



Student Drivers -

Driving question boards empower students to figure out what they really need to know and how they will get there

I noticed...

Why did...

**How often
does...**

I Wonder...

What if...

You can find more storylines and the storyline tools
at:

<http://www.nextaenstorylines.org>



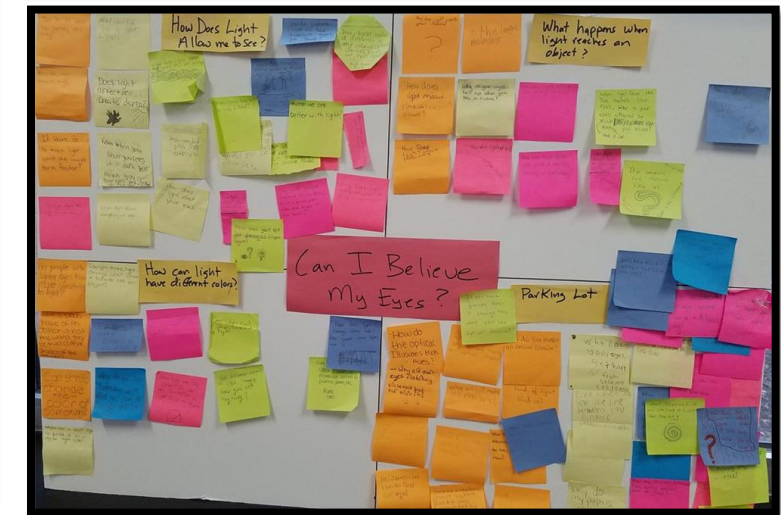
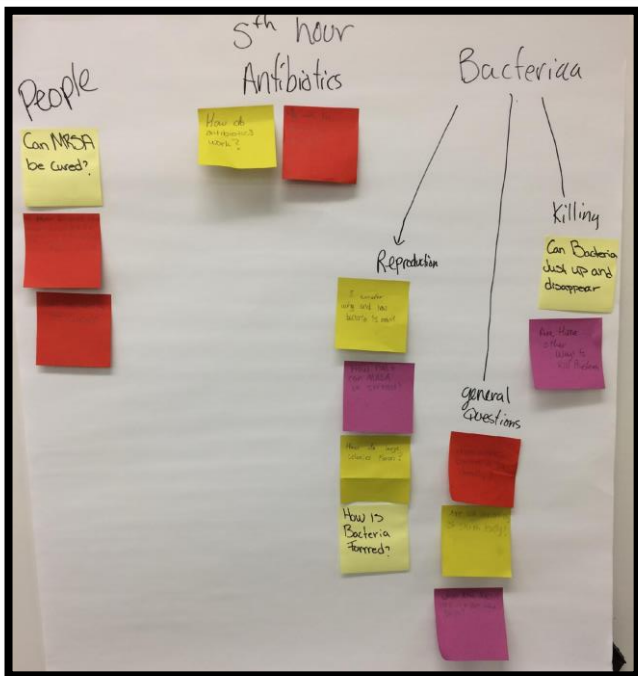
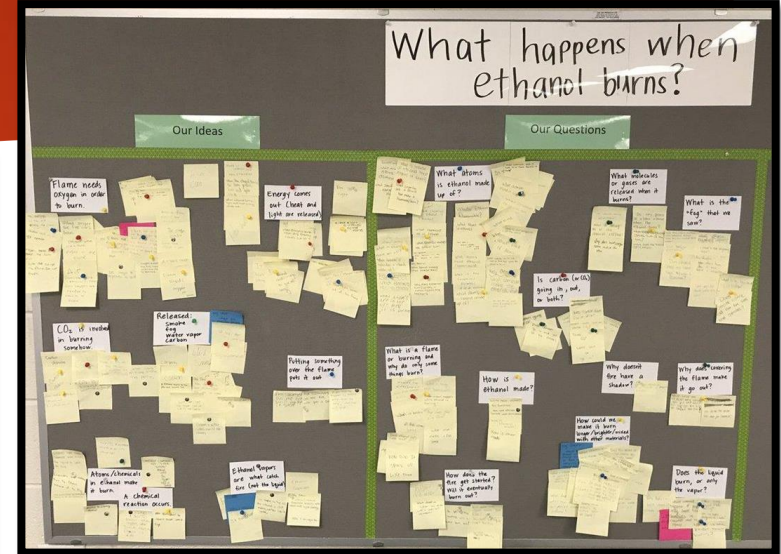
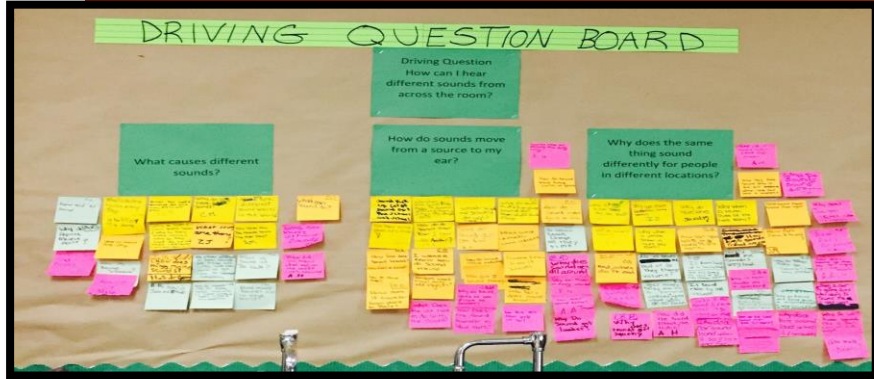
You can find lots of examples of work in our
classrooms on Twitter:

Holly Hereau @hhereau (hollyhereau.weebly.com)

Wayne Wright @wewright1234

The Driving Question Board

Not about how it looks but how it is used!



Driving Questions vs. Parking lots

What the difference?



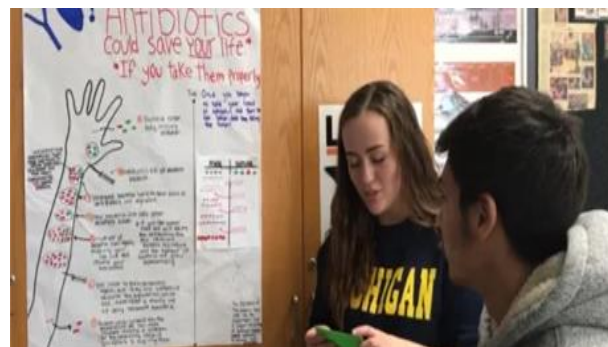
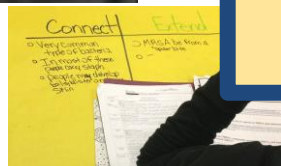
DQB	Parking Lot
<p>People</p> <p>3rd hour</p> <p>Prevention/ Roles</p> <p>Life of Bacteria</p> <p>Treatment/ Antibiotics</p> <p>Match on Eukarya</p>	<p>PARKING LOT</p>

Students are DRIVING their learning using their own Questions



DQB
Student Centered

“We figure out the science ideas.”



“We figure out where we are going each step.”

“We put the pieces of the science ideas together over time.”

STUDENT HAT



Let's do a Driving Question Board!



What would a (well behaved) 5th grade version of you notice and wonder about the following phenomena?

Why do dead things disappear over time?





Predictions

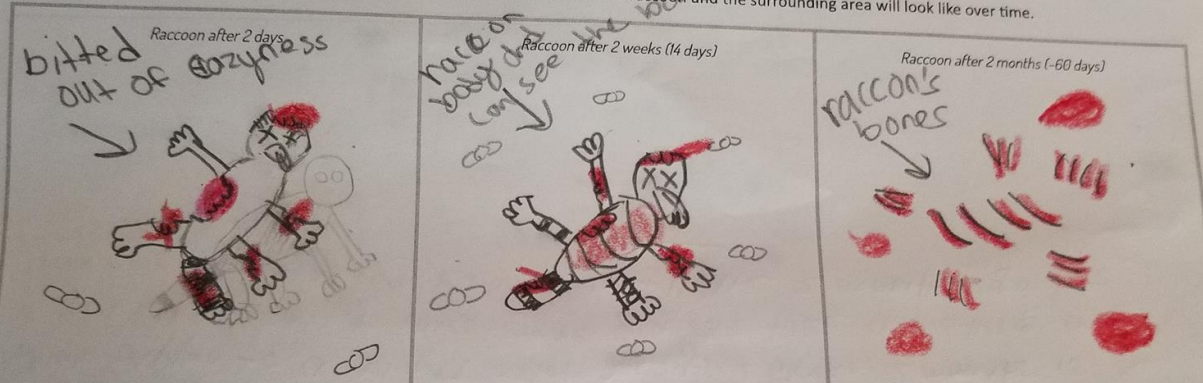
- ▶ DRAW
- ▶ What will this look like in 2 weeks?
- ▶ What will this look like in 2 months?



Examples of Student Predictions

Lesson 1 - Student Activity Sheet: What will happen to the raccoon? Name: Rosmee Farrell Date: Jan 30, 19

Q1) Draw and label your predictions of what you think the raccoon and the surrounding area will look like over time.



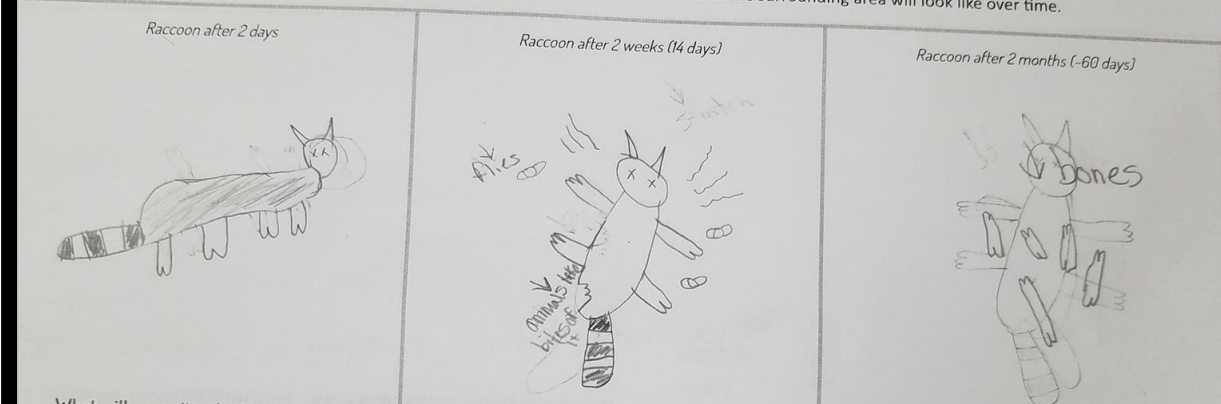
What will cause it to look this way?
The raccoon looks like that because other raccoon and animals killed the raccoon.

What will cause it to look this way?
The raccoon bones are showing because the other animals were eating the raccoon and had open the raccoon skin.

What will cause it to look this way?
The raccoon is gone and there are nothing but the bones because the skin have decompose.

Lesson 1 - Student Activity Sheet: What will happen to the raccoon? Name: Ariana Strong Date: _____

Q1) Draw and label your predictions of what you think the raccoon and the surrounding area will look like over time.



What will cause it to look this way?

What will cause it to look this way?

What will cause it to look this way?




Examples of Student Predictions

Lesson 1 - Student Activity Sheet: What will happen?

Q1) Draw and label your predictions of what you think the raccoon and the surrounding area will look like over time.

Raccoon after 2 days

bitten out of business

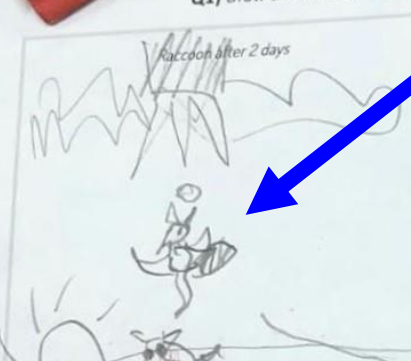


What will cause it to look this way?

The raccoon looks like that because other raccoon and animals killed the raccoon.

Q1) Draw and label your predictions of what you think the raccoon and the surrounding area will look like over time.

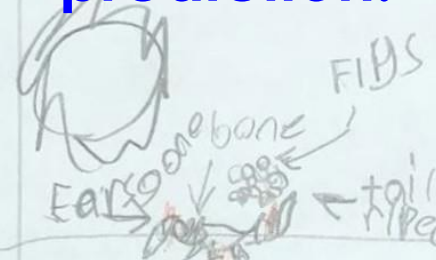
Raccoon after 2 days



What will cause it to look this way?

it just got hit


Raccoon after 2 weeks (14 days)



What will cause it to look this way?

The skin is being eaten by flies and the skin is rotting.

Raccoon after 2 months (~60 days)



What will cause it to look this way?

all the skin has rotted and been eaten

1

These materials were developed in part with support from an MSP grant from the Connecticut Department of Education, the Connecticut Science Center, the Michigan Department of Education, the Gordon and Betty Moore Foundation, and support from the NGSS Project at Clark University, Tlaxmark Institute, and Northwestern University.

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My all time favorite prediction!



Name: Ariana Strong Date: _____

Q1) Draw and label your predictions of what you think the raccoon and the surrounding area will look like over time.

Raccoon after 2 months (~60 days)



What will cause it to look this way?



What do we Notice/ Wonder?

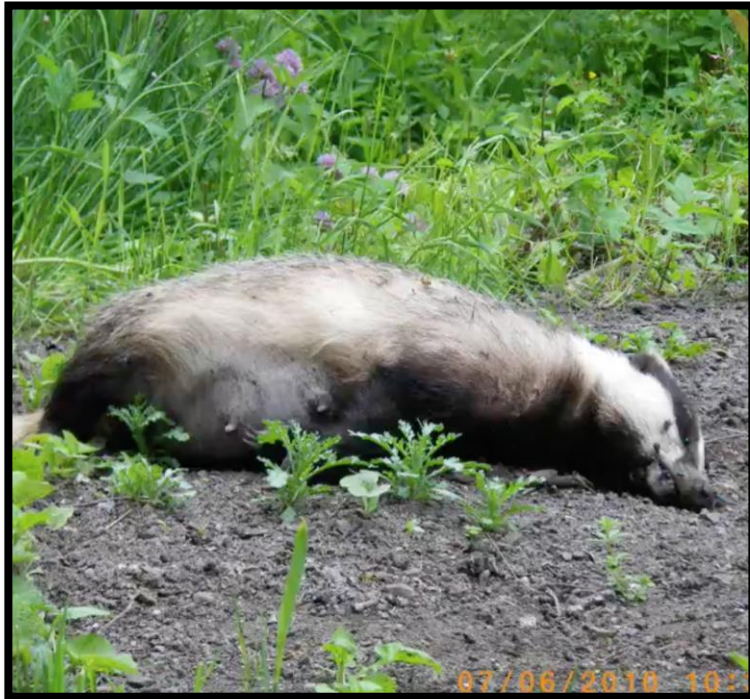


<https://www.youtube.com/watch?v=E93rNE5F-LE>



Driving Question Board

Why did this dead thing disappear?



Day 1

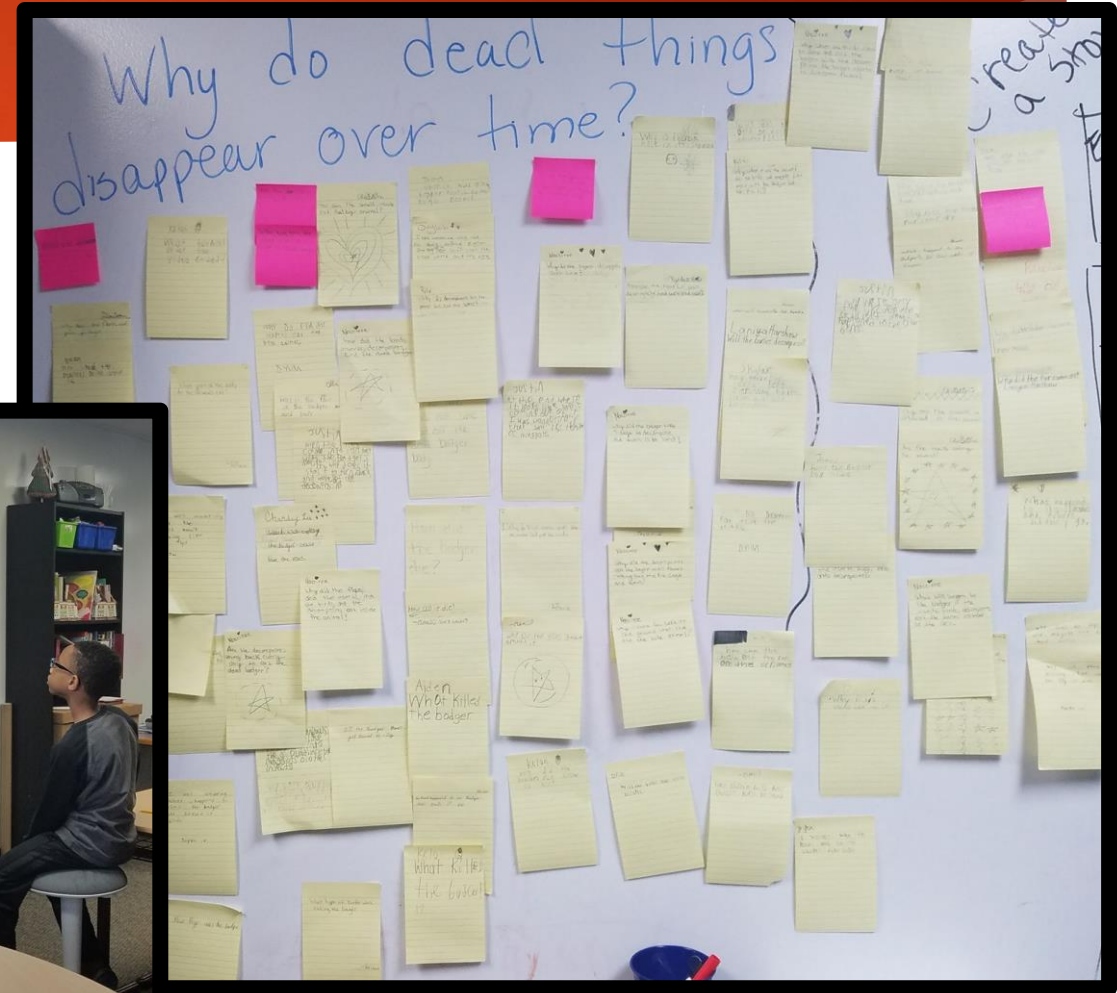
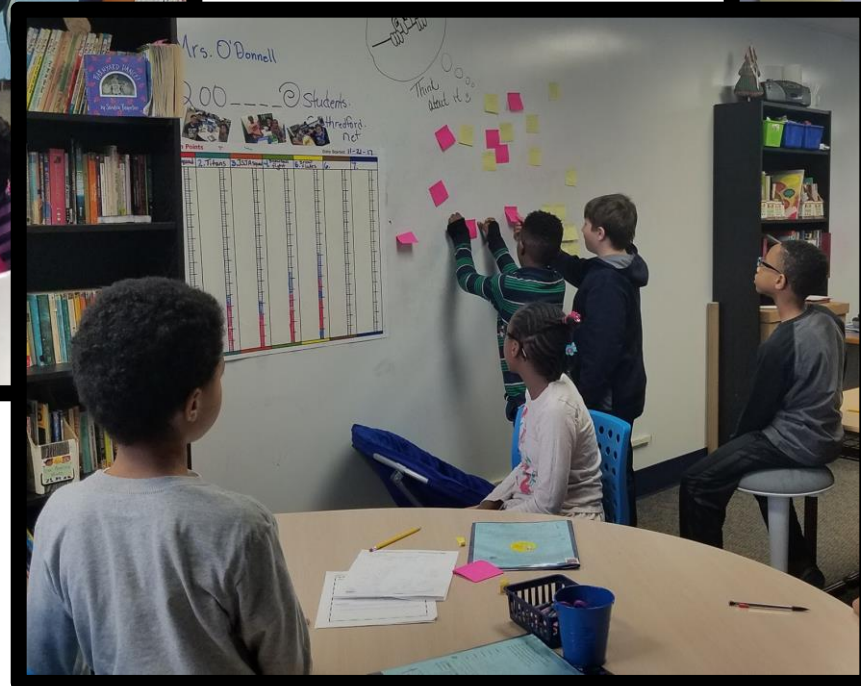
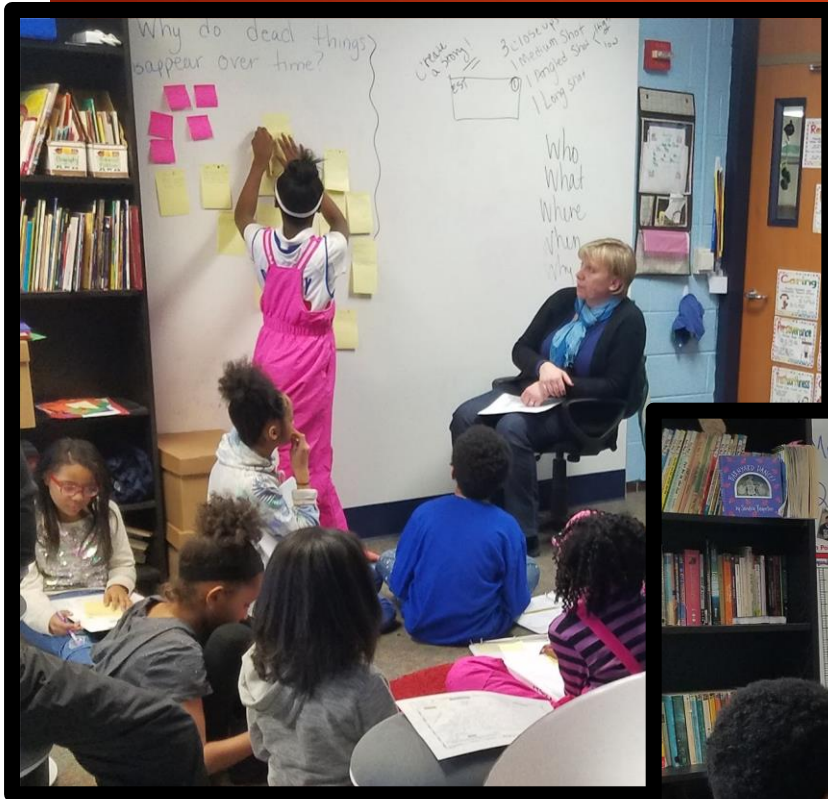


Day 9



Day 5

Driving Question Board in Lynda's Class





Examples of Questions

- What are those insects doing on the carcass? Where did they come from?
- What happens to all the parts of the badger like the inside muscles and organs, fur, and bones?
- Do some parts of the badger go into the soil? Does some get washed away? Does it get eaten etc.?
- Is this the same thing that happens to leaves, or fruit or wood when it rots?
- How do new plants grow from parts of plants that seem like they are dead?



SEP: Asking Questions/ Defining Problems

1. It isn't just about students writing any questions

1. All questions are not necessary/helpful to help us figure out the phenomena (DCI).

we need to purposefully scaffold our DQB to make sure students give meaningful questions that will help us figure out our phenomena (DCI)

Effective DQB are beneficial to both teachers and students because...



Teacher's Perspective



NGSS PERFORMANCE EXPECTATIONS BUNDLE		
Matter and Energy in Organisms and Ecosystems		
5-PS3-1	5-LS1-1	5-LS2-1
Structure and Properties of Matter		
5-PS1-1		

Students' Perspective



We have a lot of questions about where dead things go and we need to figure this out

By the end of grade 5. Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means (e.g., by weighing or by its effects on other objects). For example, a model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects (e.g., leaves in wind, dust suspended in air); and the appearance of visible scale water droplets in condensation, fog, and, by extension, also in clouds or the contrails of a jet. The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish (e.g., sugar in solution, evaporation in a closed container). Measurements of a variety of properties (e.g., hardness, reflectivity) can be used to identify particular materials.

Effective DQB are beneficial to both teachers and students because...

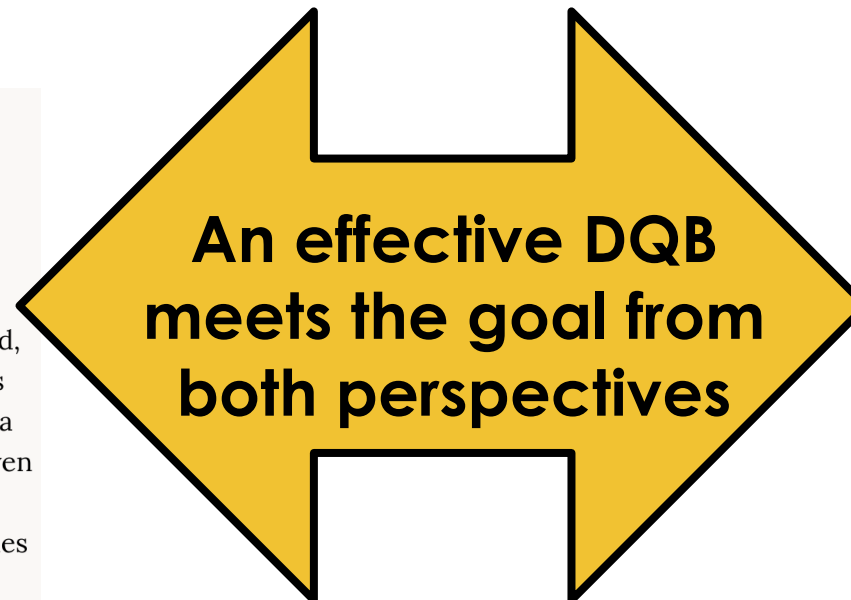


Teacher's Perspective



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Students' Perspective



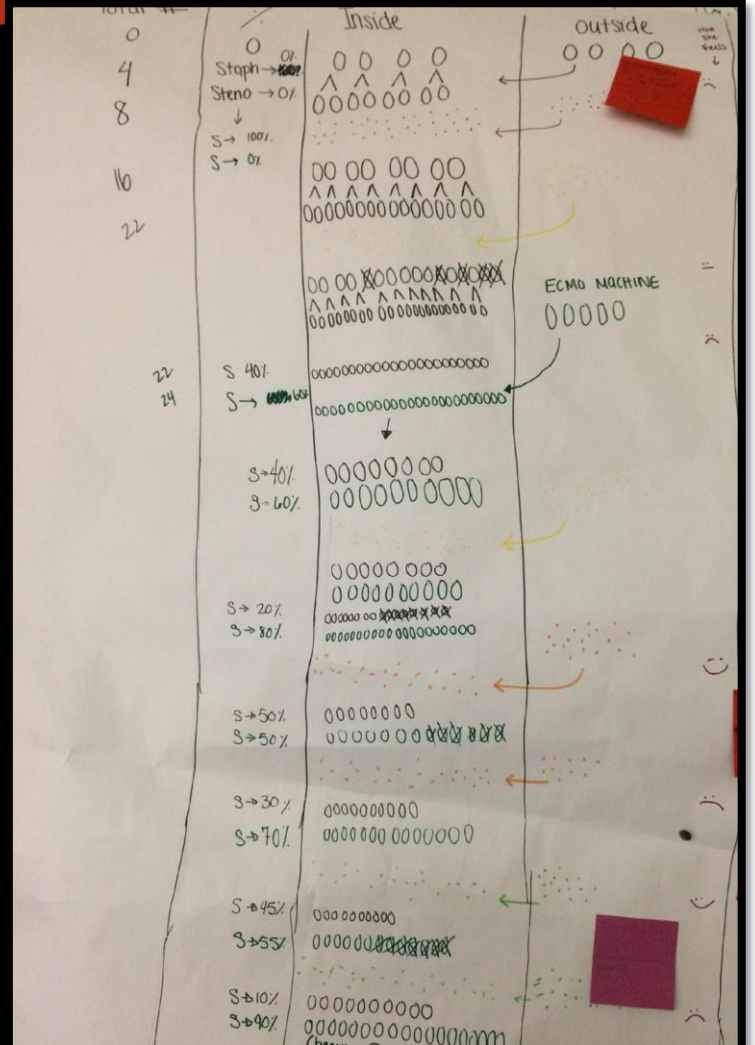
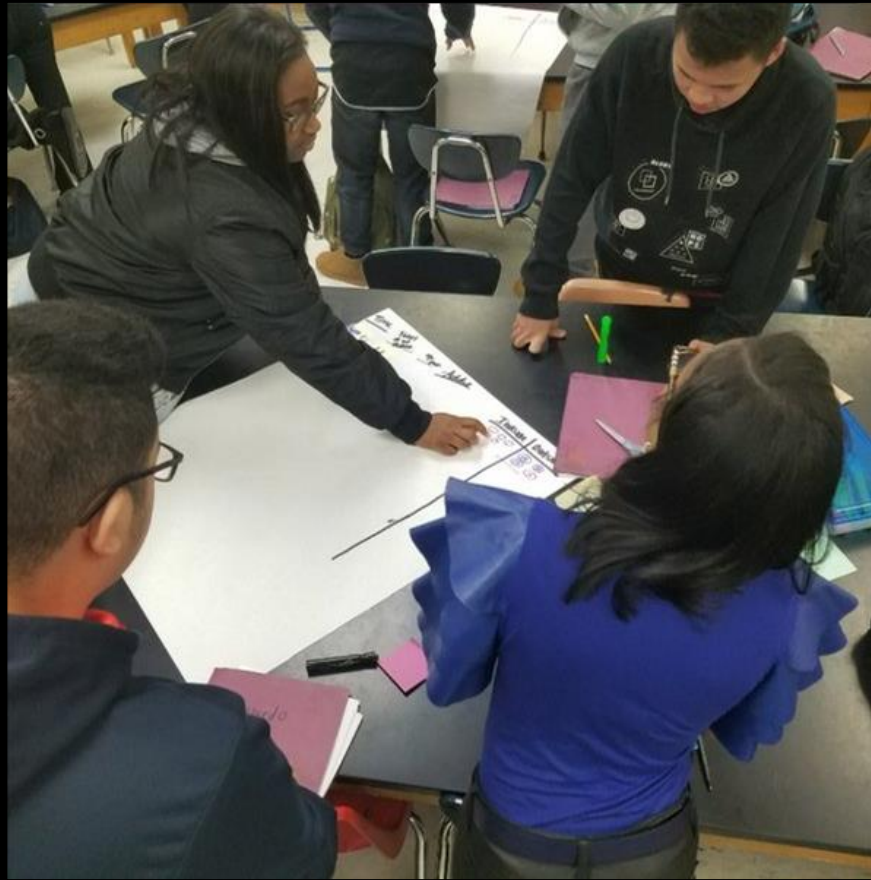
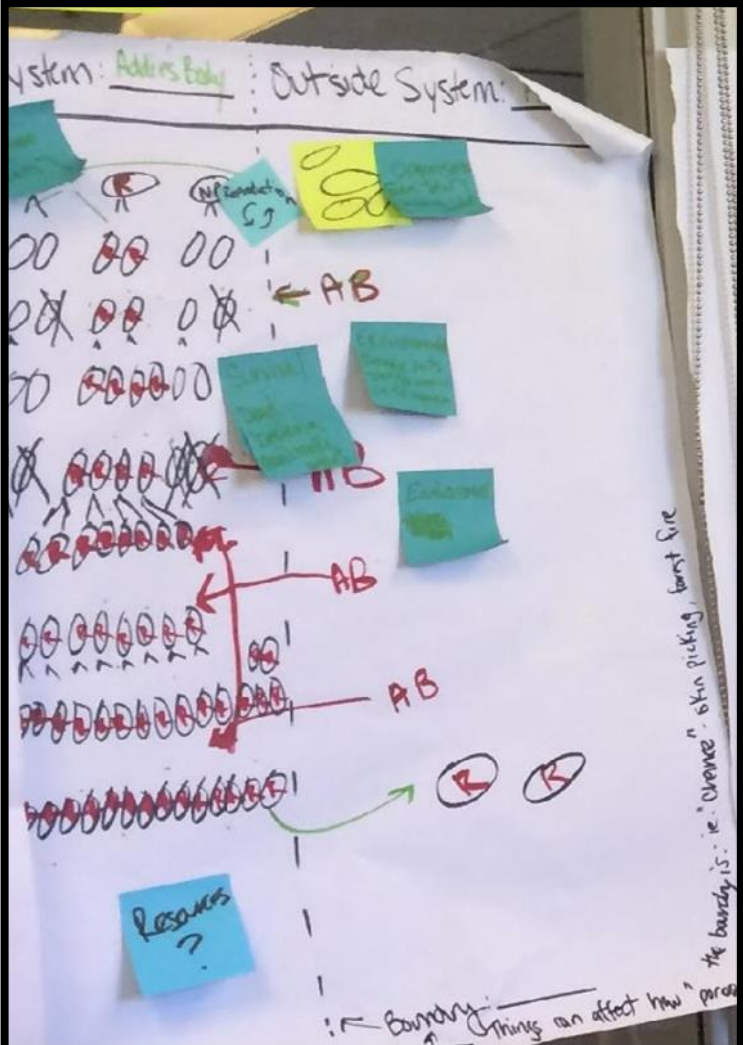
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Having the END in Mind!

What do you want students to produce?



How Do We Make Sure Our DQB is Effective?



1. Timing- when your DQB happens...
2. Framing your DQB...
3. Student Engagement with the DQB

1. Timing is Everything....



You need to be purposeful about when you do your DQB within your instructional sequence to make sure your students ask questions that lead to the DCI's .



Initial Questions
(too Specific)



Driving Questions
(General)

Anchoring Phenomena Routine

1) Questions on Bacteria + Antibiotics

1) this Bacteria found?
Is it found more in some places than others?
How do antibiotics work?
Why not give them all at once?
Are there other ways to kill Bacteria?
Why not give the strongest Antibiotics first?
Once infected how long before you feel sick?
How many people are affected by antibiotics?
Is there a cure yet?
How long has this been going on?
What type of Antibiotics...

2) Questions on Bacteria + Antibiotics

2) this Bacteria found?
Is it found more in some places than others?
How do antibiotics work?
Why not give them all at once?
Are there other ways to kill Bacteria?
Why not give the strongest Antibiotics first?
Once infected how long before you feel sick?
How many people are affected by antibiotics?
Is there a cure yet?
How long has this been going on?
What type of Antibiotics...

3) Bacteria

3) Bacteria
Other
Places?

4) Antibiotics

4) Antibiotics
Bacteria
Other
Places

Explore Anchoring Phenomena



What do we notice?

Attempt to Make Sense



How can we explain this?
Do our explanations agree?

Identify Related Phenomena



Where else does something similar happen?

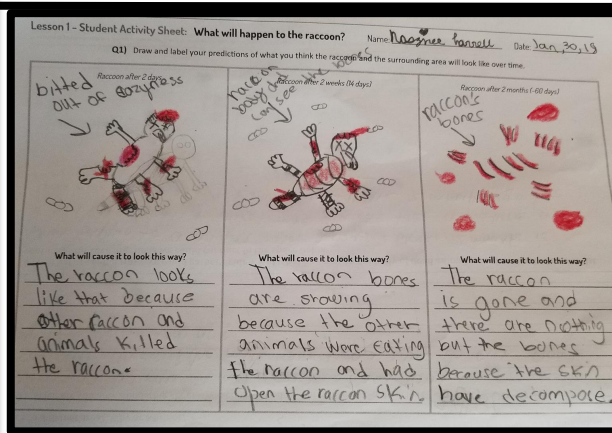
Develop Questions and Next Steps



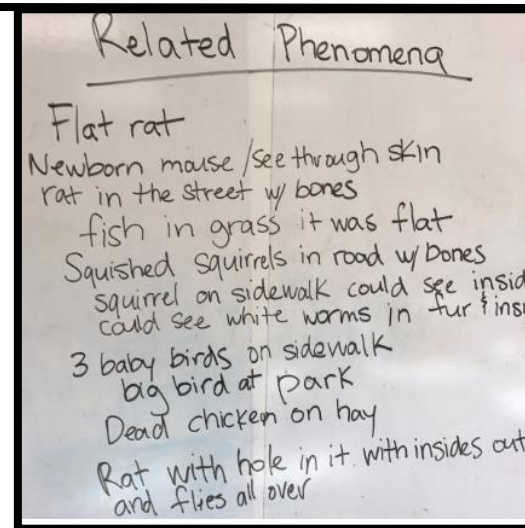
What can we do to figure out how to explain all this?



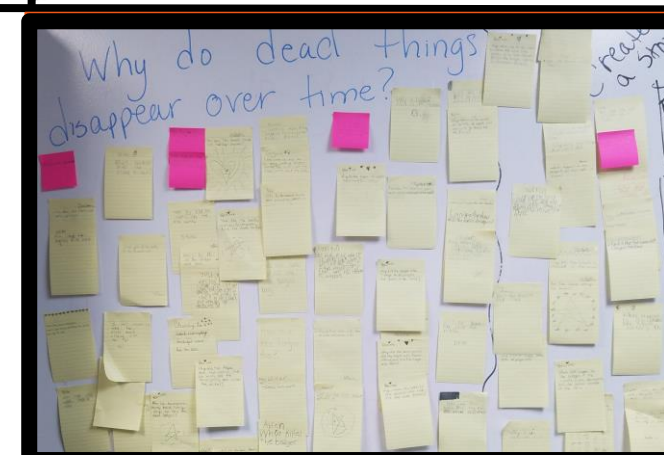
What will happen to the body of this dead raccoon over time?



we have different predictions about what will happen?



We have come across other dead animals outdoors.



What will happen to the body of dead things over time?

Explore Anchoring Phenomena



What do we notice?

Attempt to Make Sense



How can we explain this?
Do our explanations agree?

Identify Related Phenomena

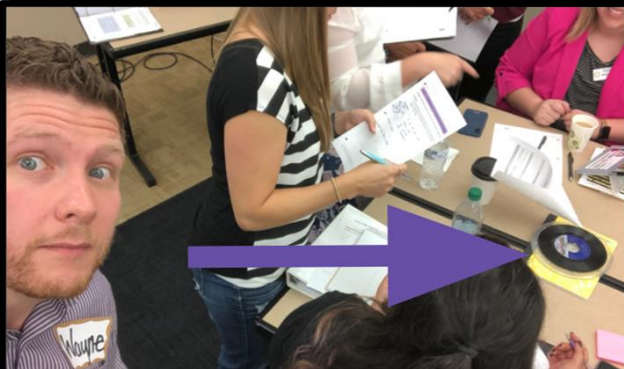


Where else does something similar happen?

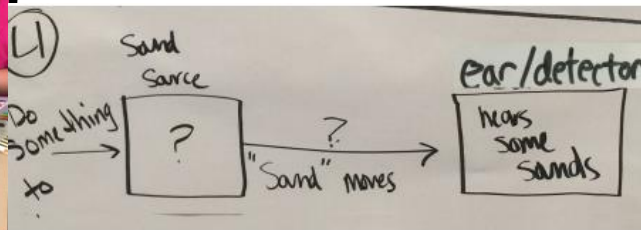
Develop Questions and Next Steps



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



How can we hear so many sound when the record spins?

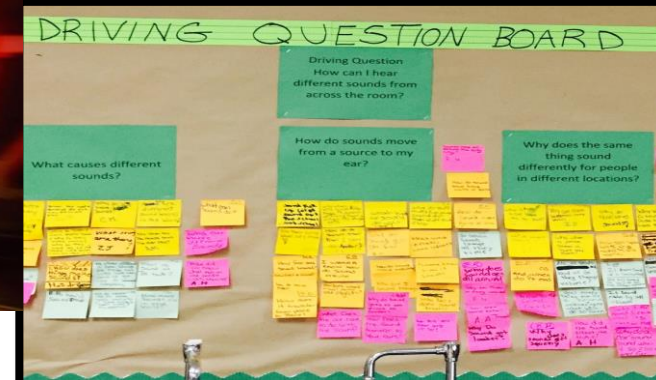


We Notice...

1. There is a sound starter.
2. Sound moves through air.
3. something catches the sound



we have a lot of experiences with sound



what questions do we have about sound or about how we hear noises?

Explore Anchoring Phenomena



What do we notice?

Attempt to Make Sense



How can we explain this?
Do our explanations agree?

Identify Related Phenomena



Where else does something similar happen?

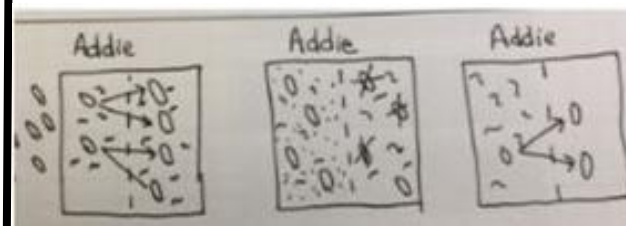
Develop Questions and Next Steps



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



How did addie get so sick?



We have a lot of different ideas about how the antibiotics stopped working.



1. Have you ever gotten sick before?

2. how often does antibiotic resistance happen?



Why don't antibiotics work like they use to?



2. Frame the DQB Board.

How you frame the Driving Question Board is important in what types of questions you will get.

“What Questions would we need to ask that answer would help us figure out...”



3. Student Engagement

1. Create the culture that everyone is going to get a question on the board. All student questions and ideas are valued.
2. The facilitator listens and asks clarifying questions to lift the important ideas voiced by students
2. Scientist circles are important.



High School Example - Junco Evolution





3. Student Engagement

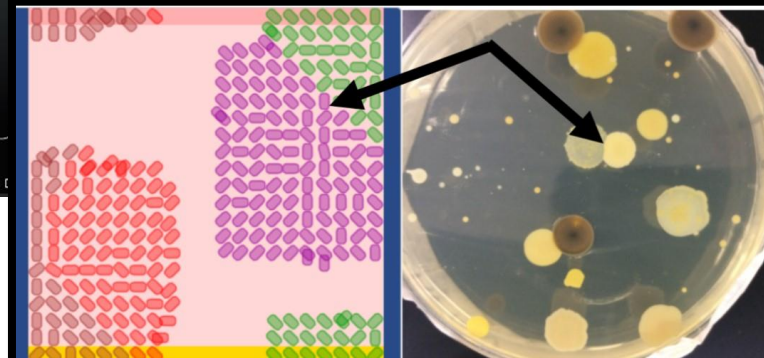
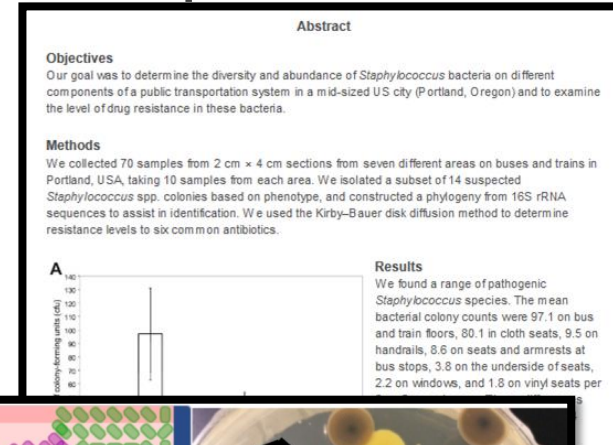
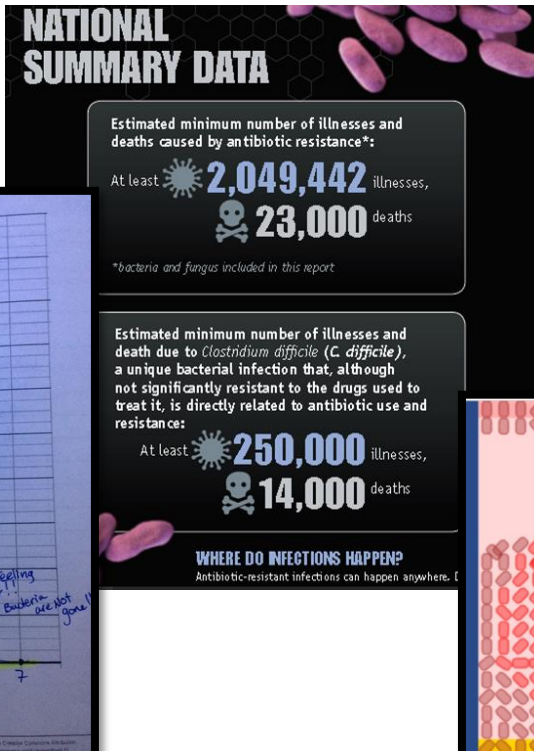
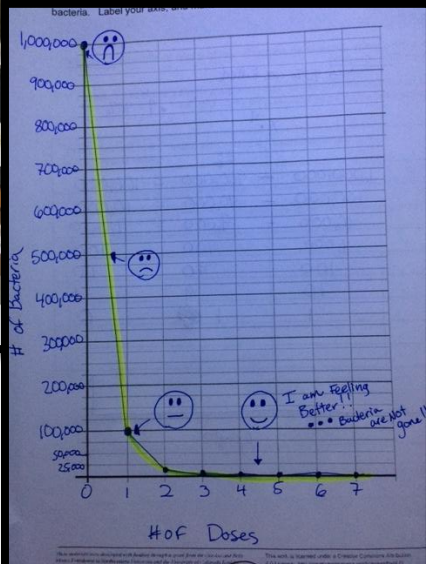
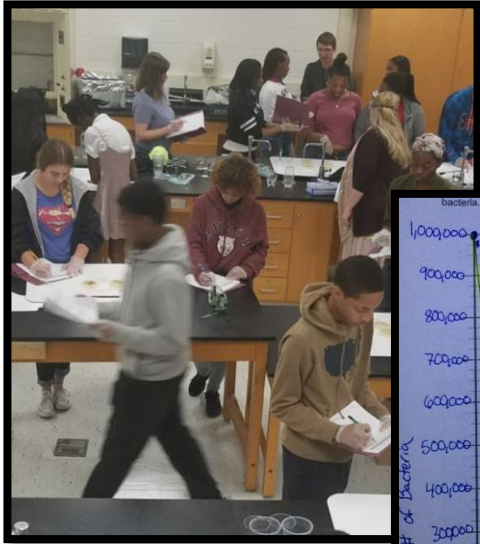
4. Students need to listen to classmate's questions to see how their questions connect.

5. The class works together to categorize the questions into groups



3. Student Engagement

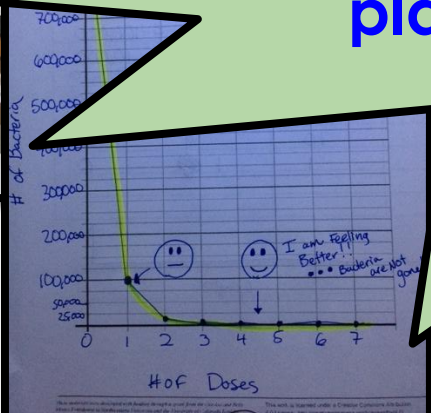
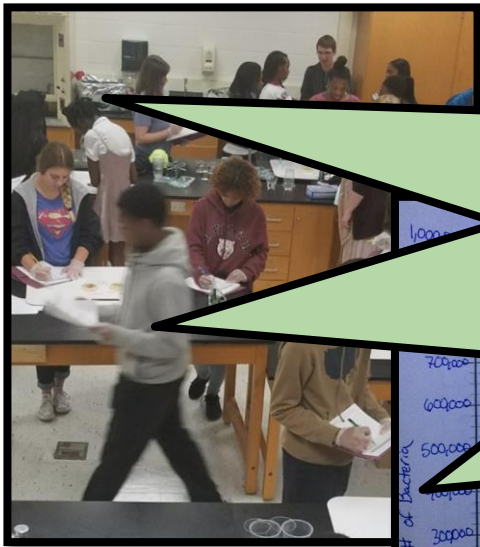
6. The DQB motivates students to plan investigations that will attempt to answer these questions



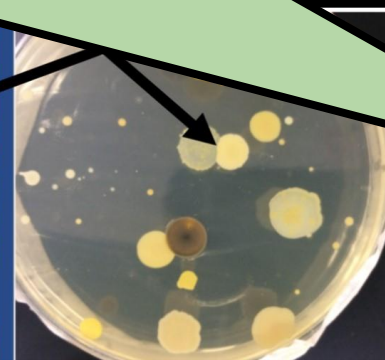
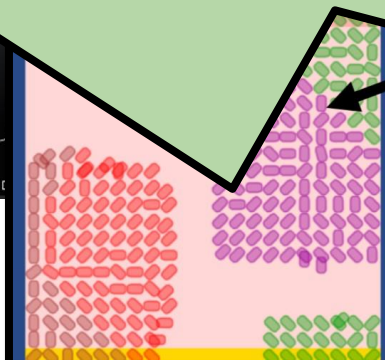
3. Student Engagement

5. The DQB motivate students to plan investigations that will attempt to answer the questions

What we **figure out** from those **investigations** often lead to new **questions** that motivate students to **plan another investigations!**



INFECTIONS HAPPEN?
Antibiotic-resistant infections can happen anywhere.



3. Student Engagement



7. We return later back to the board throughout the unit to see how we have answered our questions.

Lesson

- Addie Video
- Models
- Infographic
- Question Board
- Designing Experiments
- Do the experiment
- Articles on Antibiotics
- Results from Experiment
- Video of Bacteria reproducing
- Math Model
- Bacteria Growth Computer Simulation
- Antibiotic graphs
- Set up of Antibiotic

What did we do?

- Watched the video
- Made a timeline to find out how she got sick.
- Made initial model to explain how antibiotics stopped working.
- We looked at an infographic to see how common cases like Addie happen.
- We researched looking at articles to find out more about Antibiotic Resistance.
- We thought what we thought was important to figure out in order to figure out Antibiotic Resistance.
- We organized our questions.
- Talked about how to "catch" bacteria.
- Touched Petri dish, waited to see what happened.
- Designed experiment around S.O's
- Swabbed / Did experiment after
- Feedback from other students.
- How do we find bacteria?
- How do I kill bacteria?

What did we figure out?

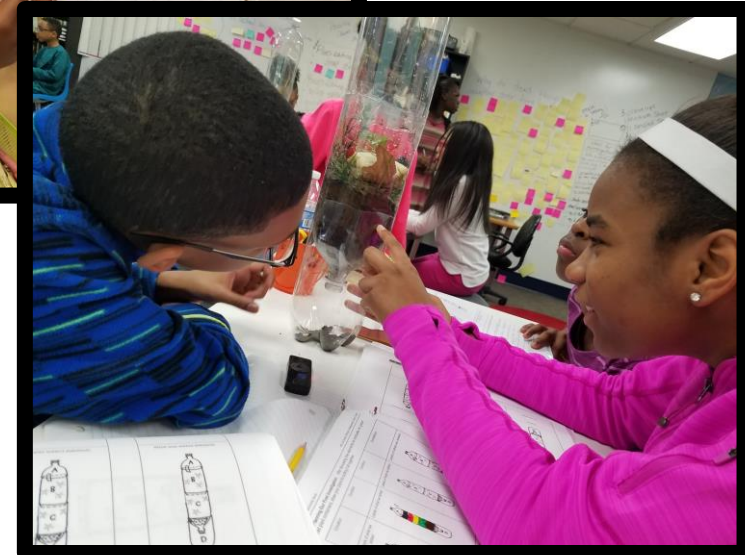
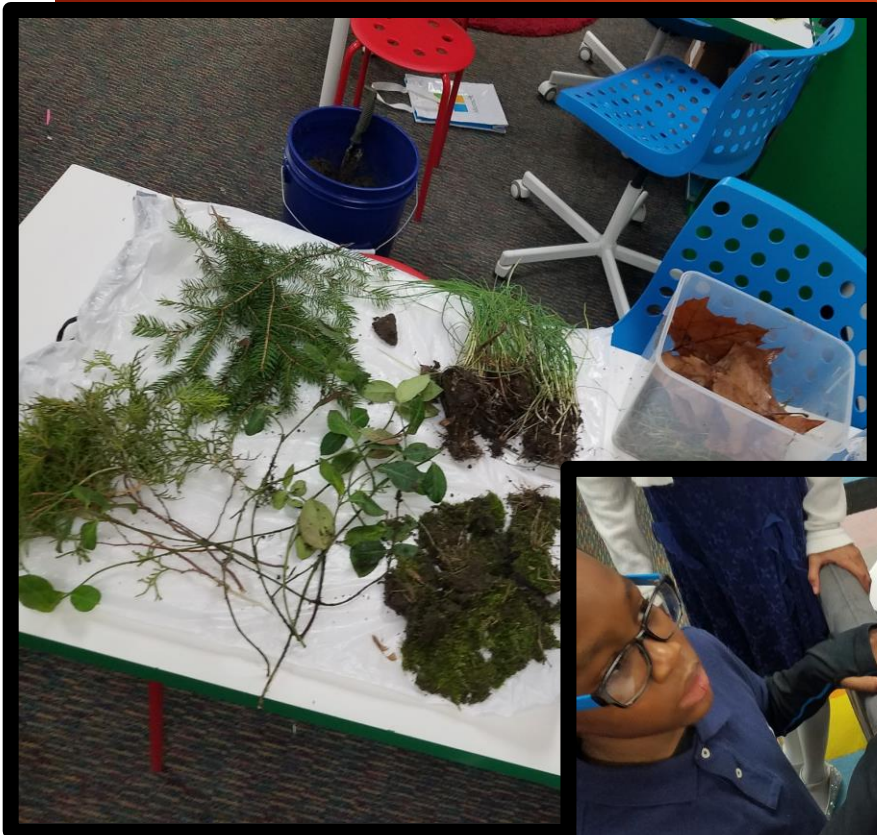
- Antibiotics stopped working
- Something changed with Bacteria
- We have a lot of ideas why the antibiotics stopped working.
- A lot of people get Antibiotic Resistance... Not all people die.
- This is happening more often.
- We have a lot of questions about how this is happening.
- Bacteria Needs Food & Water to Survive.
- Bacteria grow.
- Certain areas have better environments for Bacteria to grow.
- Different Antibiotics Affect Bacteria in different ways.
 - * Beta Lactam - Bacteria explodes
 - * Macrolides - Stop proteins from being made
 - * Quinolones - Stop reproduction
- Bacteria was found more in frequently used places.
- Bacteria grow... But in order to see it we needed a certain environment.
- When Bacteria grow they split in two
- Every 20min they split in two
- the growth was exponential
- Bacteria only produce the same type of Bacteria
- Variation in Starting Bacteria
- Bacteria stop reproducing
 - ran out of space/food
 - ran into other bacteria/competition
 - Antibiotics

What should be in our model?

- Bacteria getting worse... we don't agree what that looks like.
- Antibiotics affecting Bacteria
- On Area / Environment
- Bacteria growing... Need to figure this out.
- Resources for the bacteria to survive.
- Bacteria grow/spread... Need to figure this out...
- the environment
- Antibiotics stopping/killing Bacteria
- Variation of Starting Bacteria
- Bacteria only produce the same type
- there are factors that stop Bacteria from reproducing.
- Antibiotics killing Bacteria
- Have multiple discs



Lynda's Class





Thank you to:

The incredible teachers and researchers around the country that created and piloted these materials

The Next Generation Science Storylines Team at Northwestern University



You can find more storylines and the storyline tools
at:

<http://www.nextaenstorylines.org>



You can find lots of examples of work in our
classrooms on Twitter:

Holly Hereau @hhereau (hollyhereau.weebly.com)

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