Lesson #1: Let's talk crops

Lesson description: In this lesson, students will familiarize themselves with the area around their school, home, and the state that is used for crop growing. Using various resources, they will learn about the crops grown as well as view aerial images of various farm fields.

Time: 1-2 class periods

Grade Level: 6th-8th grade

Materials
1 or more devices connected to internet for viewing Google maps and visiting various websites
Paper and pencil or dry erase markers with boards
Student notebook for answers to questions or Exit ticket

Objectives/Target

Students will be able to name the crops grown in their area, region and/or state.
Students will be able to identify a soybean field, how it is organized and become familiar with the methods used to harvest soybeans.

Vocabulary: harvest, combine/harvester,

Prior Knowledge

Students may not be familiar with what a soybean looks like, so have photos available. In addition, reach out to a local farmer of extension agent to see if you can get soybeans for students to examine.

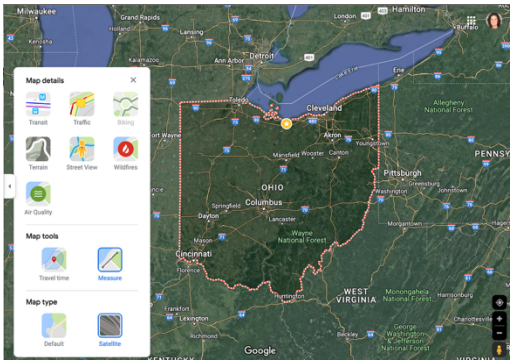
5E Plan:

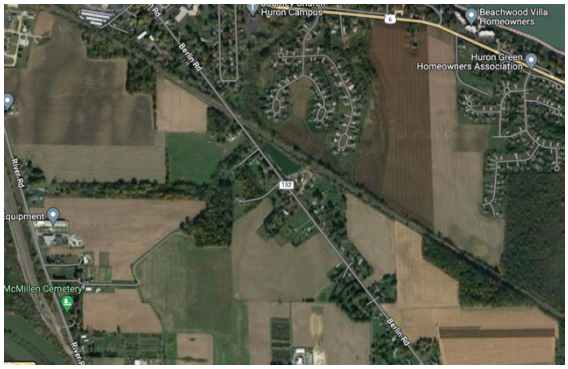
Engage (5 minutes)

1. Ask students to identify crops that are grown in their location, region, or around the state. They can discuss and brainstorm a list of crops in groups of 2-3 students. These answers can be written on the paper or dry erase boards.
2. After about 2-3 minutes of discussion, have the students share one of their answers. While each team shares, have other teams cross off the crops mentioned on their list.

Explore (10-15 minutes)

1. Ask students to identify where these crops are located. Do they know where the fields are located? Do they know what these regions look like?
2. Have students open Google Maps on their device to view their area. Tell them to zoom in to their region and select the satellite view.
3. Can they identify the areas being farmed? How do they look different from neighborhood areas? What makes them different? How do they stand out on the map? Can you identify the crop being grown there?

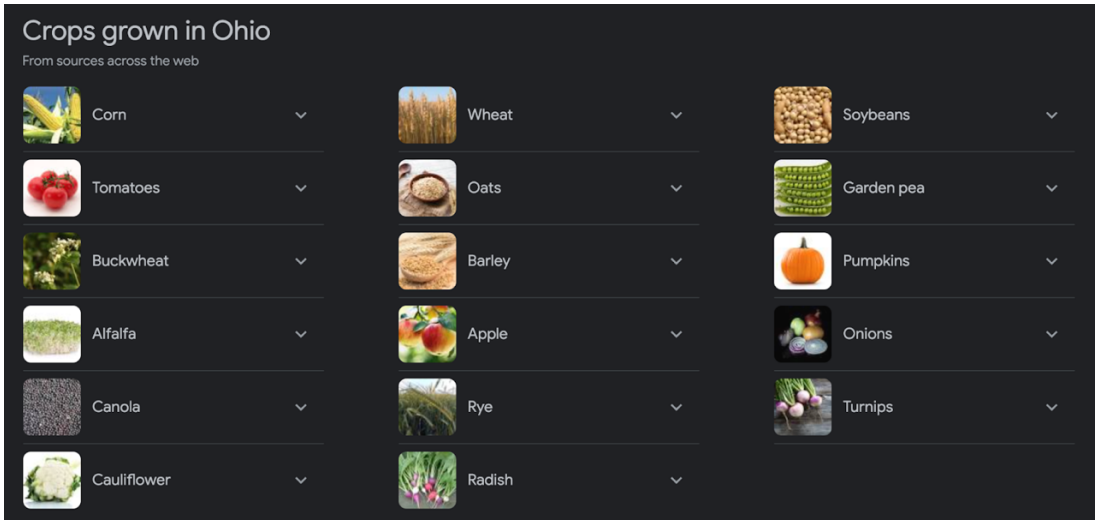




4. Students should be able to roughly identify the areas used for farming as well as how they distinguished these areas.

Explain, Extend, Evaluate (20 minutes)

1) Jump start this next section with a quick version of 2 truths and a lie game with students.
   a) Say, “Pick the two truths and one lie from these statements about Ohio Agriculture. Ohio ranks first nationally in the production of swiss cheese. Ohio ranks second in egg production. Ohio ranks 50th in production of tomatoes and pumpkins.”
   b) The lie is the statement about Ohio ranking 50th in tomatoes and pumpkins. Ohio ranks third.
2) Next, give students the website, https://www.ohiosos.gov/profile-ohio/things/ohio-agriculture/ to create their own 2 truths and a lie statement. Allow students 5 minutes to create the statements using the paper or dry erase boards, then have teams share with each other.
3) Next, ask students to complete a little research about what crops are grown in Ohio. This can be a short Google search with results such as:



4) They can pair and share with a neighboring team after a quick 5 minute search.
5) After sharing, ask students to dig a little deeper into soybean farming. Give the teams time to look up the following questions: (Groups can be assigned certain questions depending on time constraints.)
   a) How important is soybean farming in Ohio?
   b) What are soybeans used for? Do we eat them?
   c) How are soybeans grown?
   d) How are soybeans harvested?

Additional Resources

https://www.soyohio.org/

https://www.ecofarmingdaily.com/grow-crops/grow-soybeans/soybean-harvesting/harvesting-and-storing-soybeans/

Soybeans 101 e-learning course: https://elearning.grownextgen.org/soybeans-101/#/

Lesson #2: Field fundamentals

Lesson description: Student teams will conduct research on soybean farming and harvesting in Ohio.

Time: 1 class period

Materials

1 or more devices connected to internet for researching and visiting various websites
Paper and pencil or dry erase markers with boards
Student notebook or exit ticket

Objectives/Target

Students will familiarize themselves with soybean farm fields. They will be able to answer the questions: What do soybean fields look like? How are they organized? What is the process of harvesting soybeans?

Vocabulary: no new vocabulary

Prior Knowledge: students may benefit from completing the Soybeans 101 e-learning course

5E Plan:

Engage (5 minutes)

1) Tell students, "Now that we have some details about soybean farming and its importance to Ohio's economy and as a resource for many, let's take a closer look at the actual soybean farms."
2) Ask students, "Do you know the answers to these questions:
    a) What do soybean fields look like?
    b) How are they organized?
    c) What is the process of harvesting soybeans?"
    d) Gather student ideas.
3) Tell students that this is going to be the focus for the lesson today.

Explore (20 minutes)

1) Divide students into research teams and assign one of the three questions.
2) Allow students time to conduct research to find answers to these questions. Remind them to check the sources. Are they using sites that have authors involved in agriculture? Did they open the website completely? Have they checked the location of the images they are finding?
    a) Students can take notes on their paper/dry erase boards

Explain, Extend, Evaluate

1. Have students share what they have learned and create a space to combine information. This could be a large dry erase board, a Google Doc, chart paper, or any method that makes sense.

Additional Resources

https://www.ecofarmingdaily.com/grow-crops/grow-soybeans/soybean-planting/soybean-seedbed-preparation/

https://soybeanresearchinfo.com/wp-content/uploads/2021/02/FINAL-2700-002-20-Row-Spacing_Science-for-

Success-Dec-22_v1.pdf

https://agcrops.osu.edu/newsletter/corn-newsletter/2016-08/soybean-planting-date-seeding-rate-and-row-width

https://www.ecofarmingdaily.com/grow-crops/grow-soybeans/soybean-harvesting/harvesting-and-storing-soybeans/

Lesson #3: Harvest engineering challenge

Time: 2 days

Materials

1 or more Sphero RVR robots ($339 each)
Device for coding the Sphero RVR
RVR extra battery ($70)
Optional- Sphero Craft Pack for making the farm simulation ($115)
OR...mix of maker type materials for building cardboard structures to attach to RVR, create soybean crop, and build additional farm spaces

Objectives/Target: Students will design, build, and reenact a soybean harvesting event using the RVR robot, various maker tools, and the Sphero EDU software for coding.

5E Plan:

Engage (15 minutes)

1) Part of the learning process is that they must show what they know about soybean fields, harvesting, building, and coding! Ask students to select which team that they would like to be on:
    a) Creating a soybean field (making mini plant models, outlining the field, creating the starting point and the harvest drop point for the crop).
    b) Creating the structure to attach to RVR for harvesting the crops (cardboard top structure and harvesting component to attach to the front or side of the RVR).
    c) Learning to code the RVR using the Sphero EDU software.
        i) Get started with this lesson- https://edu.sphero.com/cwists/preview/67572x

Explore, Extend, Evaluate (2 or 3, 30-minute segments)

1) Give students time to create and build the farm area, the harvesting structures, and the code.
2) This will take some collaboration between the teams. (This is the best part!) Coders need to work with the field designers. Field designers will need to work with the builders of the harvesting equipment.

Additional Resources

Sphero coding video: https://youtu.be/AYj9T8DktGI?si=WFaVUsRJ9ijetERT
GNG Virtual Field Trip: Planting
https://www.youtube.com/watch?v=nXJn8rGeuCo&list=PLXq_oMfl3AuwQSNDeFxIN7Yix3jssNQVH&index=4
GNG Virtual Field Trip: Harvest
https://www.youtube.com/watch?v=x4VQVisOW0I&list=PLXq_oMfl3AuwQSNDeFxIN7Yix3jssNQVH&index=6

Lesson #4: Code to collect and deliver

Time: 1 class period

Materials

Finished field area
Student created harvesting attachments for the RVR
RVR and extra battery
Devices for coding the RVR
Exit ticket for Harvesting engineering challenge

Objectives/Target: Students will explain their process and demonstrate their results.

5E Plan:

Engage (10 minutes)

Have students set up the field with crops. Have them discuss their process and the organization of the field and simulated spacing, etc.

Explore, Explain, Extend, Evaluate (15 minutes)

1) Ask students to attach their harvesting design to the RVR. Have them discuss the process and how it is similar to real world harvesting technology.
2) Ask the RVR team to run their program to demonstrate automation in the harvesting of the soybean crop.
    a) Teams may need to adjust multiple times to get a complete harvest done. Celebrate the process and student ingenuity!
3) Have some soy-based treats on hand to celebrate the teams' successes. Ideas include soy nuts, chocolate (nearly all chocolate treats have soy lecithin added), granola bars (check the label; many contain soy lecithin), Chex mix, Cheez its and other snack foods often have soy protein or have been fried in soybean oil.
4) Use the Exit ticket from lesson 3 to collect some reflections on what students thought.