Good Climber**

Does your lizard survive? ❑ Yes! ❑ No

A

What do the graphs from each generation tell you about how the genetics or inherited traits of the lizards have changed?

HOW MANY LIZARDS?

GENERATION 1: ORIGINAL LIZARDS

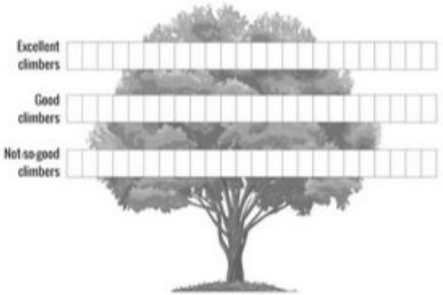
When brown lizards came to the island, the green lizards could climb trees. But some green lizards were better climbers than others.

There are _____ excellent climbers

There are _____ good climbers

There are _____ not-so-good climbers

To make a bar graph, color in a box for each lizard.



GENERATION 2: BABY LIZARDS

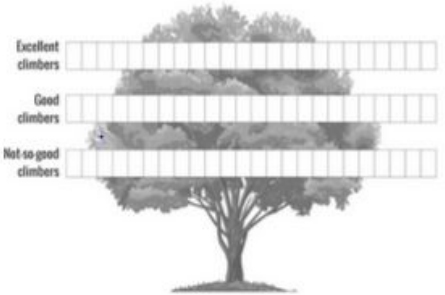
This is what the green lizard babies were like after the brown lizards arrived.

There are _____ excellent climbers

There are _____ good climbers

There are _____ not-so-good climbers

To make a bar graph, color in a box for each lizard.



✔ In the group of parent lizards, there were as many not-so-good climbers as there were excellent climbers. In the group of baby lizards there are now *more* excellent climbers, and fewer not-so-good climbers.

Want to know more about how scientists study lizards?

- Read about Todd Campbell and Yoel Stuart, the scientists who studied lizards on Lizard Island.
- Watch biologist Jonathan Losos demonstrate how to catch a lizard using a tiny loop of string on a stick.
- Watch Jonathon Losos test the abilities of different types of lizards in a Lizard Olympics contest.

Optional Extras

Below are ideas for extending this topic beyond the activity & Exploration which you just completed.

- Written Response Questions and Answer Key
- **Reading:** Scientists of Lizard Island introduces Todd and Yoel, the scientists who studied the lizards of Lizard Island.

- **Bonus Mystery:** Why do some animals live in groups?
- **Activity:** A bowl of candy helps students understand how a group of animals changes over time in a hands-on activity called Candy Dish Selection .
- **Activity:** This hands-on activity lets student see how natural selection resulted in birds with beaks of different sizes and shapes.

Full Screen

4th Grade-Natural Resources

4-ESS3-1: Students can obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

4-ESS3-2: Students can generate and compare multiple solutions to reduce the impacts of the natural Earth processes on humans.

Science vocabulary to use and teach

Renewable Resource: Resource that is readily available and will not run out

Nonrenewable Resource: Resource that takes millions of years to form and cannot be replenished

Solar Energy: Light from the sun converted to energy

Geothermal Energy: Heat inside the earth

Wind Energy: Energy created using the wind

Fossil Fuel: Nonrenewable resource made from dead plants and animals

Petroleum: a fossil fuel, oil

Natural Gas: a fossil fuel, mixture of different gases

Coal: a fossil fuel, shiny black rock burned to create energy

Reduce: Using less to conserve resources

Reuse: Using things more than once to save resources

Recycle: Breaking down materials so they can be made into something new

Questions and Background to Review Before Activity

What are natural resources?

What is coal and how is it used? Coal provides lots of energy, burned it makes heat and light energy. Coal is used in trains and ships for fuel. It is mainly used to make electricity. It causes lots of pollution. 37% of our energy is from coal.

What is petroleum and how is it used? Commonly called oil and makes gasoline. Without this we would not be able to run cars, trucks, and planes. It is also used to make paint, medicine, and soap. This is out most used energy source. It causes pollution in the air, water, and soil.

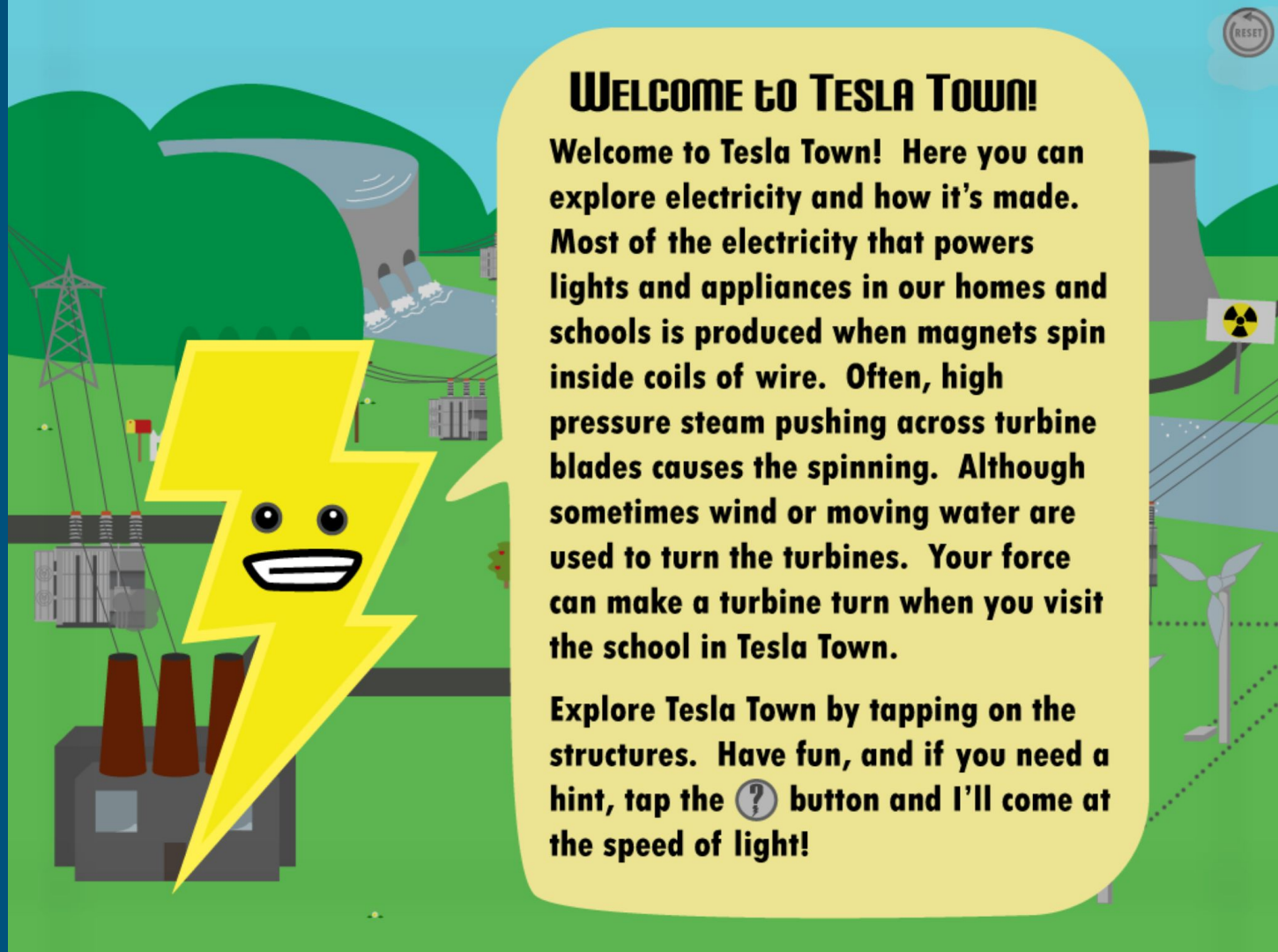
What is Natural Gas and how is it used? It is burned to make heat and electricity. Natural gas is used to heat homes, schools, water heaters, stoves and ovens. It is an ingredient in paint, glue, plastic, fertilizers, and medicine. It is the cleanest natural resource to burn.

Doing the Activity

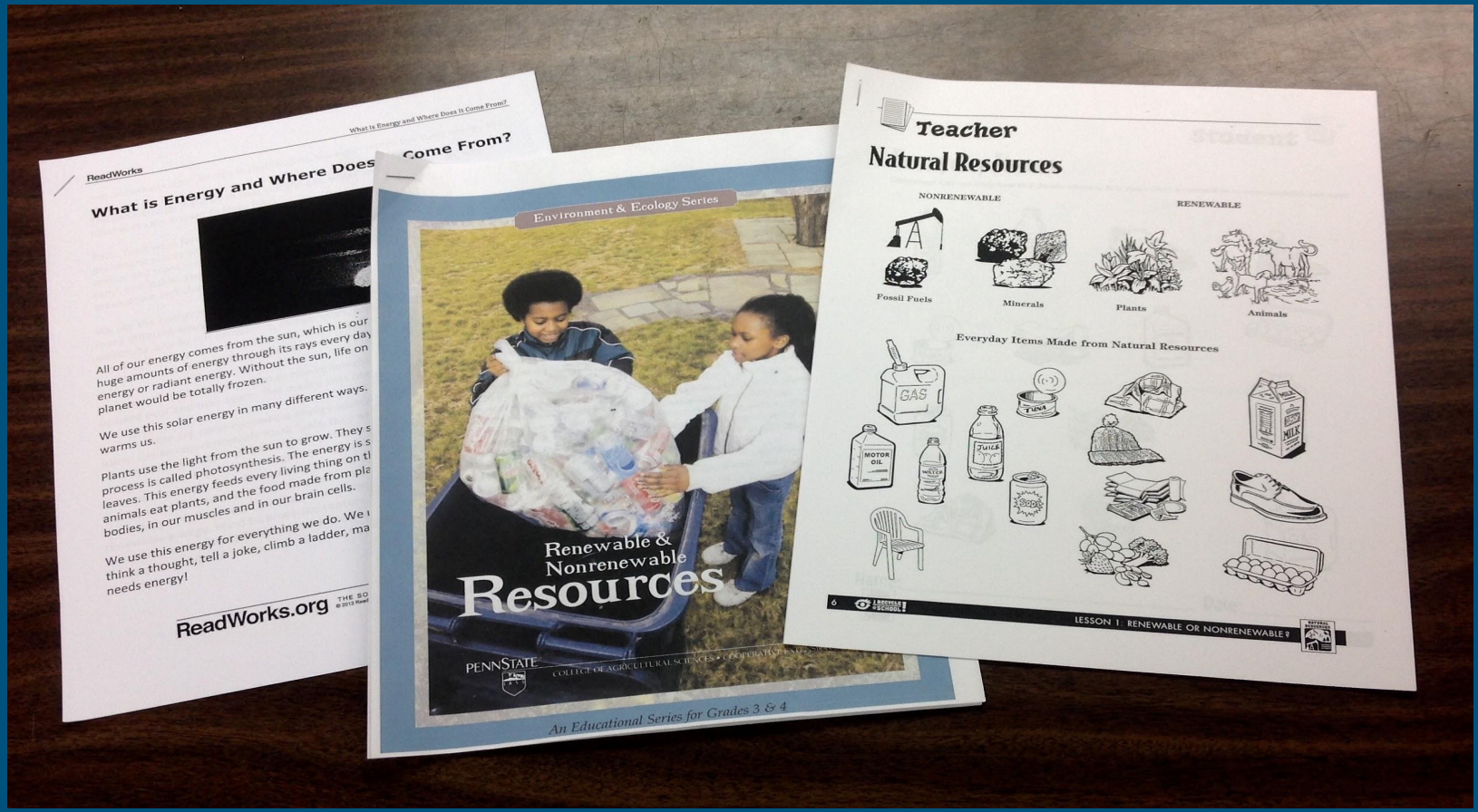
Divide students up into groups of 5. Each group of students will be given a tub with sand and five colors or beans. Each bean represents a different natural resource, some renewable others nonrenewable. Nonrenewable resources will have a smaller amount of beans added to the tub. They will each collect their assigned resource for three one minute intervals. Renewable resources will be replenished after each interval.

Students do research using QR codes. Then teams give a report to the whole class.

Tesla Town is an I-Pad app that allows students to explore the energy needed to supply a town.



Extra lesson resources



Jot Thoughts

- Share with a colleague something you learned today
- What are you going to implement?
- What are you still wondering about?

Q & A

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Students from Mrs. Smith's class with their finished project (PLTW Module 1)

Students from Mrs. Smith's class with their finished project (PLTW Module 1)

Students in Mrs. Bartel's class learning about properties of matter and testing their coolers. (PLTW Module 1)