




Using Phenomena to Drive
Student Learning in a Unit of
Instruction for Elementary
School Students




Holly Hereau **Wayne Wright**
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Figuring out Phenomena 


How does phenomena help
us support a classroom
culture of figuring out for
all students?




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Figuring out Phenomena 


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Figuring out Phenomena 

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Figuring out Phenomena



How does phenomena help us support a **classroom culture** of figuring out for **all students**?

Anchoring and Investigative Phenomena



We will show how we use an Anchoring Phenomenon to drive learning of a complex idea in an Elementary School Unit

We will show how we use Investigative Phenomena to support a culture of “figuring out” - so all students participate in knowledge building while explaining the complex idea

Using the Elementary School Storyline Example



We will familiarize ourselves with the Performance Expectations we are building toward in the elementary school (Grade 5) Ecosystems example unit “Why do dead things disappear over time?” (aka “Roadkill Cafe”)

We will examine the anchoring phenomenon in this unit

We will figure out the key characteristics that make the anchor and investigative phenomena effective

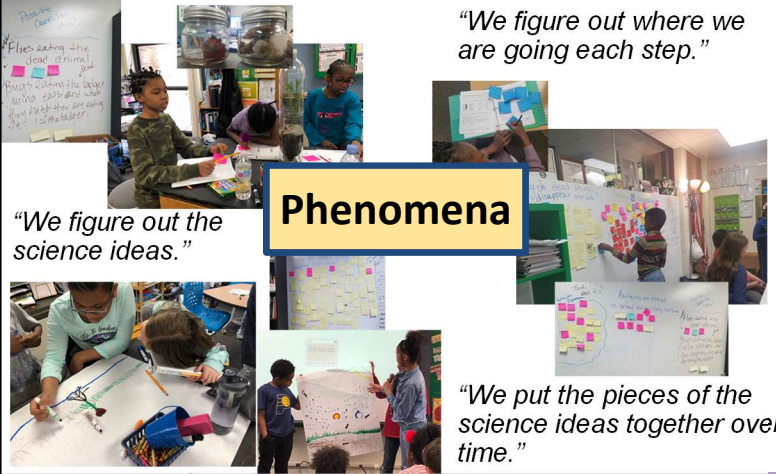
Why is the use of phenomena important to get to these performance expectations?



To explain the phenomena students will use:

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
Developing and Using Models <ul style="list-style-type: none"> Use models to describe phenomena. Develop a model to describe phenomena. Engaging in Argument from Evidence <ul style="list-style-type: none"> Support an argument with evidence, data, or a model. 	PS3.D: Energy in Chemical Processes and Everyday Life LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems PS1.A: Structure and Properties of Matter	Energy and Matter <ul style="list-style-type: none"> Energy can be transferred in various ways and between objects. Matter is transported into, out of, and within systems. Systems and System Models <ul style="list-style-type: none"> A system can be described in terms of its components and their interactions Scale, Proportion, and Quantity <ul style="list-style-type: none"> Natural objects exist from the very small to the immensely large

Students as partners in knowledge building



"We figure out where we are going each step."

Phenomena

"We figure out the science ideas."

"We put the pieces of the science ideas together over time."

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Thinking about the 5th-grade Ecosystems Storyline and how to employ phenomena

- How can we use an anchoring phenomenon to motivate developing a complex model like showing how matter moves between organisms in an ecosystem.
- Can we use student questions to motivate investigations that look at new phenomenon that will be helpful in developing our ideas about how matter moves in ecosystems?
- Can students construct a model of the movement of matter and energy step by step by building up from their explanations of their investigations of phenomenon?

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5th-grade Ecosystem Unit Target PEs

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

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What key elements are necessary to ensure the anchoring phenomenon can carry the unit?


Elements of the Anchoring Phenomenon Routine

- Students Explore the Anchoring Phenomenon - *What do we notice?*
- Students attempt to make sense of the Phenomenon - *How can we explain this? Do our explanations agree?*
- Students Identify Related Phenomena - *Where else does something like this happen?*
- Develop Questions & Next Steps - *What do we need to figure out?*

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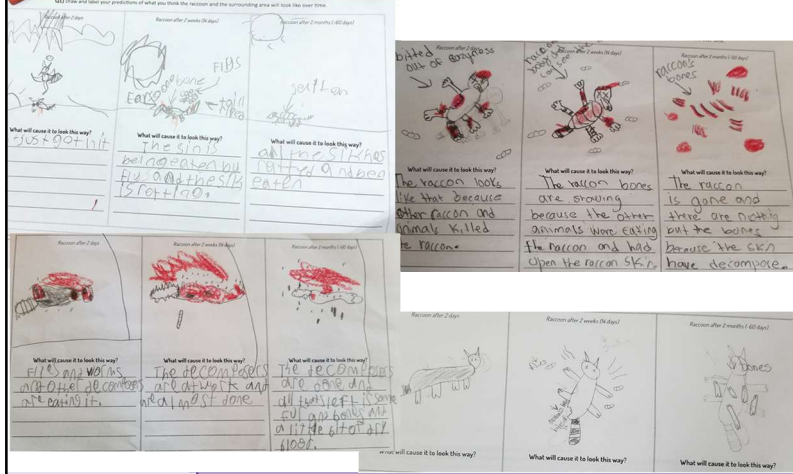
Why do dead things disappear over time?

The teacher introduces unit by asking a question: Have you ever noticed something like this on the road? Does it stay there forever? What happens to it?




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Students make predictions about what this raccoon will look like in the future



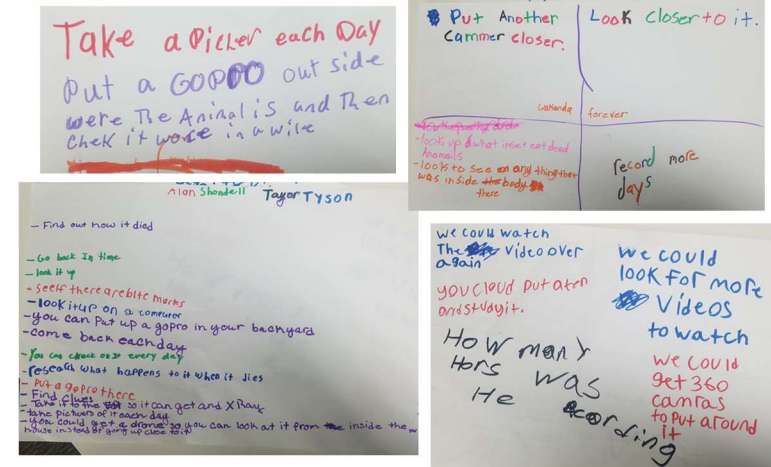
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Students' Initial Questions



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Students have lots of ideas for how to test their predictions...



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They decide to set up a video camera on a dead thing in the woods to find out what really happens



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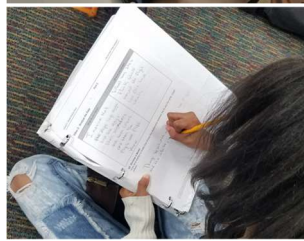
Effective Anchoring Phenomena...



- Are immediately (or progressively) interesting to explore

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Students attempt to explain the phenomenon... and have some competing ideas



Similarities / Differences

- maggots were eating the meat off the badger
- fur came off
- we could see the teeth
- can body get bigger

Differences

- bones were dark
- what happened to it?
- eyes had maggots.
- what are the flies doing inside it?

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Effective Anchoring Phenomena...



- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)

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Students explore some more information about what's going on with the dead animal and share related experiences

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Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.

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Students generate questions

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Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.
- Generate questions

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Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.
- Generate questions and **ideas for investigations**

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Students brainstorm ways to investigate their questions

Handwritten student ideas for investigations:

- Google / Siri → watch video + take notes
- Ziploc bag w/ bones plant * hot/cold
- take meat and put it outside
- get a tripod and watch the animal
- bring phone and continues to watch
- find dead animal and check progress
- put in a box and put it some where we can see it
- Investigate weight
- Capture a fly
- different bug
- plant
- fruit veggie
- Dead plants in a jar with soil & earthworms
- * pictures & videos of dead animals to compare to plants
- * Put tree parts & mushrooms in a jar and observe
- * Potato in a bowl some w/ water some without none w/ soil
- * Insect in a jar (with soil/without)
- at MS McCreals house
- * Fruit in a jar sealed up

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What have we accomplished so far?

Students Explore the Anchoring Phenomenon

What do we notice?

How can we explain this? Do our explanations agree?

Students attempt to make sense of the Phenomenon

Where else does something similar happen?

Students Identify Related Phenomena

What can we do to figure out how to explain all this?

Develop Questions & Next Steps

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Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.
- Generate questions and ideas for investigations
- Becomes our goal to try explain (by some later point in the unit).**




*In this role we refer to such a phenomena as an **anchoring phenomena** as it anchors the launch of the unit and is something we will revisit in future lessons.*

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What did students decide to test first?



Students have ideas for what is happening, and how to test those ideas

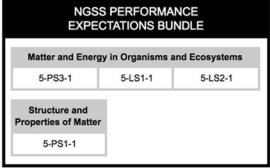




How can we know for sure what is making our plants change over time?

Why are we doing this investigation?

We need to find out if plants also will disappear over time, and try to figure out what factors are involved because...

Teacher's Perspective:
Students need to build and use science ideas



5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. Systems and System Models
A system can be described in terms of its components and their interactions.

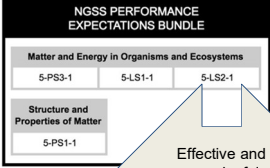
Kids' Perspective: We're trying to see what happens to plants - is it the same or different than when the animals disappeared?

Because we're trying to answer our Driving Question "How do dead things disappear over time?"

Why are we doing this investigation?

We need to find out if plants also will disappear over time, and try to figure out what factors are involved because...

Teacher's Perspective:
Students need to build and use science ideas



5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. Systems and System Models
A system can be described in terms of its components and their interactions.

Effective and meaningful investigative phenomena

Kids' Perspective: We're trying to see what happens to plants - is it the same or different than when the animals disappeared?

Because we're trying to answer our Driving Question "How do dead things disappear over time?"

Results of this investigation led to more questions.... more ideas.... and more investigations

What do plants need to grow?

What do plants need to grow?

Investigations Can Center On Multiple Phenomena

- Throughout the unit, students use multiple investigative phenomena. After the anchoring phenomenon, we use more phenomena to make progress on our questions...which often leads to more questions and more phenomena we need to explore

*In this role we refer to such a phenomena as an **investigative phenomena** as it forms the basis for our investigations.*

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Effective Phenomena...

- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.
- Generate questions and ideas for investigations
- Advance our understanding of the key science ideas at our grade level as we work to explain it
- Become part of the puzzle we have figured out that is going to eventually help us explain other phenomena (e.g. the anchoring phenomenon).

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How do students put their ideas together?

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Storylines

Student questions motivate each lesson

Lesson Routine	Questions	Phenomena / Problems	What we figured out
L1 Anchoring phenomena		and students' prior experiences	We had different predictions about what would happen to the body of a dead animal over time based on what surface it was on or what environment it was in.
L2 Investigation	What will happen to the body of this dead raccoon over time?		A few days after an animal died, insects started appearing on it, and then the body started "disappearing" a few days after that.
L3a Investigation	What were those things we saw on the dead animal doing?		Female flies lay eggs on the body parts of dead things that hatch into larvae that eat the dead stuff. This helps them grow bigger and grow new body structures.
L4 Investigation	What kind of dead stuff containers can we make to help us investigate some of our questions?		We designed and built some different systems to simulate different environments to see what would happen to parts of plants left in them over time.

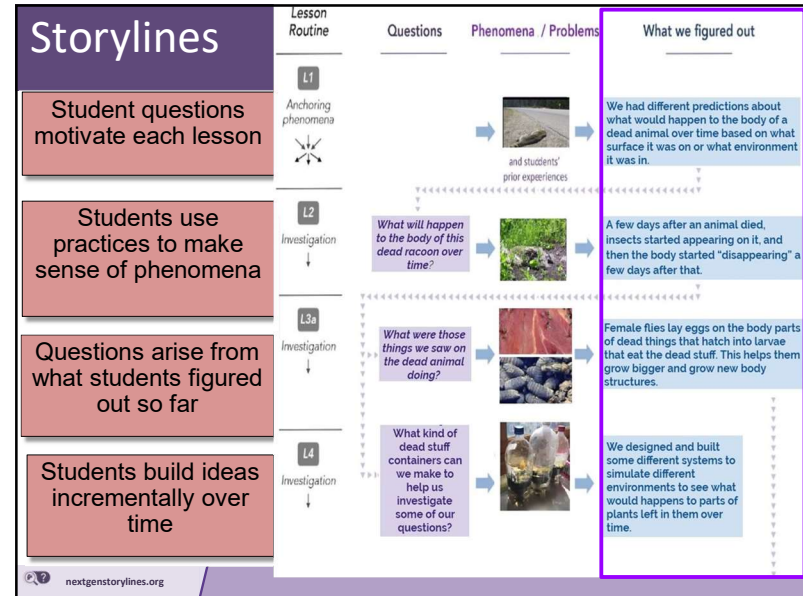
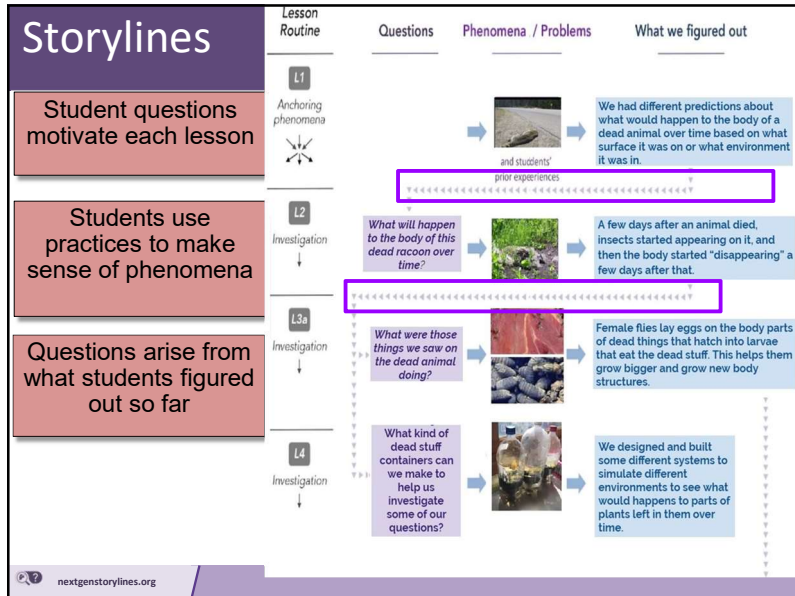
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Storylines

Students use practices to make sense of phenomena

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Summary

- The teacher and unit design work together to support students in developing questions or identifying problems to solve about the phenomenon
- **Students'** questions and problems become the motivation for each investigation or design challenge
- Students put their ideas together across lessons to make sense of phenomena and solve the problem.

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The examples we showed are open source materials developed by teams of teachers and are freely available, along with supporting teacher guides and lesson plans to try out. There are other K-12 examples available at this site too, and more are coming soon.

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Questions?



Download this unit and other
open-source storylines:
[http://www.nextgenstorylines.
org](http://www.nextgenstorylines.org)

This research was funded by grants from the Gordon and Betty Moore Foundation and the Carnegie Corporation of NY to Northwestern University; and training grant #R305B140042 from the US Department of Education, Institute of Education Sciences to the Multidisciplinary Program in Education Sciences, Northwestern University. The opinions expressed herein are those of the authors and not necessarily those of these foundations and other agencies.

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