Leveraging students' authentic questions about COVID-19 to motivate meaningful engagement with science

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mySci is a project of

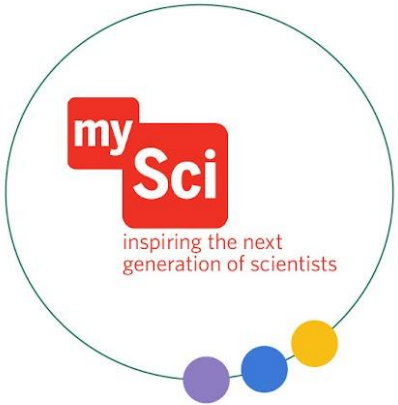
Washington University in St. Louis
Institute for School Partnership

The Institute for School Partnership (ISP) connects Washington University with the surrounding K-12 community to inspire and empower educators and students with the resources they need to succeed.

We identify best practices in teaching and learning and implement these practices in local schools, particularly those with the most vulnerable and underserved students. We translate the most current research in education into learning opportunities for educators at all levels.

The Institute for School Partnership Programs

Best science teaching practices in partnership with Hawthorn Leadership School for Girls



Implementing Best Practices prior to COVID-19

According to teacher leaders, scientists, and educational researchers, the kinds of experiences that science learners (and teachers) across grades K-12 need and should be able to do:

- Understand, use, and interpret scientific explanations of the natural world
- Generate and evaluate scientific evidence and explanations
- Understand the nature and development of scientific knowledge
- Participate productively in scientific practices and discourse

SOURCES:
Taking Science to School: Learning and Teaching Science in Grades K-8 (2007)
A Framework for K-12 Science Education Standards (2012)
Ambitious Science Teaching (2018)

Understand, use, and interpret scientific explanations of the natural world

The question we asked: **Why does regular sugar make rock candy and Splenda doesn't?**

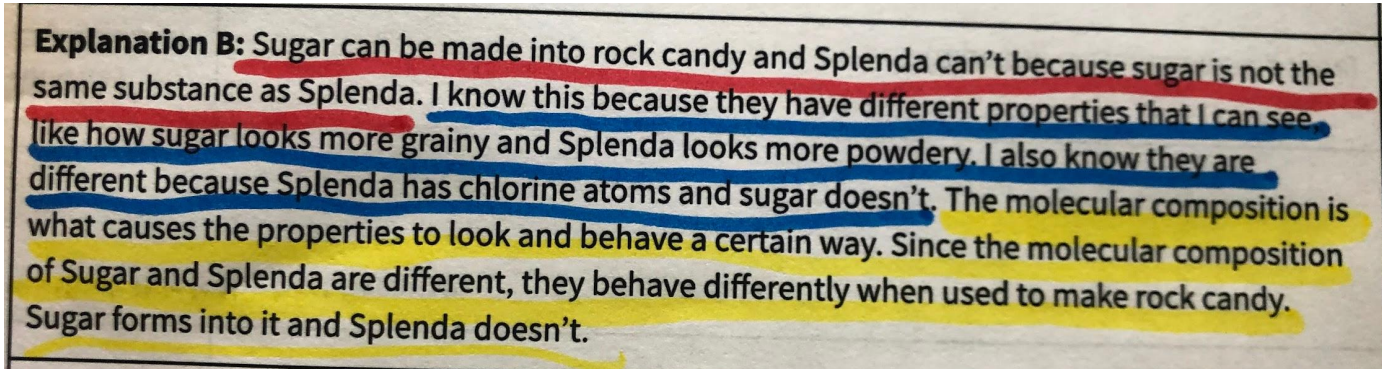
The Best Explanation	(tape the explanation strip here)
We think this is the best because…	
An Okay Explanation	(tape the explanation strip here)
We think this is just okay because…	
The Worst Explanation	(tape the explanation strip here)
We think this is the worst explanation because…	

Explanation A: Sugar can be made into rock candy and Splenda can't because sugar is not the same substance as Splenda. They look similar, but they are different if you look close. This is why Splenda can't make rock candy.

Explanation B: Sugar can be made into rock candy and Splenda can't because sugar is not the same substance as Splenda. I know this because they have different properties that I can see, like how sugar looks more grainy and Splenda looks more powdery. I also know they are different because Splenda has chlorine atoms and sugar doesn't. The molecular composition is what causes the properties to look and behave a certain way. Since the molecular composition of Sugar and Splenda are different, they behave differently when used to make rock candy. Sugar forms into it and Splenda doesn't.

Explanation C: Sugar can be made into rock candy and Splenda can't because sugar is not the same substance as Splenda. The way a substance looks depends on the molecular composition and the molecular structure. Sugar and Splenda are different because Splenda contains an atom that sugar doesn't have. I know this because we read about what makes up substances and we built models of sugar and salt and other substances.

Understand, use, and interpret scientific explanations of the natural world

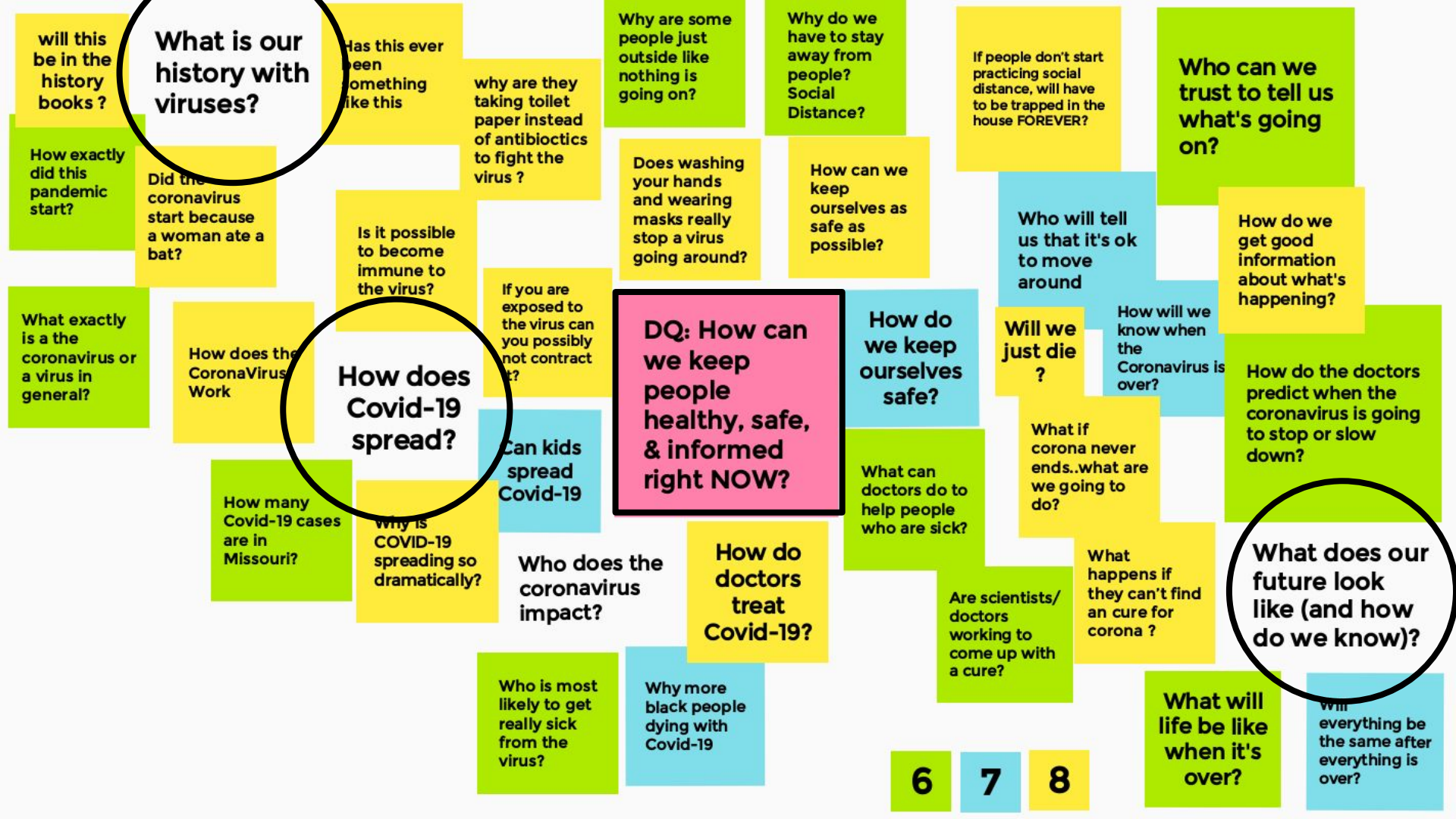


Explanation B: Sugar can be made into rock candy and Splenda can't because sugar is not the same substance as Splenda. I know this because they have different properties that I can see, like how sugar looks more grainy and Splenda looks more powdery. I also know they are different because Splenda has chlorine atoms and sugar doesn't. The molecular composition is what causes the properties to look and behave a certain way. Since the molecular composition of Sugar and Splenda are different, they behave differently when used to make rock candy. Sugar forms into it and Splenda doesn't.

1. Contains a claim and 2 pieces of evidence.
2. Contains strong reasoning that completely answers the question by connecting the unique molecular composition with the unique behavior of Splenda and that of sugar.
3. Contains connecting words that increases writing fluency:
    - "I know this because…"
    - Also…
    - Since…
    - Like...

The COVID-19 shutdown

- The last day of in-person classes: Tuesday, **March 17, 2020**.
- Hawthorn moved their Spring Break to **March 23-27** and used this time to prep and plan for distance learning in April.
- **On April 13**, Mary and Heather virtually facilitated a lesson to elicit and discuss students' questions about the COVID-19 pandemic phenomenon.


will this be in the history books ?
What is our history with viruses?
Has this ever been something like this
why are they taking toilet paper instead of antibioctics to fight the virus ?
Why are some people just outside like nothing is going on?
Why do we have to stay away from people? Social Distance?
If people don't start practicing social distance, will have to be trapped in the house FOREVER?
Who can we trust to tell us what's going on?
How exactly did this pandemic start?
Did the coronavirus start because a woman ate a bat?
Is it possible to become immune to the virus?
Does washing your hands and wearing masks really stop a virus going around?
How can we keep ourselves as safe as possible?
Who will tell us that it's ok to move around
How do we get good information about what's happening?
What exactly is a the coronavirus or a virus in general?
How does the CoronaVirus Work
How does Covid-19 spread?
If you are exposed to the virus can you possibly not contract it?
DQ: How can we keep people healthy, safe, & informed right NOW?
How do we keep ourselves safe?
Will we just die ?
How will we know when the Coronavirus is over?
How do the doctors predict when the coronavirus is going to stop or slow down?
Can kids spread Covid-19
What can doctors do to help people who are sick?
What if corona never ends..what are we going to do?
How many Covid-19 cases are in Missouri?
Why is COVID-19 spreading so dramatically?
Who does the coronavirus impact?
How do doctors treat Covid-19?
Are scientists/ doctors working to come up with a cure?
What happens if they can't find an cure for corona ?
What does our future look like (and how do we know)?
Who is most likely to get really sick from the virus?
Why more black people dying with Covid-19
What will life be like when it's over?
Will everything be the same after everything is over?
6
7
8

COVID-19 Distance Learning Module

I. Have we seen anything like this before?

ELICIT/ ENGAGE	Students ask questions about the coronavirus pandemic.
EXPLORE	Students obtain, gather, and evaluate information related to infectious disease outbreaks, how they spread, who is affected, and the impact on society.
EXPLAIN	Students analyze graphical data on the contagiousness, deadliness, and media coverage of COVID-19 relative to other infectious diseases.
ELABORATE	Students evaluate the credibility, accuracy, and possible bias of two different articles on the same topic.
EVALUATE	Students revisit their driving questions to see what they have figured out thus far.
EXTEND	Students play a game that puts them in the position of someone spreading misinformation. (optional)

II. How does COVID spread and how can we prevent it?

ELICIT/ ENGAGE	Students revisit the DQB to answer old questions and add new ones and discuss the new guiding question.
EXPLORE	Students draw a model of how a virus invades the body, watch video on how viruses spread in the body, and use the Washington Post's "flattening the curve" simulation to model the effects of various prevention measures.
EXPLAIN	Students read an animated cartoon strip that uses scale to explain the spread of COVID-19 and how to stop it. They revise their initial model of how a virus spreads in the body.
ELABORATE	Students interview families about how they practice social distancing. They use social media to send messages of support to essential workers who cannot socially distance.
EVALUATE	Students revisit their questions on the DQB.
EXTEND	Students watch a video about immunity and how vaccines work (optional).

III. What does the future look like (and how do we know)?

ELICIT/ ENGAGE	Students revisit the virtual DQB to answer old questions and add new ones. They discuss the guiding question for the cycle on Google Classroom discussion board.
EXPLORE	Students investigate why Philadelphia's infection curve was so different from St. Louis' curve during the 1918 Spanish Flu pandemic.
EXPLAIN	Students obtain information about the messy process of modeling in order to forecast the future.
ELABORATE	Students write arguments based on public understanding of the Imperial College London's initial and revised projections for COVID-related deaths and argue via the discussion board.
EVALUATE	Students revisit their questions on the class DQB.
EXTEND	Students create and run their own pandemic model/ simulation using NetLogo (optional).

Generate and evaluate scientific evidence and explanations

Who can we trust to tell us what's going on?

The scene:

On March 16, 2020, the Imperial College London COVID-response team published a scientific paper that outlined a "worse-case scenario" of 510,000 deaths in the U.K. assuming the country would continue doing nothing to respond to the COVID-19 outbreak. In response to this study, the country (along with the U.S.) made preparations for a public lockdown. As of April 25, 2020, "only" 18,000 deaths have been recorded in the U.K.'s hospitals. That's 28 times fewer than predicted by the initial projections.

4. When the Imperial College London team revised their initial model-based projections, some news media outlets reported that the team had an error in the initial model. This worried many people that scientists are making mistakes. Some people even argued: we shouldn't trust what these scientists say because their models are wrong. Knowing what you know about models, do you agree or disagree with this statement? Use the **CER Checklist** on the next page to remind yourself what makes a good argument.

Implications and Reflections

- Despite the school shutdowns, we were able to engage students in generating and evaluating scientific evidence and explanations.

- An anchoring phenomenon that is both complex and relevant helped us reframe science from “recreating school at home” to fostering authentic, equitable learning experiences with flexible goals. The design of this unit resulted in higher attendance during synchronous Zoom meetings, more submitted work, and a safe space for students to share how the pandemic had impacted their lives.

- The public, central space for students’ questions (i.e. a “driving question board” or “summary table”) was instrumental to motivating their subsequent investigations. It is a useful tool to help teachers and students take stock of what they asked, what they did, and what they learned as a result.

Questions for Further Investigation

- What if students' questions do not lead to important disciplinary core ideas they're supposed to learn within a unit of instruction?
- How are teachers currently using the coherent kit-based curriculum (mySci) with students?
- How do teachers make decisions about what to adapt and how are they adapting?
- Are teachers and students using the kit materials?