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


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# 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 and 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

Additionally we will highlight the relationship we have developed to support the introduction of NGSS storyline units in two 5th-grade classes in our district

# 5th-grade Ecosystem Unit Target PEs

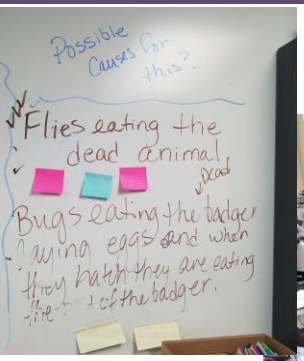
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

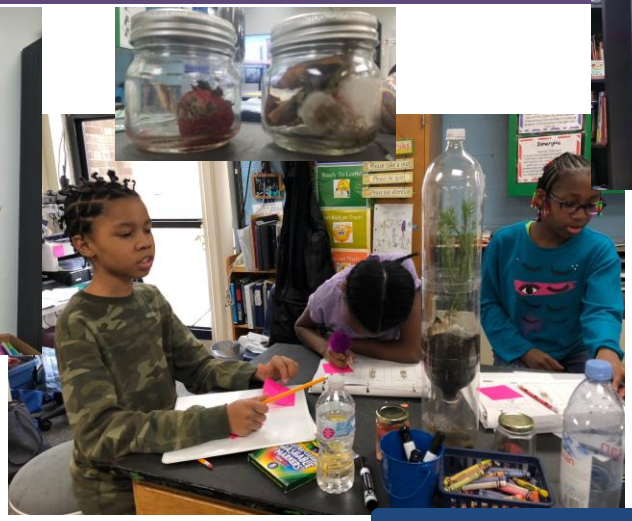
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Systems and System Models

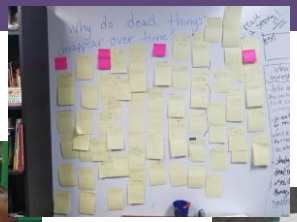
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

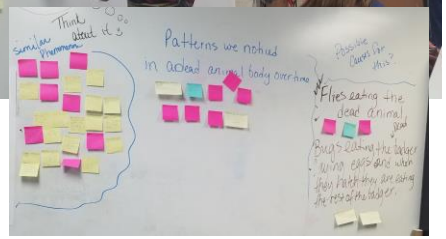
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

# Students as partners in knowledge building



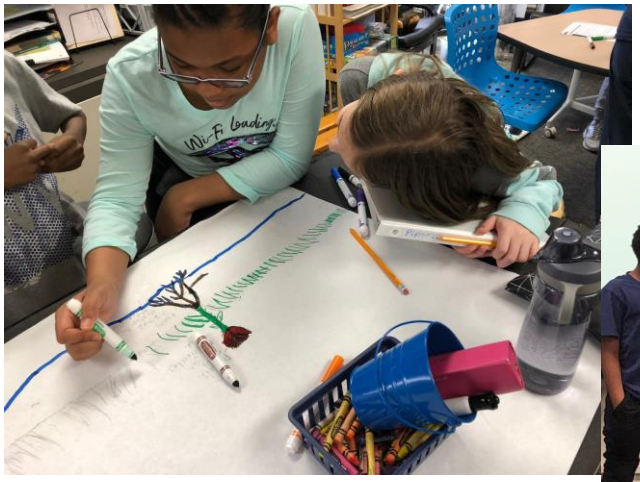



*"We figure out the science ideas."*

**Phenomena**

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





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

# 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**<br>● Use models to describe phenomena.<br>● Develop a model to describe phenomena.<br><br>**Engaging in Argument from Evidence**<br>● Support an argument with evidence, data, or a model. | **PS3.D:** Energy in Chemical Processes and Everyday Life<br><br>**LS1.C:** Organization for Matter and Energy Flow in Organisms<br><br>**LS2.A:** Interdependent Relationships in Ecosystems<br><br>**LS2.B:** Cycles of Matter and Energy Transfer in Ecosystems<br><br>**PS1.A:** Structure and Properties of Matter | **Energy and Matter**<br>● Energy can be transferred in various ways and between objects.<br>● Matter is transported into, out of, and within systems.<br><br>**Systems and System Models**<br>● A system can be described in terms of its components and their interactions<br><br>**Scale, Proportion, and Quantity**<br>● Natural objects exist from the very small to the immensely large |

# 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?

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

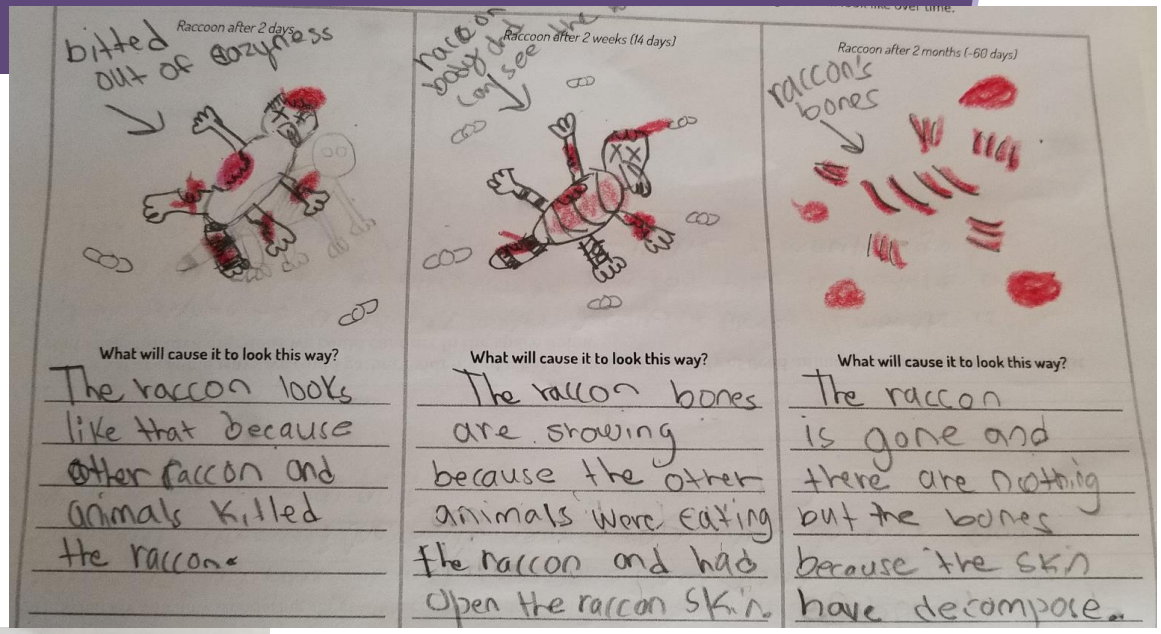
## Elements of the Anchoring Phenomenon Routine

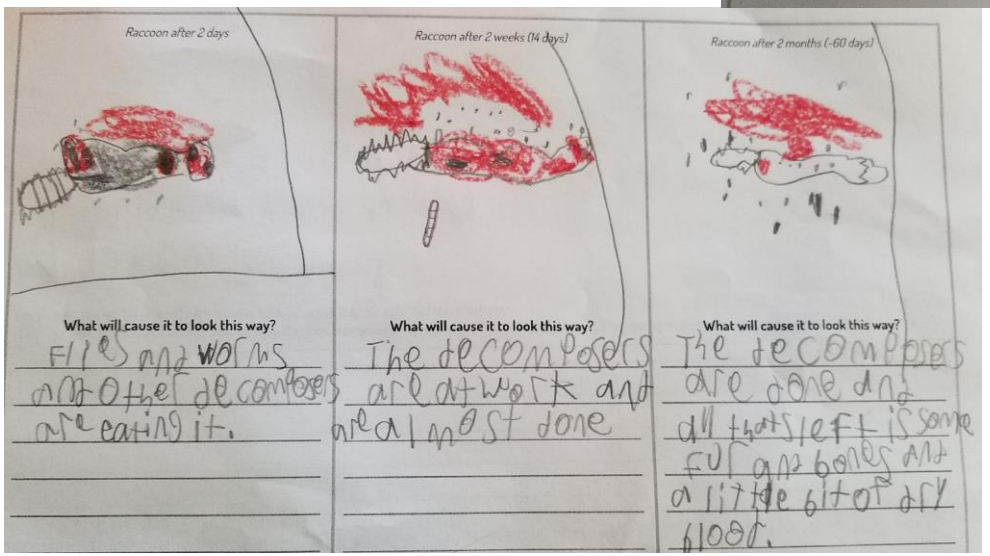
- Students Explore the Anchoring Phenomenon - *What do we notice?*
- Students attempt to make sense of the Phenomenon - *How can we explain this? Do our explanations agree?*
- Students Identify Related Phenomena - *Where else does something like this happen?*
- Develop Questions & Next Steps - *What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

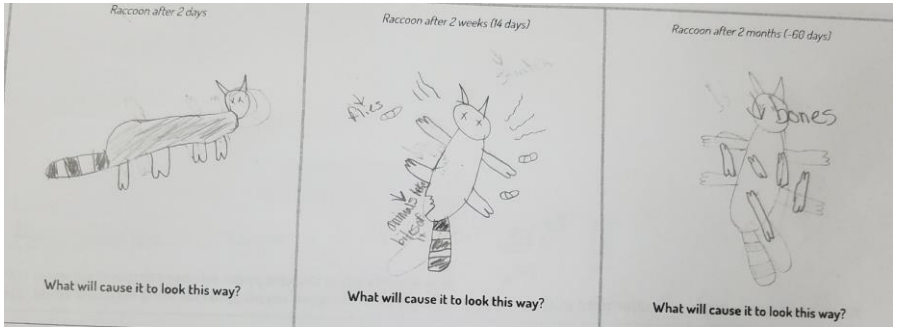
# Why do dead things disappear over time?

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?

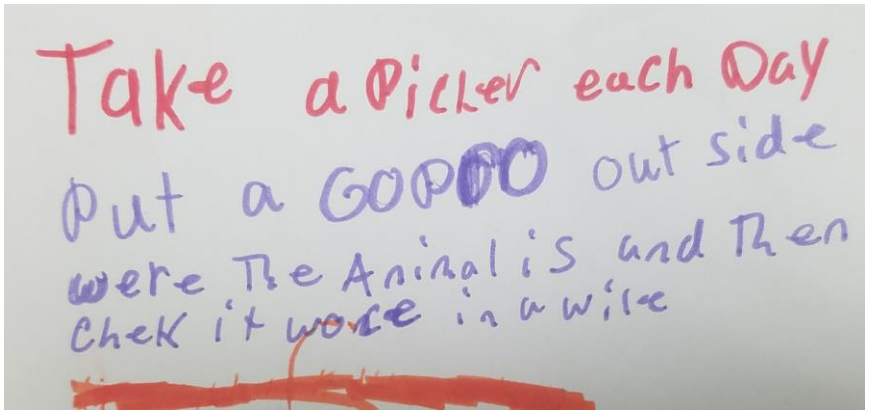
Students make predictions about what this racoon will look like in the future

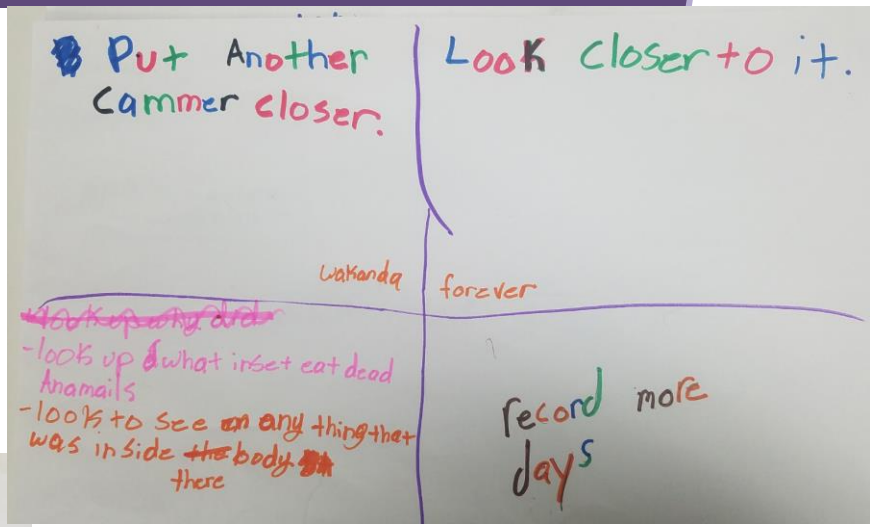


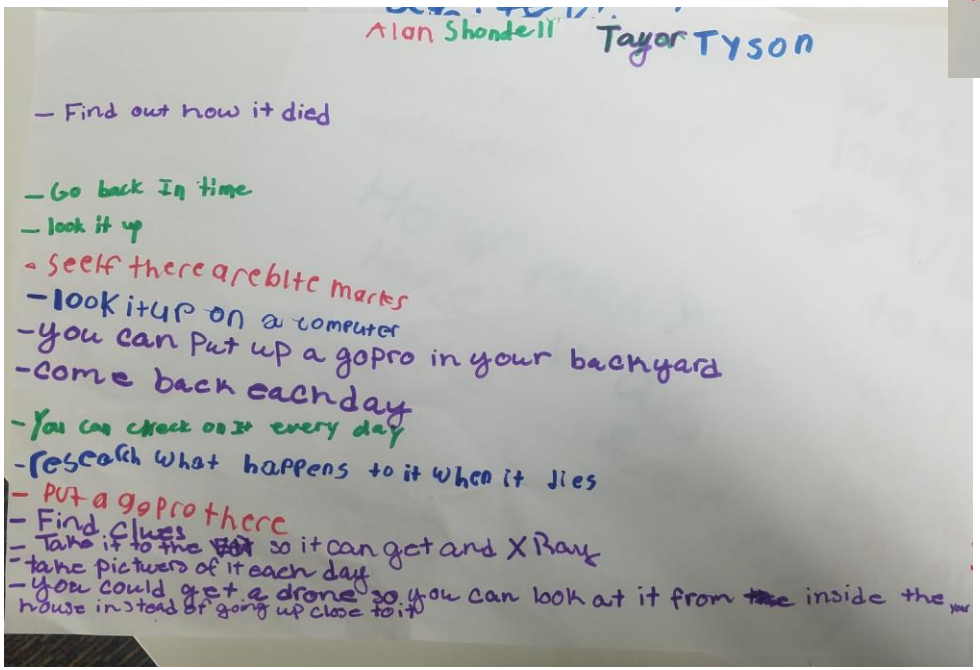



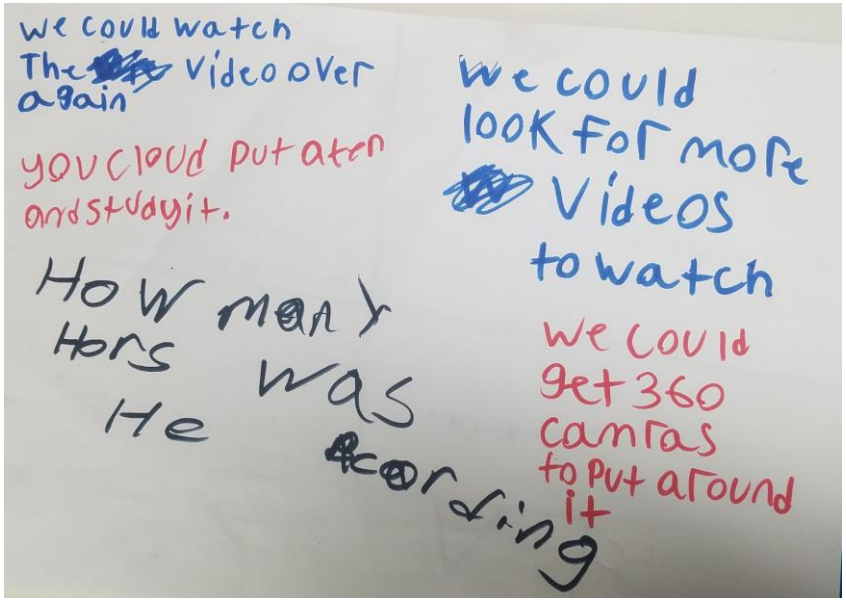



# Students have lots of ideas for how to test their predictions...



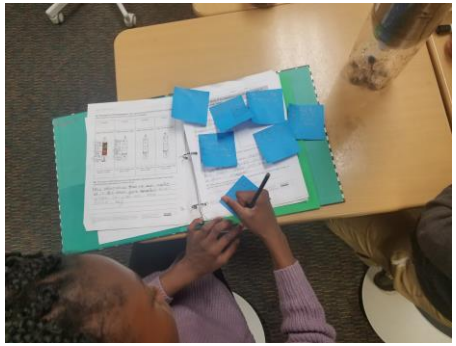



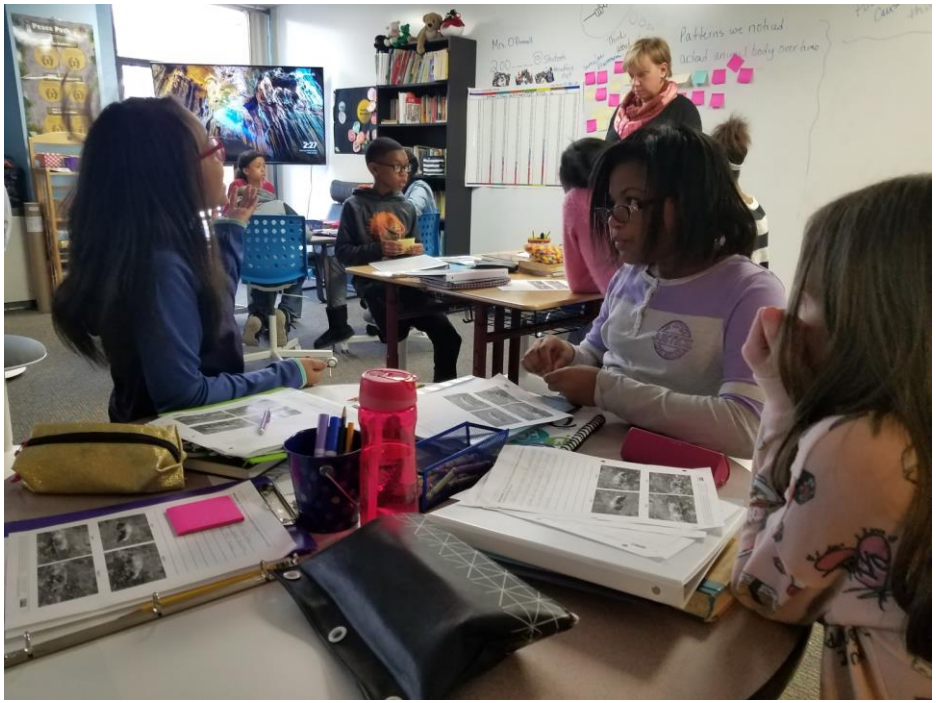
# They decide to set up a video camera on a dead thing in the woods to find out what really happens

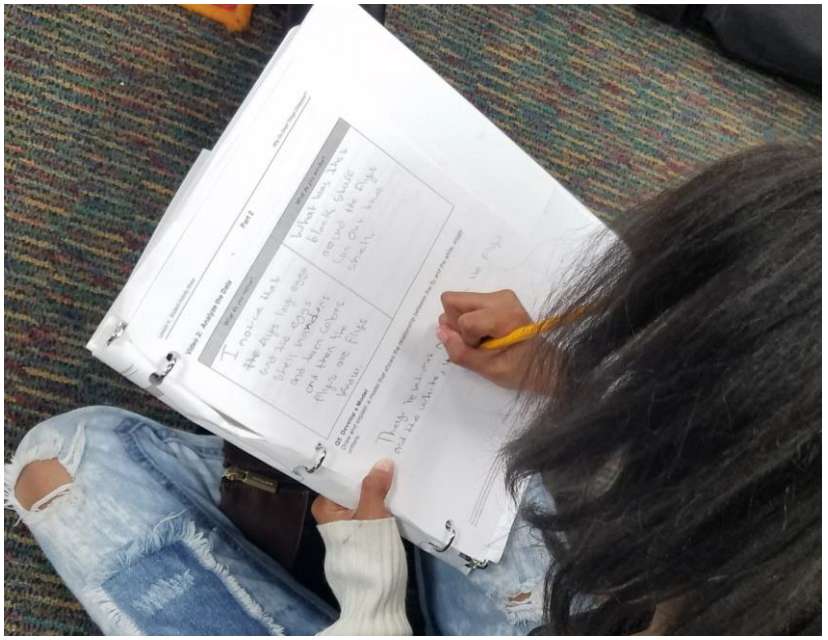
# Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore

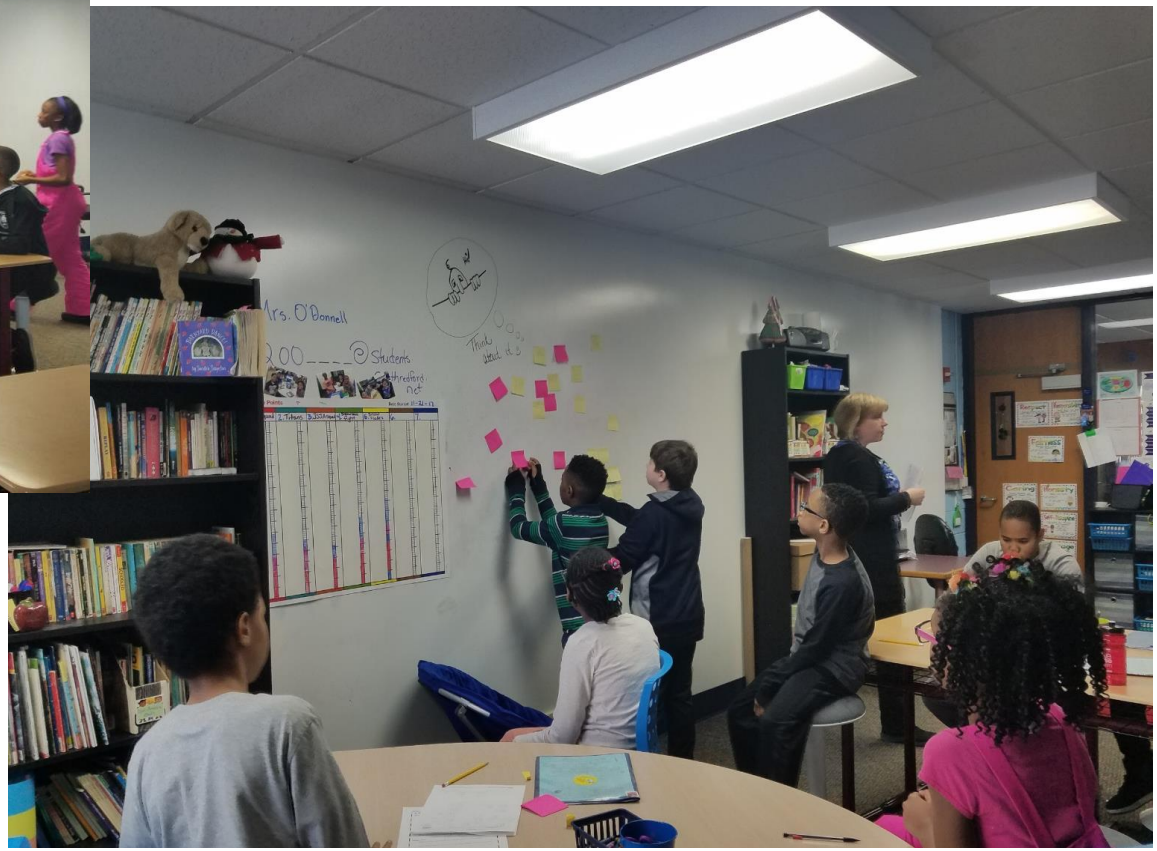


# Students attempt to explain the phenomenon… and have some competing ideas



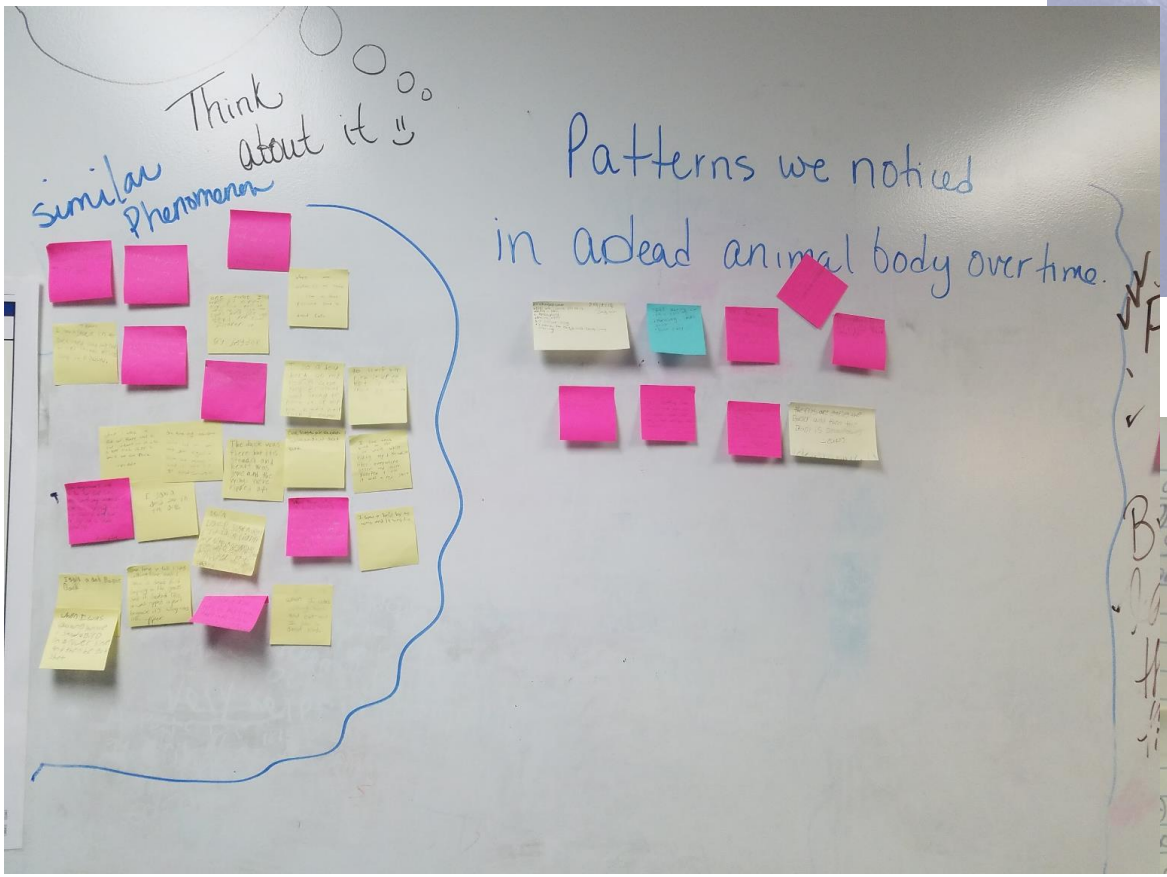
# Students' Initial Questions

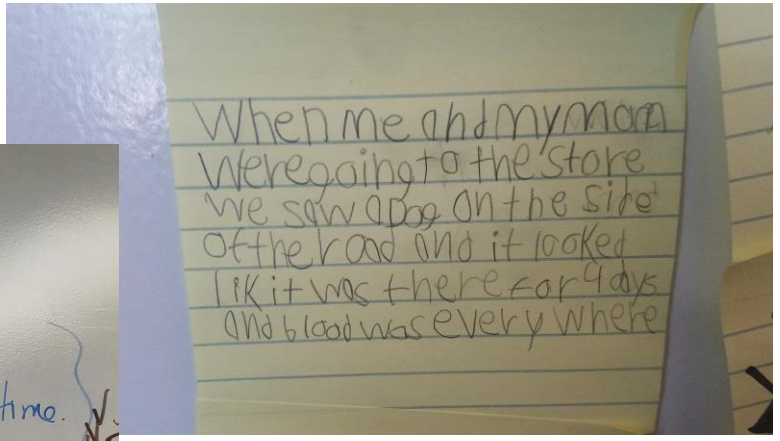


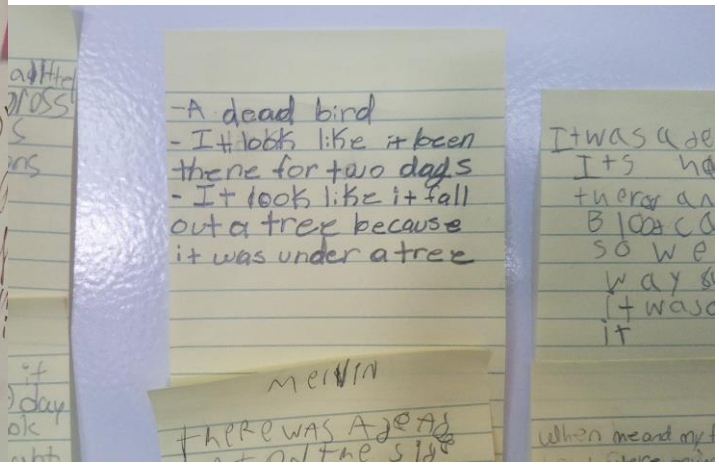
# Effective Anchoring Phenomena…

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

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



# Effective Anchoring Phenomena...

- Are immediately (or progressively) interesting to explore
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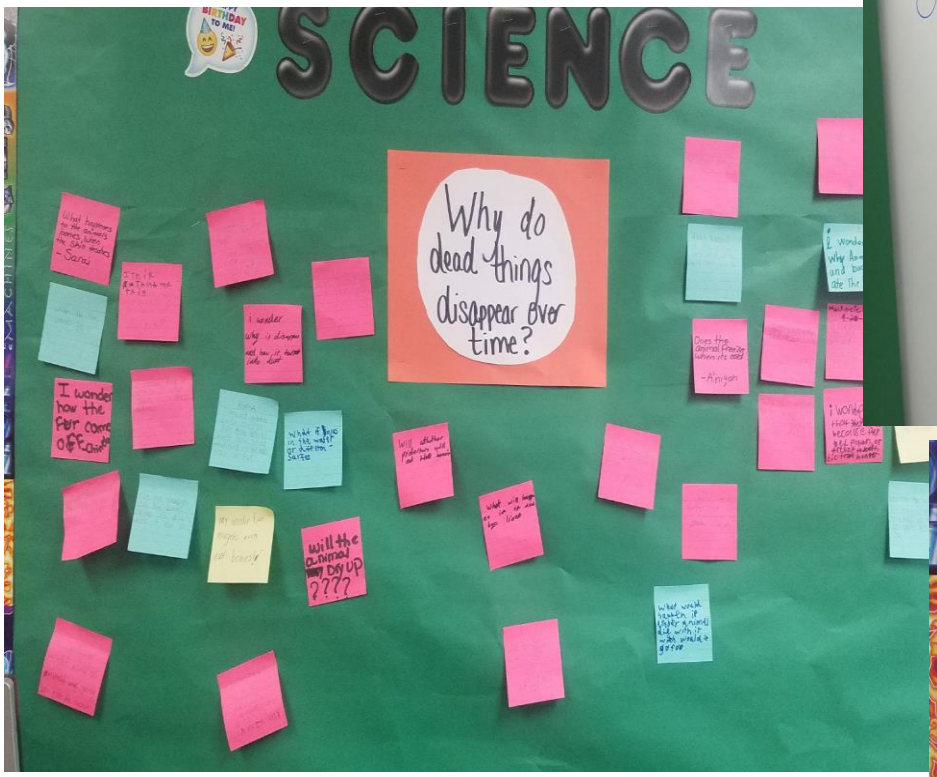
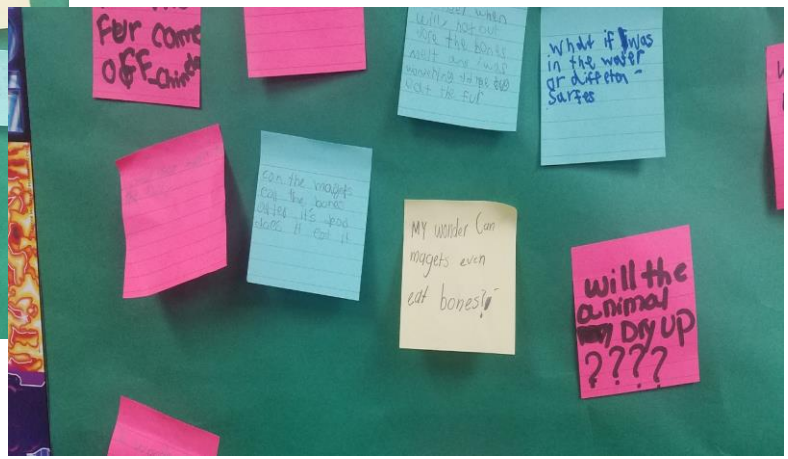
- Connect to other experiences that students have had with related phenomena in the world.

# Students generate questions







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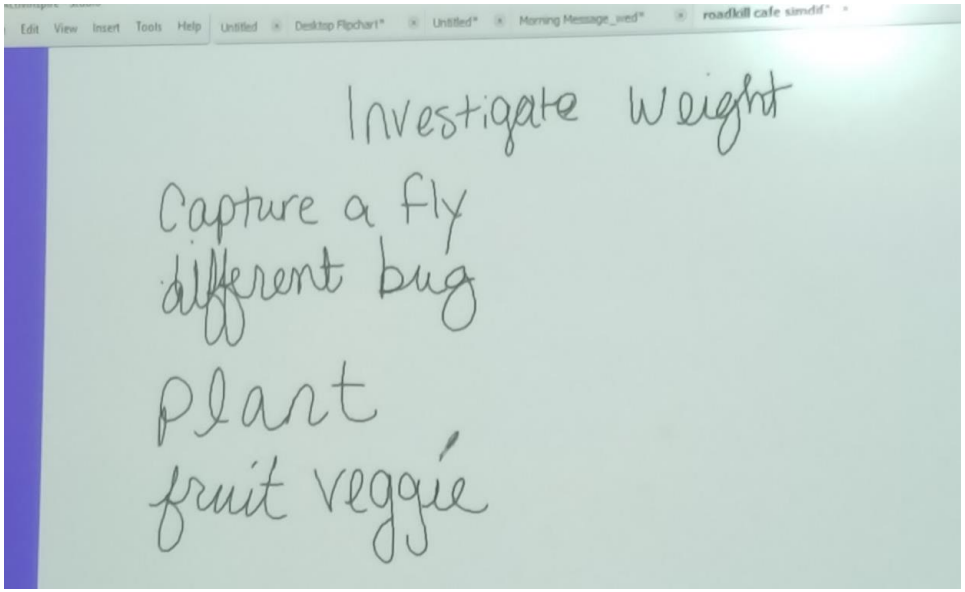
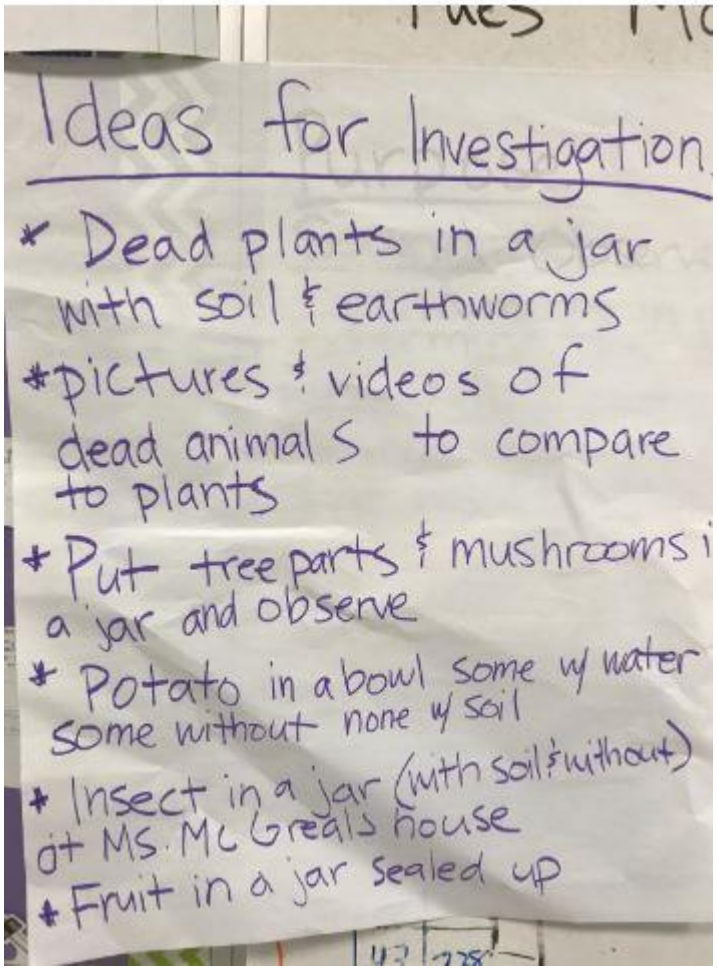
- Generate questions

# Students brainstorm ways to investigate their questions



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- Generate questions and ideas for investigations

# What have we accomplished so far?

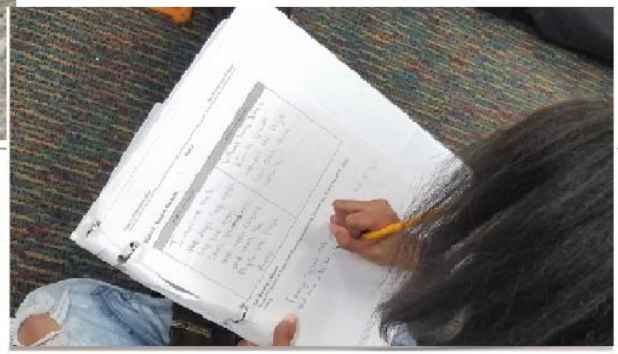
**Students Explore the Anchoring Phenomenon**

**Students attempt to make sense of the Phenomenon**

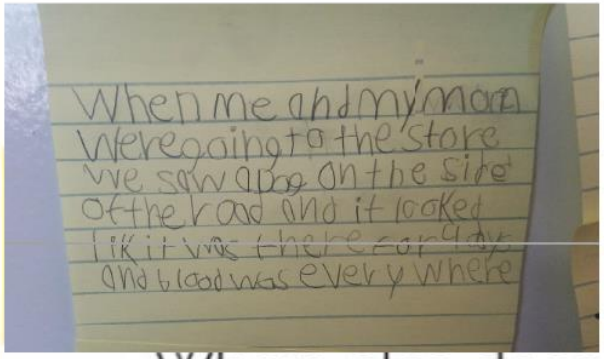
**Students Identify Related Phenomena**

**Develop Questions & Next Steps**

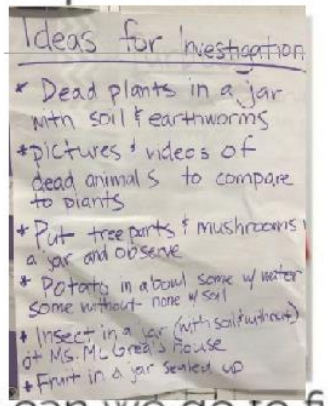
What do we notice?



How can we explain this?
Do our explanations agree?




Where else does something similar happen?




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

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- 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.***

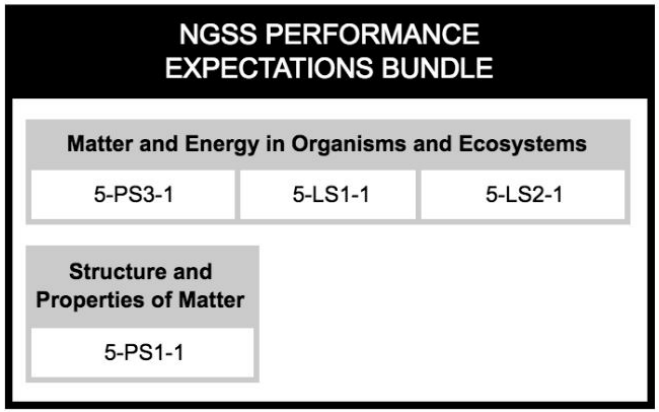
# What did students decide to test first?

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




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

**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.

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

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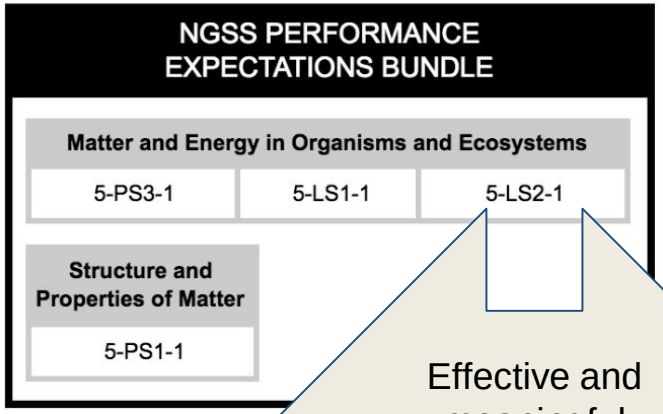


Effective and meaningful investigative phenomena

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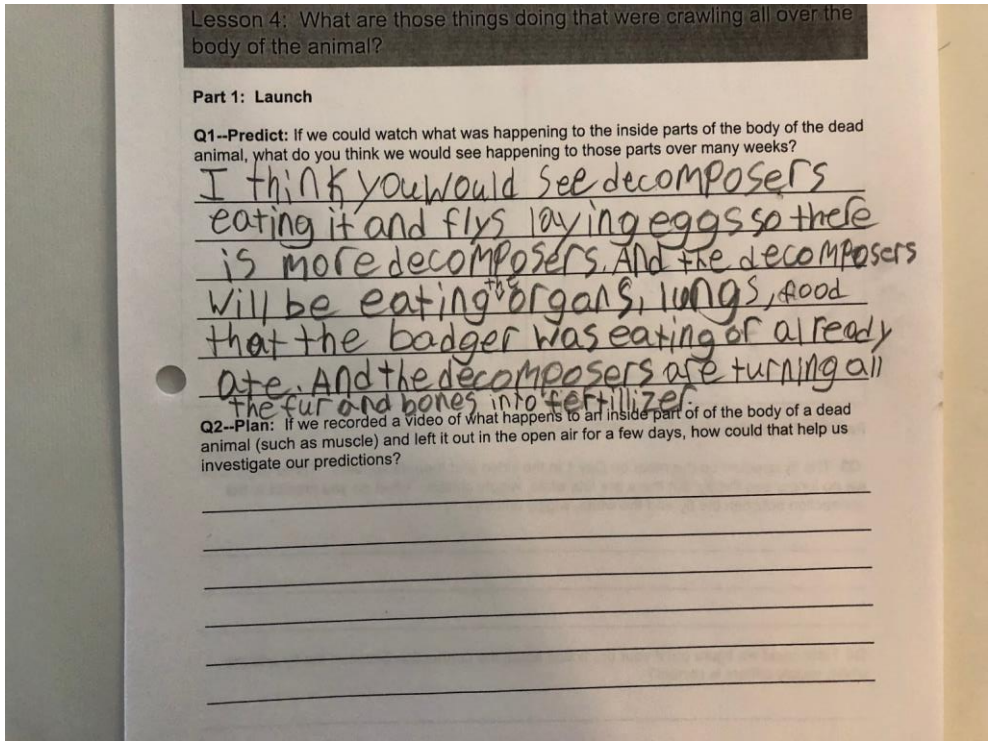
# Results of this investigation led to discovering some key ideas and also led to more questions….



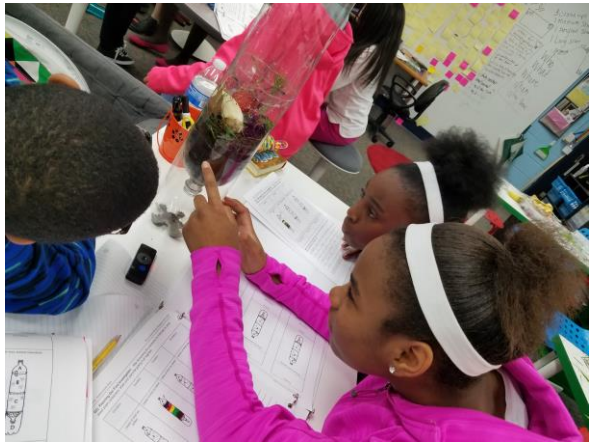
Lesson 4: What are those things doing that were crawling all over the body of the animal?

**Part 1: Launch**

**Q1--Predict:** If we could watch what was happening to the inside parts of the body of the dead animal, what do you think we would see happening to those parts over many weeks?

I think you would see decomposers eating it and flys laying eggs so there is more decomposers. And the decomposers will be eating the organs, lungs, food that the badger was eating or already ate. And the decomposers are turning all the fur and bones into fertilizer.

**Q2--Plan:** If we recorded a video of what happens to an inside part of of the body of a dead animal (such as muscle) and left it out in the open air for a few days, how could that help us investigate our predictions?



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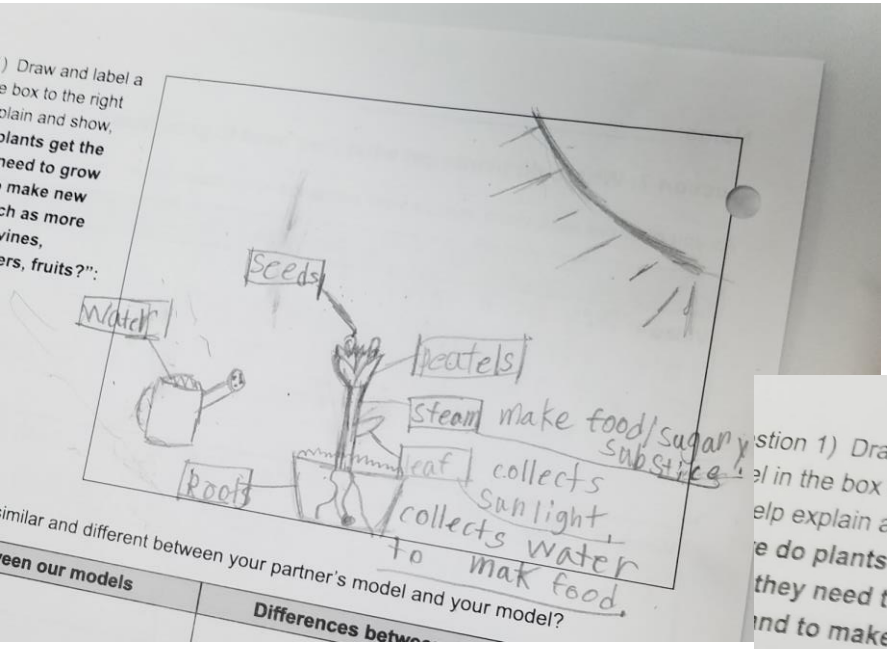
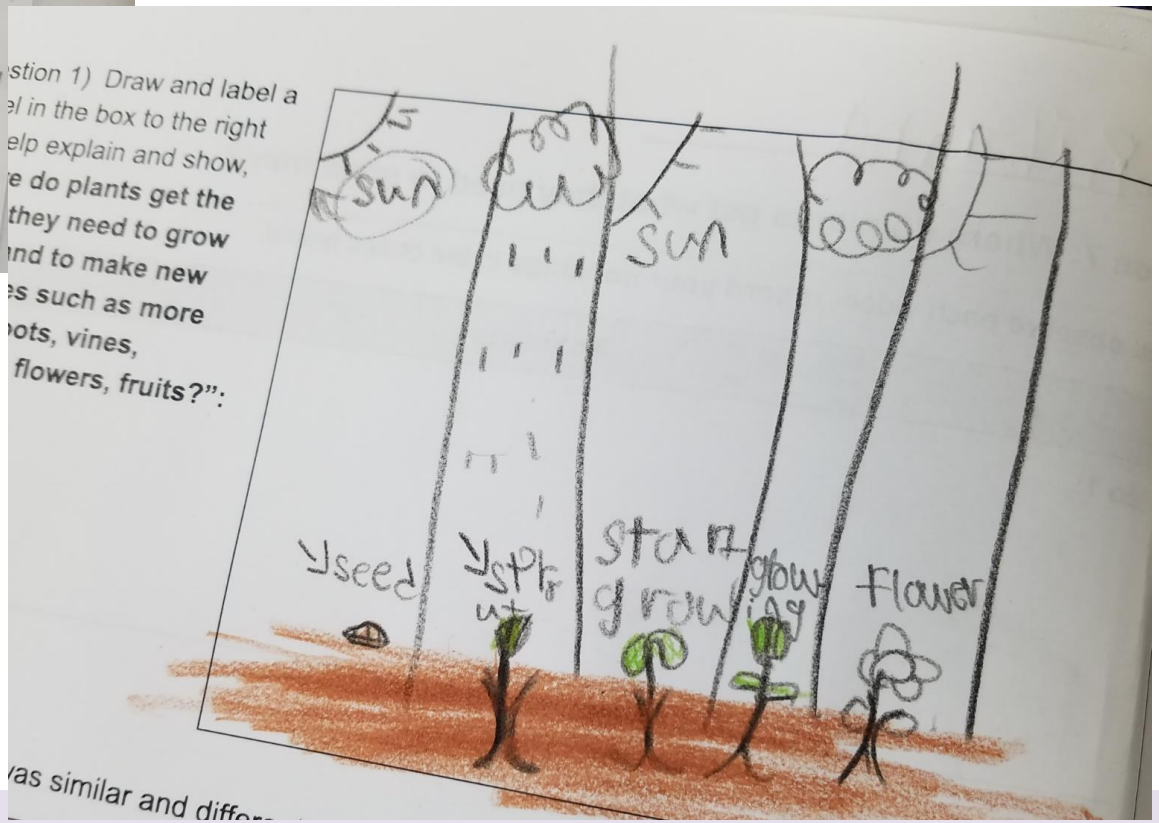


# What do plants need to grow?

# What do plants need to grow?

# Investigations Can Center On Multiple Phenomena

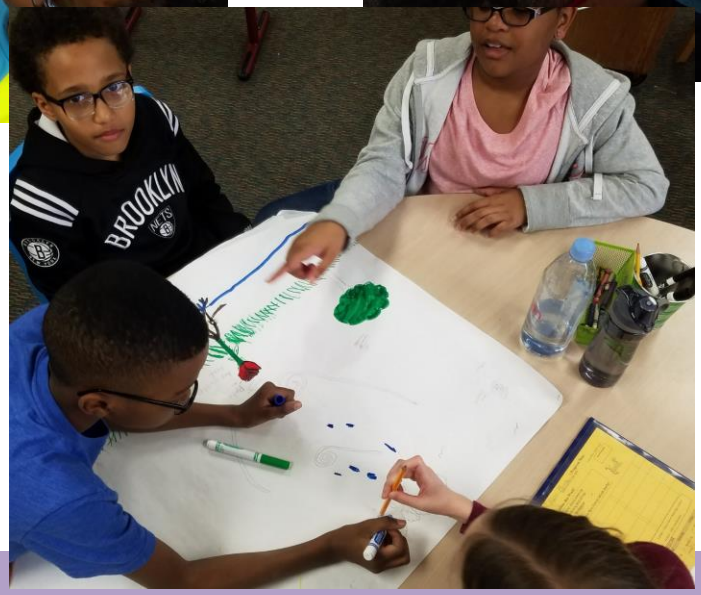
- Throughout the unit, students use multiple investigative phenomena. After the anchoring phenomenon, we use more phenomena to make progress on our questions...which often leads to more questions and more phenomena we need to explore

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

# Effective Phenomena...

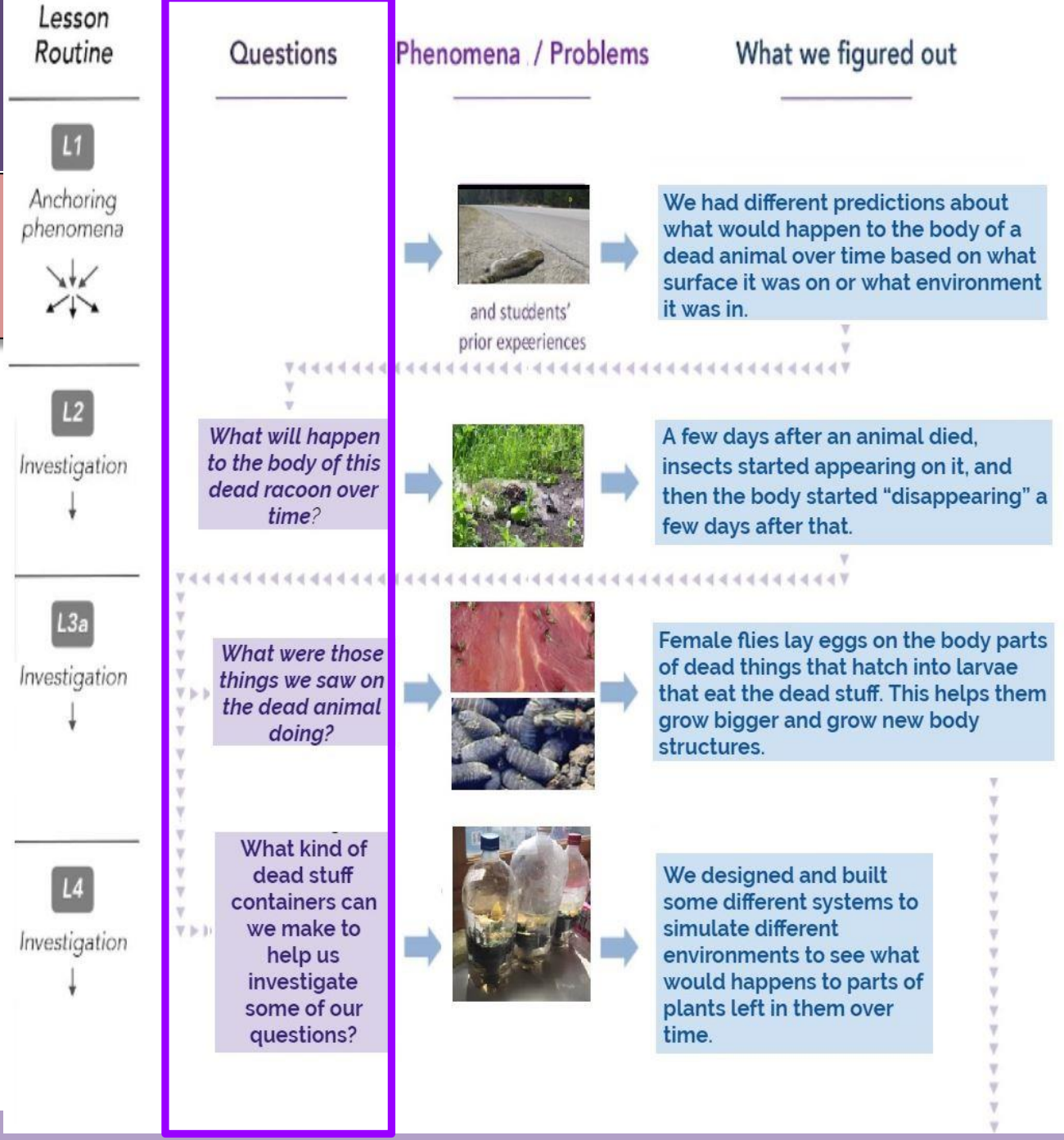
- Are immediately (or progressively) interesting to explore
- Lead us to wonder
- Generate controversy (competing explanations)
- Connect to other experiences that students have had with related phenomena in the world.
- Generate questions and ideas for investigations
- Advance our understanding of the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

# How do students put their ideas together?



# Storylines

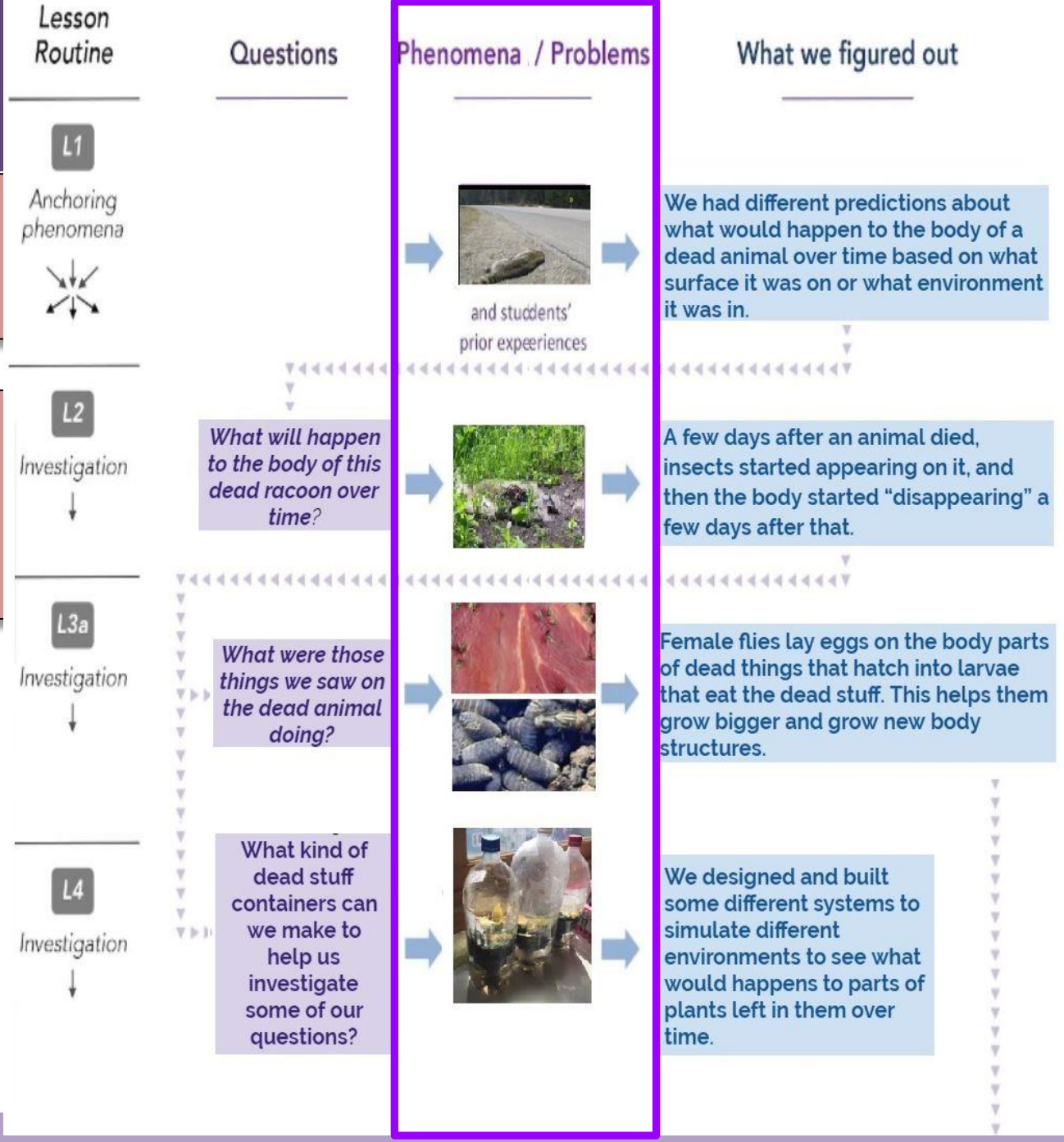
Student questions motivate each lesson



# Storylines

Student questions motivate each lesson

Students use practices to make sense of phenomena

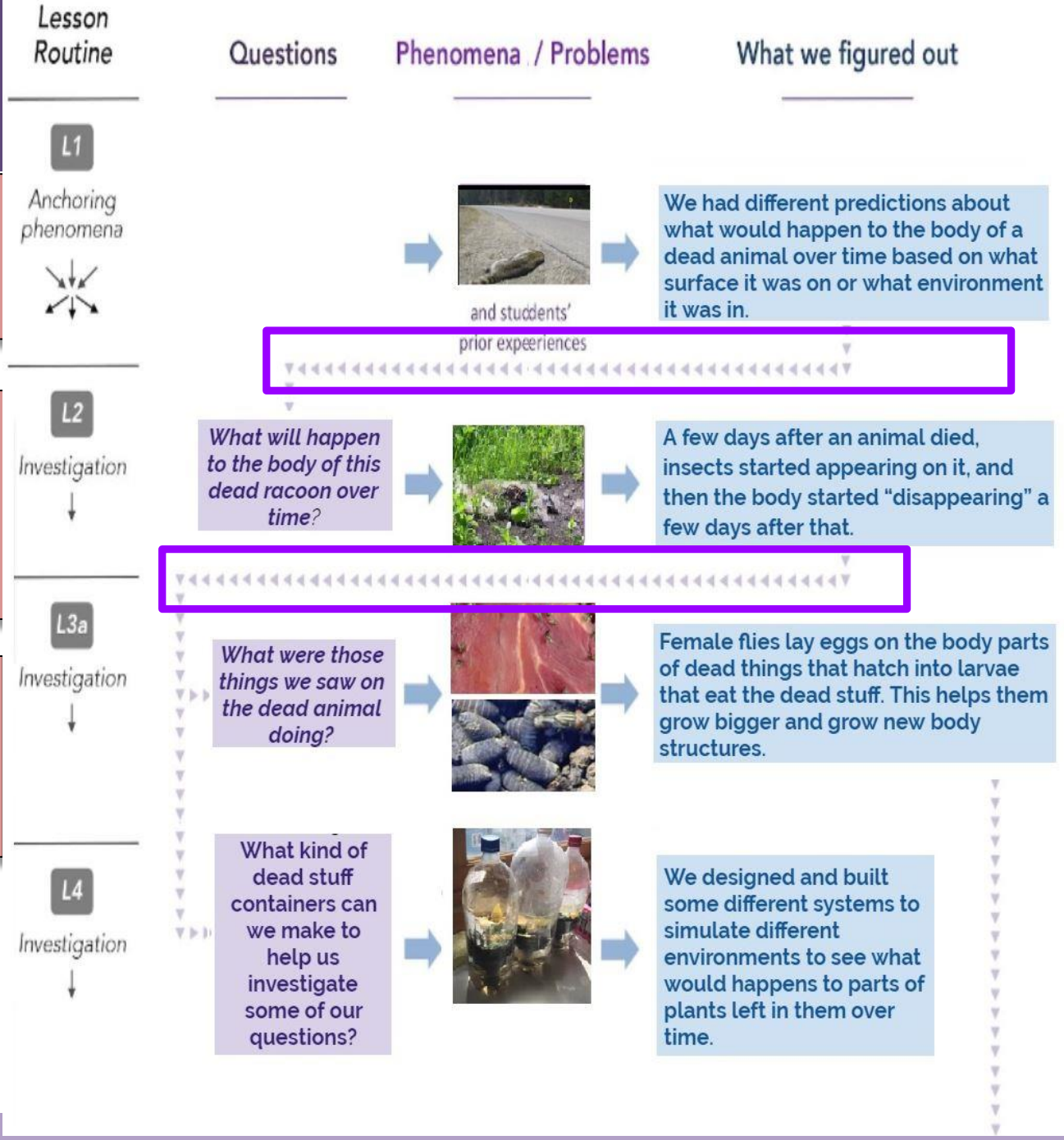


# Storylines

Student questions motivate each lesson

Students use practices to make sense of phenomena

Questions arise from what students figured out so far



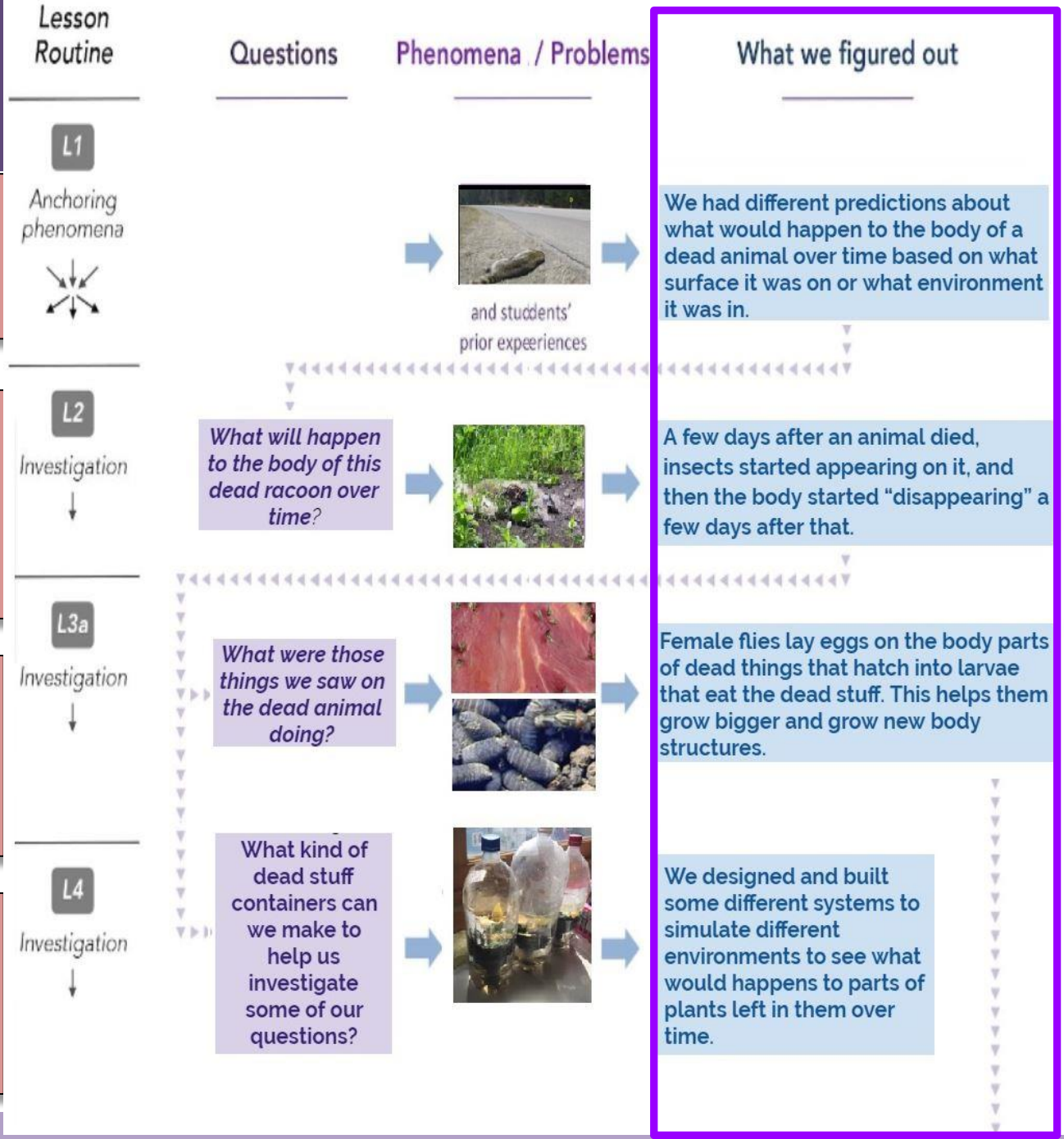
# Storylines

Student questions motivate each lesson

Students use practices to make sense of phenomena

Questions arise from what students figured out so far

Students build ideas incrementally over time



# 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.

# Nextgenstorylines.org

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.

# Nextgenstorylines.org

Talk about continued support and having teacher teams HS/Elementary partners.

# Questions?

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

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