

Our World and Soil

Activity Level: 4-6 Grade | Time: 60 minutes

PURPOSE

Students will create a model that fractionally represents the amount of earth's usable soil.

NEBRASKA STATE STANDARD CONNECTION

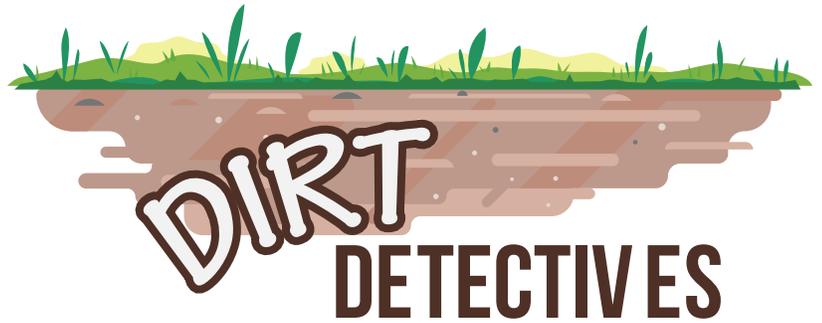
- SC.4.13.4.D Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- SS 4.3.5.d Describe environmental issues in Nebraska (e.g., soil conservation, water stewardship, contour farming, minimum tillage, air quality, solid waste).
- SC.5.13.4.C Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- SS 5.3.3.b Identify examples of ecosystems located in the United States (e.g., forests, deserts, grasslands).
- SS 8.3.2.a Analyze physical and human characteristics of places and regions (e.g., climate, language).
- SS 8.3.3.a Compare and contrast various biomes/climates (e.g., rainforest, grasslands, forests)
- SS 8.3.5.b Identify and evaluate how humans utilize the physical environment (e.g., irrigation, levees, terraces, fertile soils, mechanized agriculture, changes in land use).

ACTIVITY SNAPSHOT

1. Organize and Prepare Supplies
2. Read Background Information
3. PowerPoint
 - a. Play-doh Activity
4. Scientific Journal

MATERIALS

- Dirt Detectives: Our World and Soil PowerPoint
- Scientific Journal
- Play-Doh—1 per student
- Plastic knives—1 per student
- Inflatable globe
- Play-doh video for teacher reference youtu.be/dpWyiGeQU8E



WHAT'S THE CONNECTION TO AGRICULTURE?

Taking care of our soil and water is important because they are needed to grow food. We need crops to feed animals and humans. Farmers strive to be good stewards of the land to protect and use soil wisely to produce food, fiber, and fuel. Farmers also need to use water for crops and animals to provide food for us. Farmers are mindful of their water use and strive to use the appropriate amount of water for crops and animals, being careful not to over water or under water.

PROCEDURES:

1. Organize and Prepare Supplies

See "Materials" on cover page.

Prepare supplies and set up PowerPoint.

2. Background Information

Do you have what it takes to discover DNA traits in plants while exploring the science behind how our food grows? Students will use problem-solving skills to develop a strategy over the next eight lessons for the following question; "How do we grow more food with less land?" Each lesson builds on each other as students discover topics such as plant genetics, soil textures, food science and engineering practices, seed identification, pollination, and by-products of crops that are grown here in Nebraska. Students will use the knowledge they have detected throughout these eight lessons to create their very own strategy to grow more food with less land.

Each week students will use their scientific journal to keep notes of key concepts and brainstorm ideas for solving our posed problem.

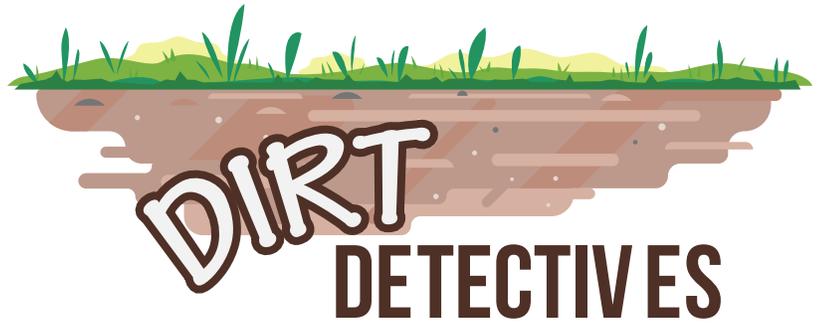
This first lesson explores how valuable our land and water are for growing food. Fresh water and soil are essential to growing plants. Plants are used for food, shelter, shade, habitat, landscaping, and much more! We have a finite amount of water and soil, so being good stewards of our earth is important to ensure a sustainable amount of food and products. Plants must use fresh water because salt water will actually make plants wilt—meaning water is leaving the plant passively.

Play-Doh Activity Overview Video youtu.be/dpWylGeQU8E

3. PowerPoint

Slide 1: Introduction to Dirt Detectives:

- Over the eight lessons you are going to use your detective skills to help solve a problem. The problem you will help solve is, "How do you grow more food with less land?"
- These next eight lessons will give you ideas about how you might solve this problem. You will discover topics such as plant genetics, soil textures, food science and engineering practices, seed identification, pollination, and by-products of crops that are grown right here in Nebraska.
- Today's lesson explores how valuable our land and water is in growing the food we eat.



Slide 2:

- Which do you think is the most valuable? (Nikes only cost about \$85, PS4 -\$250, season football tickets for 2 people-\$840, TV-\$1000, Soil-\$3,250)
- One acre of land is about the size of a football field and costs about \$3,250.
- Land is valuable because we can grow food on it.
- Is food important? *Yes, we must have food to survive..*

Slide 3:

- Who grows the food we eat? *Farmers and ranchers.*
- *Farmers and ranchers grow crops and livestock.*
- We call that agriculture.
- What are some examples of crops we might grow? *Corn, soybeans, and, wheat.*
- What about livestock? *Pigs, chickens, dairy cows, and beef cows.*

Slide 4:

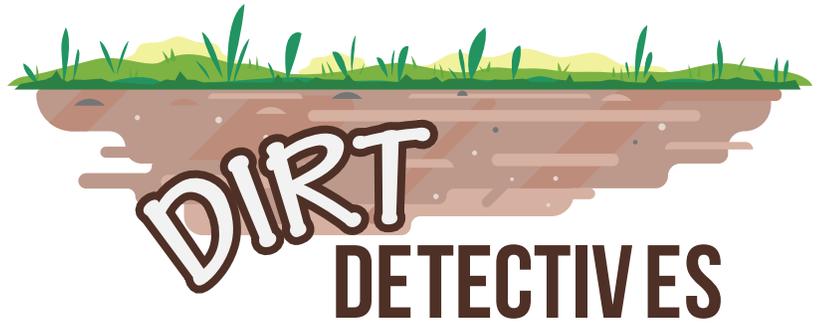
- This is a picture of Nebraska.
- We raise several different types of crops and livestock. Where do you think Nebraska grows a majority of their soybeans? *Eastern NE*; What about potatoes? *Western NE, North Central NE*; Dry beans? *Western, North Central NE*; Sorghum? *Southern NE*; Cows? *Whole state*
- Nebraska uses 91 percent of our land to grow crops and raise livestock on. Our land is valuable to grow food.

Slide 5:

- What do plants need to grow? *Plants need water, sunlight, air, soil, and care.*
- Where do plants start to grow? *Seeds start to grow in soil.*
- Soil is the foundation for plants to grow.
- It has the nutrients it needs for seeds to germinate.

Slide 6:

- Today we are going to discover just how much soil there is in the world that we can use to grow crops and raise livestock on.
- We are going to play a quick game with the globe.
- Do you think there is more land or water in the world?
- We are going to toss the ball around the room catching it with both hands, share out loud what your right pointer finger landed on. Did it land on water or land?
- Have someone keep a tally each time.
- Did we land on water or land more times?
- On average your finger is going to land on water more times than land because there is more water



in the world. About 75 percent of the world is water and 25 percent land.

Play-doh Activity:

- Now that we tested that theory, we are going to slice up fractions of the world using our ball of Play-doh. After each step, advance the slide on the PowerPoint to visually show what each slice represents.
 - a. Shape the Play-doh into a sphere to represent the world.
 - b. Using a plastic knife cut the sphere into quarters. Set aside three quarters to represent the water on earth. The fourth quarter roughly represents the total land area in the world.
 - c. Slice the land quarter in half, making two $\frac{1}{8}$ world pieces. Set aside one of the pieces. This is land inhospitable to people (polar areas, deserts, swamps, very high or rocky mountainous areas). The other $\frac{1}{8}$ piece of the land area is suitable for living, but not necessarily where crops can be grown.
 - d. Slice the $\frac{1}{8}$ piece into four sections making four $\frac{1}{32}$ pieces. Set aside three of these pieces. These areas are too rocky, wet, cold, steep, or infertile to produce food. The three pieces also include the areas of land that could produce food but are either national parks, cities, highways, suburban developments, etc.
 - e. This leaves $\frac{1}{32}$ slice of earth. Carefully cut a small thin slice from the Play-Doh along the outer edge. This tiny “peel” represents the surface or top soil, the very thin skin of earth’s crust upon which humans depend. It also represents the amount of soil, which is used for food production to feed the world—less than five feet deep. It is a fixed amount of food producing land. (See end of document for an example.)
 - f. How many of you were surprised by the amount of soil we have left?

Slide 7: How will we grow more food?

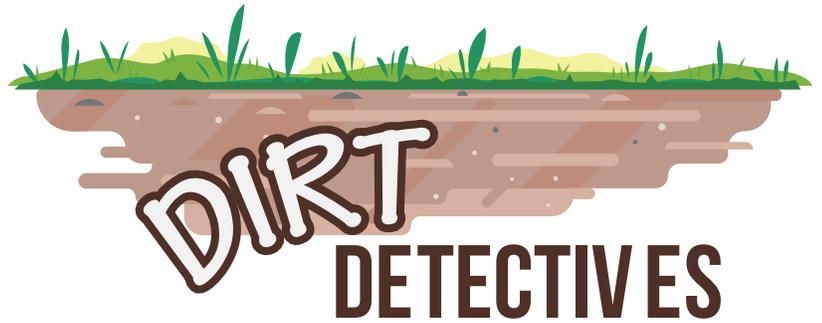
- Today the world’s population is 7 billion people.
- In the next 30 years the population is expected to increase to 9 billion people.
- What will those 2 billion more people need? *Food, shelter, space, etc.*
- Who will be responsible to for growing that food? *Farmers and ranchers, but also food scientist, engineers, computer software developers, etc.*
- Many people will play important roles in helping solve this problem.

Slide 8:

- Farmers care about the soil because it is a natural resource.
- It is limited and we can’t grow more of it.
- Farmers are using conservation practices to help protect the soil.
- Here are a few ideas that could help you solve the problem with your strategy as well.

Slide 9:

- Contour planting is one way. Farmers plant their fields so the water flows downhill and reduces erosion. Erosion washes away soil and farmers want to keep the soil in place.



Slide 10:

- Crop rotation is another way farmers protect the soil. Crop rotation allows farmers to plant different crops in their fields each year and by doing this it replenishes the nutrients back into the soil so they don't have to put on as much fertilizer.

Slide 11:

- Precision agriculture uses science and engineering to develop technology to use in the farmer's field.
- Water probes detect the moisture in the soil allowing farmers to know when they should water their fields.
- GPS technology is used in tractors and combines. It can tell farmers exactly where they planted, how many seeds they planted, how many bushels they harvested and so much more. They can even drive the tractor or combine with a touch of a button.
- Farmers use drones and pivot sensors as well.
- Think of the new technology you could develop to help solve your question.

Slide 12: Review what we talked about today. Use follow-up questions:

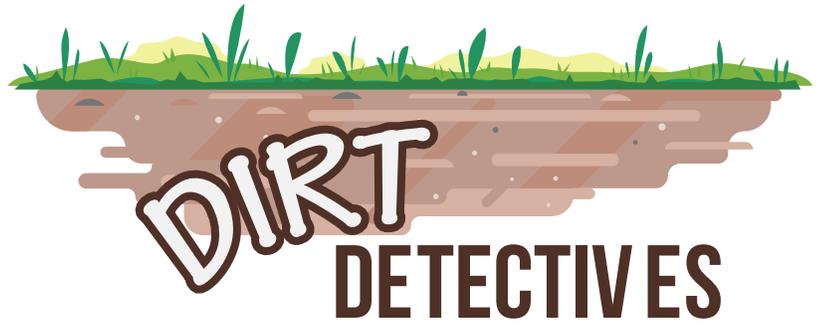
- Why is soil so valuable? It is essential for growing our food.
- How do farmers help protect the soil today? Through crop rotation, contour planting, precision technology
- Thinking to our big question, how might you grow more food with less land? Answers may vary

Slide 13:

- We will conduct a dirt shake to look at soil textures and explore soil erosion through a dirt splat zone.

Review:

- Ask students to get out their scientific journal.
- What have you learned from today's lesson? Write down key concepts and ideas that will help us solve our problem: how we grow more food with less land?
- Brainstorm new ideas and ways to solve this problem and write it in the ideas box.



Example pie chart showing available land use:

