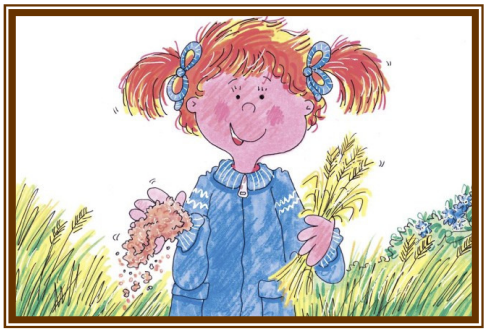
The Soil Race Lesson



A lesson based on the book, The Soil Neighborhood by Dan Yunk & Steve Swaffar.

America's food supply is safe, affordable and abundant but misunderstood by the public. Kansas Farm Bureau seeks to improve consumer knowledge of the importance of farming and ranching through the *Kailey's Ag Adventure Series*, of which this book is a part.

Level: Pre K – Grade 2

Subjects/Standards:

Science 2nd:

Physical Science
Structure and Properties of Matter
2-PS1.1

Math K-2nd:
Counting & Cardinality
CCSS.Math.Content.K.CC.C.6
Operations & Algebraic Thinking
CCSS.Math.Content.1.OA.B.4

Standards may be adjusted to fit other grade levels.

Activity Description:
Students will observe a race between sand, silt, and clay to see which type settles fastest in water by adding soil and water to a jar, shaking it, and observing the differences.

Student Learning Outcomes:

The students will compare and contrast the physical properties of soil by taking observations of the settling differences between the different textures of soil – sand, silt, and clay.

Estimated Teaching Time:

45 minutes, with variable time extensions available.

Background Information:

Read *The Soil Neighborhood* aloud to the class.

After learning about the soil neighborhood with Kailey, we know that thanks to Clay, Rocky, Sandy, and their friends, crops are able to grow in the soil. We then can use the crops in items we use everyday.

An important part of soil is its ***texture***. Texture refers to how something feels. Just as types of clothing feel different, like a silk shirt and a wool jacket, different types of soils feel different, too.

- *Optional: Bring a silk shirt and wool jacket, or two other contrasting clothing textures, for students to feel the differences.*

But, just because a silk shirt and wool jacket feel different, they still are types of clothing. They are just made of different material. Soil is similar.

The recipe for soil includes three different materials, ***sand, silt, and clay***. As you learned with Kailey, Sandy, Rocky and Clay all played important parts in the soil neighborhood in the story. Sand, silt, and clay all play important parts in forming good soils, too! Different combinations of the three materials – sand, silt, and clay – form different kinds of soils with different textures.

Sand, silt, and clay are really small. In fact, silt and clay particles cannot be seen without magnification. Only sand particles are large enough to be seen with the naked eye.

- *Optional: To visually illustrate the differences in particle sizes, use a basketball, softball, and ping pong ball. Explain that if a grain of sand was a basketball, then silt would be a softball, and clay would be a ping pong ball.*

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Many times we forget about the importance of soil, even though it is under our feet in our backyard, on the playground, or in our farmer friends' fields. Let's use our observation skills to study soils. How do you observe something?

- *Student responses should include the five senses.*

Observation requires using one or more of our five senses – touching, tasting, hearing, seeing and smelling – and recording what we find. Let's use our observation skills today as we race soils!

Activity:

No, soils cannot run in a race like you and me, but they can move with the help of water! Today, Sandy, Rocky, and Clay are going to have a race to see who moves the fastest! All of you are going to observe to see who the winner is!

- *Divide students into groups of 4. Younger grades may benefit from splitting the class into three large groups, one sand group, one silt group, and one clay group, to observe one race as an entire class with guided help from the teacher.*

- *Pass out the instructions handout and observation sheet. Guide students through each step as a group or allow students to read and follow instructions by themselves depending on grade level and ability.*

The following are the steps provided on the student instruction handout with italicized directions and suggestions for the teacher:

1. Assign roles! One group member is Sandy, one is Rocky, one is Clay, and one is the timekeeper. Record group members' names on the observation sheet.

- *Sandy will be responsible for the sand jar, Rocky the silt jar, and Clay the clay jar. The timekeeper will keep the time.*

2. Predict who you think will win and why on the observation sheet.

•*Explain that by answering the first two questions, students are stating a hypothesis, which is a simple, testable statement.*

New Vocabulary:

Texture

Sand

Silt

Clay

Materials Needed:

The Soil Neighborhood by Steve Swaffar and Dan Yunk

Each group will need:
* One sample of sandy soil
* One sample of silty soil
* One sample of sticky soil
* Three clear jars with lids, one labeled Sandy, one Rocky, and one Clay
* Calgon ® bath gel or liquid dish soap (soap speeds up settling)
* Rulers
* A pitcher of water, unless a sink is accessible
* Copies of instructions handout
* Copies of observation sheet

Optional Materials:

Silk shirt
Wool jacket
Basketball
Softball
Ping pong ball
Stopwatches

3. Each group will be given one Sandy sample, one Rocky sample, and one Clay sample, three labeled jars, and a pitcher of water.

- *Explain that Rocky is silty soil.*

4. Add water to each of the jars until it is ¾ full.

- *Use a sink if accessible.*

5. Add a few drops of Calgon® bath gel or liquid dish soap to each jar.

- *Soap helps speed up the settling process. Pass one bottle of soap around to the groups. Monitor this so an excess of soap is not used.*

6. "Sandy" puts 1 inch of the Sandy soil into the jar labeled Sandy. "Rocky" puts 1 inch of Rocky soil into Rocky jar. "Clay" puts 1 inch of Clay soil into the Clay jar. Use a ruler to measure the amount in each jar.

7. Screw the lids on tightly!

8. Sandy, Rocky, and Clay shake their jars for 1 minute!

- *Teacher times all groups at the same time. Instruct time keeper to start timing as soon as the shaking stops.*

9. Time keeper starts timing as soon as the shaking stops! Record the time immediately after you stop shaking the jars in the Start column on your observation sheet. This is the starting time for the race!

10. Observe what is happening in the observation column. Be sure not to move the samples after starting the race! If you do, you'll have to start back at the starting line!

- *If this experiment is extended over the class period, be sure students put their settling jars in an undisturbed location, such as a back table or counter, not on their desks, at the very beginning of the experiment.*

11. Record the time when the majority of the soil has settled to the bottom of the jar of each soil sample.

- *The amount of time it takes the samples to settle is dependent on many factors. All soil will not settle within the designated class time. The sand should settle the fastest, then the silt (Rocky), and eventually the clay. Options: The observations may be extended over the course of a day or even a few days. In this case, be sure the samples are in an undisturbed location. Or set a time to stop the race. The students then would be the judges for placing the soils based on how much soil has settled at the end of the designated time.*

12. Find the time by subtracting the Start time from the Finish time. Record this is in the Time column.

- *The teacher may wish to show students the example of how to do this math problem.*

13. Answer the questions on the observation sheet following the end of the race!

- *Following the experiment, discuss why Sandy won. Sand is the largest soil particle, which makes it the heaviest. Samples of the same amount of sand, silt, and clay may be passed around to demonstrate the different weights. Students may have already observed this difference when adding the soil to the jars.*

Preparing for the Race!

Name _____

What am I supposed to do? Follow these steps for a successful race!

1. Assign roles! One group member is Sandy, one is Rocky, one is Clay, and one is the time-keeper. Record group members' names on the observation sheet.
2. Predict who you think will win and why on the observation sheet.
3. Each group will be given one Sandy sample, one Rocky sample, and one Clay sample, three labeled jars, and a pitcher of water.
4. Add water to each of the jars until it is ¾ full.
5. Add a few drops of Calgon® bath gel or liquid dish soap to each jar.
6. "Sandy" puts 1 inch of the Sandy soil into the jar labeled Sandy. "Rocky" puts 1 inch of Rocky soil into Rocky jar. "Clay" puts 1 inch of Clay soil into the Clay jar. Use a ruler to measure the amount in each jar.
7. Screw the lids on tightly!
8. Sandy, Rocky, and Clay shake their jars for 1 minute!
9. Time keeper starts timing as soon as the shaking stops! Record the time immediately after you stop shaking the jars in the Start column on your observation sheet. This is the starting time for the race!
10. Observe what is happening in the observation column. Be sure not to move the samples after starting the race! If you do, you'll have to start back at the starting line!
11. Record the time when the majority of the soil has settled to the bottom of the jar of each soil sample.
12. Find the time by subtracting the Start time from the Finish time. Record this is in the Time column.
13. Answer the questions on the observation sheet following the end of the race!

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The Race is On!

Name _____

Roles: _____ is Sandy

_____ is Rocky

_____ is Clay

_____ is timekeeper

Predict who you think is going to win by circling the name.

SANDY ROCKY CLAY

Why? _____

_____

Get Ready - Get Set - Go!

Contestant Name	Start: What time did the race start?	Finish: What time did each finish?	Time: How fast did each finish?	Placing: Place 1st, 2nd, and 3rd.	Observations: What do you observe?
Example	1:00	1:05	1:05-1:00= 5 minutes Finish - Start = Time		
Sandy					
Rocky (aka Silty)					
Clay					

Who won? _____

Why do you think this soil type won? _____

_____

_____

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The Race is On!

Name KEY

Roles: Student Name is Sandy

Student Name is Rocky

Student Name is Clay

Student Name is timekeeper

Predict who you think is going to win by circling the name.

SANDY ROCKY CLAY

Why? Any logical explanation, such as because of the weight of the soil type, the size of the soil particles, or prior knowledge, that supports their prediction.

Get Ready - Get Set - Go!

Contestant Name	Start: What time did the race start?	Finish: What time did each finish?	Time: How fast did each finish?	Placing: Place 1st, 2nd, and 3rd.	Observations: What do you observe?
Example	1:00	1:05	1:05-1:00= 5 minutes Finish - Start = Time		
Sandy	Start Time Here Should be the same throughout	Finish Time Here Each time will be different	Subtract the finish time from the start time here	Most Likely to be Placed: 1st	Observations could include: water, color and clarity, movement of water and particles, etc...
Rocky (aka Silty)	↓	↓	↓	2nd	↓
Clay	↓	↓	↓	3rd	↓

Who won? Sandy

Why do you think this soil type won? Sand is the fastest to settle because it is the largest soil particle, which also makes it the heaviest. The teacher may wish to discuss this and allow students to feel the differences in the weights of the soil types. Sand usually has a noticeable difference in weight.

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