Adapting a Hands-On K-8 Science Curriculum to Remote Learning During the COVID-19 Pandemic

Lauren Ashman
Jeanne Norris
Our Program

mySci is a hands-on, inquiry-based, NGSS aligned curriculum created for and by teachers. District partners sign a contract and receive the following:

- Hands-on kits
- Professional development
- Website access to our curriculum lesson plans, assessments, slides, and other implementation materials
Diverse Needs of our Partners

- We serve over 4,000 K-8 science teachers in our region (over 250 schools).
- Each school has its own way of being during the pandemic- the response is not unified.
- Some children would have access to live learning, some would have access to on-demand or recorded learning.
- Some children would have iPads, some would have Chromebooks (etc).
Deciding what and how to adapt

- Our institution uses principles of Improvement Science to guide our work.
How were we able to so quickly pivot?

- Our program is created using Google Docs and Google Slides that we edit frequently based on teacher feedback.

**LESSON 6: What is photosynthesis?**

**LEARNING TARGETS**
Use a model to explain what plants need to make their own food for growth.

**VOCABULARY**
carbon dioxide, energy, photosynthesis, cycle, oxygen

**SUMMARY**
Estimated number of days: 3

In previous lessons, students have figured out that plants need air and water to build their matter, and light energy to look healthy and green. They figured out that different parts of the plant help the plant get those materials.

In this lesson, students will use a hands-on model to describe how plants use sunlight, water, and air to produce their own food so that they can grow. Students figure out that the process of photosynthesis involves energy (sunlight) and small particles (water and carbon dioxide) that move into the plant, and that plants use energy to change air and water into their own plant matter.

By understanding how plants use matter, students will be able to further develop their pizza farm model, and will be able to connect this to the idea that plants are involved in the cycling of matter and flow of energy in an ecosystem (Lessons 7 and 8).

**ENGAGE**
We have been trying to figure out how the ingredients on a pizza come to be. We’ve been making a model of a pizza farm to help us think about how

**MYSCI PROVIDES:**
- 1 piece of yellow fabric (1 flower)
- 1 piece of brown fabric (8 root strips)
- 1 piece of green fabric (2 leaves)
- 1 piece of green fabric (stem)
- 12 ping pong balls (blue)
- 18 ping pong balls (green)
- 6 ping pong balls (orange)
- 12 Ziploc bags
- 1 flashlight
- Batteries

**TEACHER PROVIDES:**
Cut and assemble the flower according to the picture on Teacher Page 11
Read the instructions on Teacher Page 10-11 and prepare ahead of time:
- 6 Ziploc bags each with 2 H & 1 O
- 6 Ziploc bags each with 1 C & 2 O
- Cut the 5 by 6 tray so that it is 4 by 6 and has spots for 24 balls
- Copies of Student Page 16 or Student Science Journals
- Blue markers, crayons, or pens

**EXPLORE**
Play the Photosynthesis game according to the instructions on Teacher Pages 10-11.

While you play this game with students, keep in mind that we are building on the K-2 progression of Matter and Energy- students may come with prior knowledge that things can be broken apart and put together. We can build on this knowledge with students in this photosynthesis activity. Sugar is being built by putting together smaller particles of air and water. You can also reinforce the Law of Conservation of Matter: the amount of ping pong balls is the same before and after, but the types of matter are different before and after.

**EVALUATE**
Give students time to answer the questions on the Photosynthesis page (Student Page 16). You may want to allow students to work in pairs or small groups on these questions, then share out. You could also use Post-it journal notes and chart paper to get a sense of what all students are thinking.

**VIRTUAL RESOURCES:**
Lesson 6 Virtual Adaptation

**Tech Tip:**
If you want to create your own game online for this unit or any other: FlipQuiz Kahoot Outfit

**ELA Connections:**
MIS S.R.T.1.a
MIS S.R.T.1.b.a
LESSON 6:
What is photosynthesis?
Engage

Question:
What do you think the plants do with the air and water they take in?
How do we keep the rigorous, equitable nature of NGSS instruction in a remote environment?

Criteria:
- Phenomena-based
- Student use of Science and Engineering Practices
- Equitable discourse
- Ease of student and teacher use
Program Component: Hands-On Activities

- A key component of our program involves hands-on activities that allow students to develop and use models, plan and carry out investigations, and analyze and interpret data.
- These materials are delivered in a kit that students would use in groups if school was in-person.
Virtual Adaptation

- To adapt this program component to a virtual setting, we designed:
  - Virtual labs showing how the lab would look if a student did it in-person
  - Google Slides simulations where students can click and drag Google Shapes to develop and use models
LESSON 6:
What is photosynthesis?

Explore

Play the Photosynthesis Game
Recall the different structures of a plant and their functions.

1. Place your molecule in the location where it enters the plant.
2. Use the arrows to show the movement of matter in the plant and energy transfer.
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**Sugar**
Program Component: Student Sensemaking

- A key component of our program involves allowing ALL students to engage in productive discussion and writing so that they can make sense of scientific phenomena.
- To accomplish this in-person, our curriculum utilizes turn and talks, small group discussion, and journal pages.
LESSON 6:
What is **photosynthesis**?

Explain

- Complete Photosynthesis page.
- Share your ideas with the class.

STUDENT PAGE 16:
Photosynthesis
Virtual Adaptation

To adapt this discussion to a virtual setting, we:

- Provided individual think time to develop initial explanations.
- Incorporated breakout rooms for small group discussion.
- Added norms, group roles, and sentence stems to guide breakroom discussions.
- Led whole group discussions, in order to push student thinking.
Photosynthesis Model Reflection

1. What were the inputs and outputs of matter in the plant system?
2. What energy did the plant need to start this process?
3. What did you observe about the amount of matter in the model?
4. In real life, what happens to the oxygen that was left over?
5. Why did the beans with no water and no air grow poorly?
Photosynthesis Model Reflection

1. You will go to a small group breakout room to discuss five questions.
2. You will have 15 minutes to discuss these questions.
3. Choose a recorder, a timekeeper, and a reporter.
   b. Timekeeper: Keeps track of the 15 minutes.
   c. Reporter: Will share answers with the whole class when we get back together.
Photosynthesis Model Reflection

1. What were the inputs and outputs of matter in the plant system?

2. What energy did the plant need to start this process?

3. What did you observe about the amount of matter in the model?

4. In real life, what happens to the oxygen that was left over?

5. Why did the beans with no water and no air grow poorly?
Disseminating the Curriculum Adaptations

- In order to communicate these adaptations, we:
  - created one-pager documents to summarize what we changed
  - added all links to our website, where teachers access our curriculum documents
  - presented the resources during professional development sessions and modeled lessons using them
Impact of Our Adaptations

“They made virtual learning look feasible.”

– ISP professional development participant

“This is great! Other curriculums and programs are being very vague and their recommendations are just ‘you may want to rethink your structure for virtual learning.’ But you made videos of the lessons, STEM challenges and SO much more and really worked hard to help teachers. Thank you!”

– ISP professional development participant

“This was a super helpful session which gave me very practical tips about using MySci in a virtual environment. I don't think I necessarily grew in my knowledge of teaching science but it is EXACTLY what I needed. I really wish other curriculum companies had something like this.”

– ISP professional development participant
Thank You!

Jeanne Norris  
j.norris@wustl.edu

Lauren Ashman  
lashman@wustl.edu