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Soil Composition



STEM Project Overview

Students will collaborate to:

- ➔ Collect soil samples and analyze them for their sand, silt, and clay content. *(Science/Math)*
- ➔ Enter the Soil Composition data collected during an experiment into a spreadsheet. *(Science/Technology/Math)*
- ➔ Display their data in the form of a doughnut chart. *(Technology/Engineering/Math)*
- ➔ Evaluate their findings. *(Math)*
- ➔ Brainstorm to improve the experimentation process. *(Science/Engineering)*

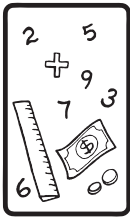
Science



Students will understand the Earth's composition and structure, including:

- Knowing the composition and properties of soil
- Knowing that soil is composed of weathered rock, plant and animal material
- Using appropriate tools and simple equipment to gather scientific data and extend the senses
- Knowing that learning can come from careful observations and simple experiments

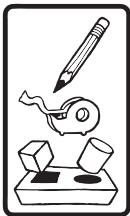
Math



Students will use mathematical analysis to pose questions, seek answers, and develop solutions, including:

- Selecting the appropriate operation to solve mathematical problems
- Applying mathematical skills to describe the natural world
- Using representations such as pictures, charts, and tables from the investigation of mathematical ideas
- Using appropriate scientific tools to solve problems about the natural world
- Relating measurement of temperature to different thermometers
- Using a ruler to measure to the nearest centimeter
- Adding two-digit numbers

Engineering



Students will use engineering design to pose questions, seek answers, and develop solutions, including:

- Proposing alternative solutions for procedures
- Using a variety of verbal and graphic techniques to present conclusions
- Identifying simple problems and solutions
- Understanding troubleshooting procedures

Technology



Students will know the characteristics, uses, and basic features of computer software programs, including:

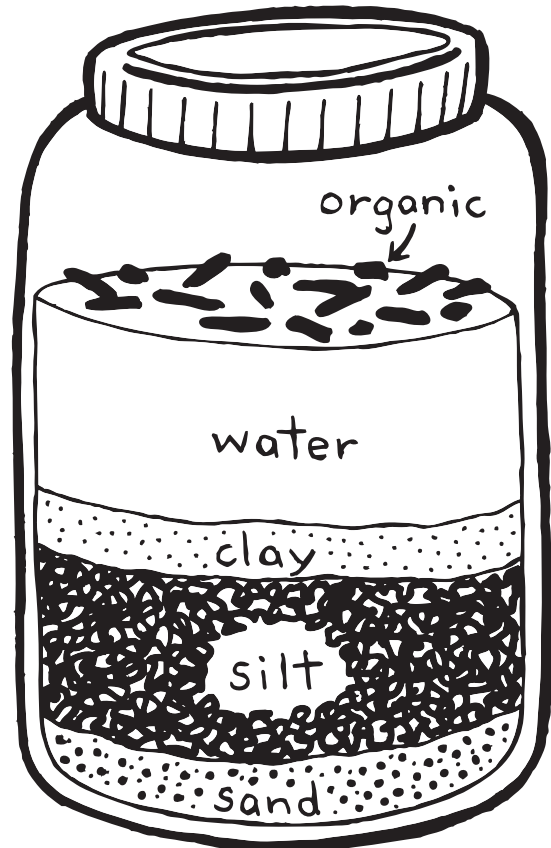
- Knowing the common features and uses of spreadsheets
- Using spreadsheet software to update, add and delete data, and to produce charts

Soil Composition (cont.)



Science Experiment Procedure (cont.)

2. Fill the Mason jar approximately $\frac{2}{3}$ full with a soil sample collected either outdoors or from the bucket provided by the teacher.
3. Bring the jar over to the sink (or bucket of water) and carefully fill it with water, up to about 1 inch from the top.
4. Carefully place the lid onto the jar and secure it tightly.
5. With help from the teacher, shake the jar to completely mix the water and soil together.
6. Once the soil and water are completely mixed, place the jar somewhere within the classroom to settle for at least 24 hours. Do not disturb the jar during this time.
7. After 24 hours, carefully observe what happened inside without disturbing the jar.
8. The soil should now be separated into four distinct layers. Floating at the top is the organic layer. The sand should be the bottom layer, followed by silt. A layer of clay should be visible on top of the silt.
9. With help from the teacher, use a ruler to measure the thickness of each individual layer of sand, silt, and clay. Record the measurements in the data table.
10. Finally, determine the sum of all three layers of minerals (clay, silt, and sand) within the jar and record in the data table.



Brainstorming

Once the class has completed the activity, ask students if they think all soils contain the same percentages of sand, silt, and clay.

Challenge the class to come up with an experiment to determine how sand, silt, and clay affect how water moves through a soil. One idea is to fill three separate containers, one with sand, one with silt, and one with clay, then have the class time how long it takes a specific volume of water to infiltrate each of them.



Soil Composition *(cont.)*



Science Experiment Procedure *(cont.)*

Soil Composition Data Table Templates

Soil Composition	
Soil Mineral	Thickness (cm)
Clay	
Silt	
Sand	
Total Thickness	

Soil Composition	
Soil Mineral	Thickness (cm)
Clay	
Silt	
Sand	
Total Thickness	

Soil Composition	
Soil Mineral	Thickness (cm)
Clay	
Silt	
Sand	
Total Thickness	

Soil Composition (cont.)



Technology Procedure (cont.)

- Next, enter the data you gathered on the thickness of each mineral layer, along with the sum of the total depth of the mineral layers from the data sheet, into the spreadsheet (Figure 4-3).

	A	B
1	Soil Mineral	Thickness (cm)
2	Clay	1
3	Silt	4
4	Sand	6
5	Total Thickness	11

Figure 4-3

- Highlight all of the data within the spreadsheet by clicking and dragging over it. Then use the **Center Align** button to center the data in each cell (Figure 4-4).

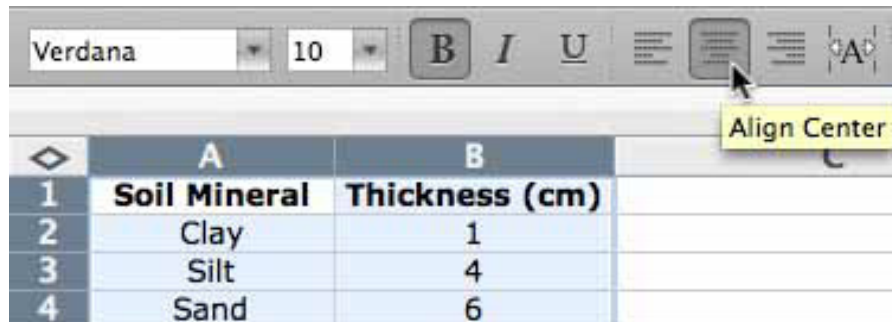


Figure 4-4

- Next you will make a doughnut chart. Click into cell A1, then click and drag over all the data except the "Total Depth" row to highlight it (Figure 4-5).

	A	B	C
1	Soil Mineral	Thickness (cm)	
2	Clay	1	
3	Silt	4	
4	Sand	6	
5	Total Thickness	11	
6			

Figure 4-5

- With the data still highlighted, go to the **Insert** menu, select **Chart**, and choose **Exploded Doughnut** (Figure 4-6).

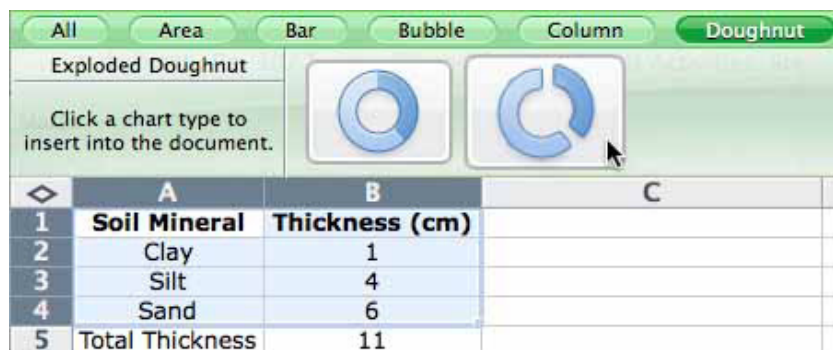


Figure 4-6

Soil Composition (cont.)



Technology Procedure (cont.)

12. Your chart is now complete. **Save** and **Print**. It should look similar to the one in Figure 4-9.

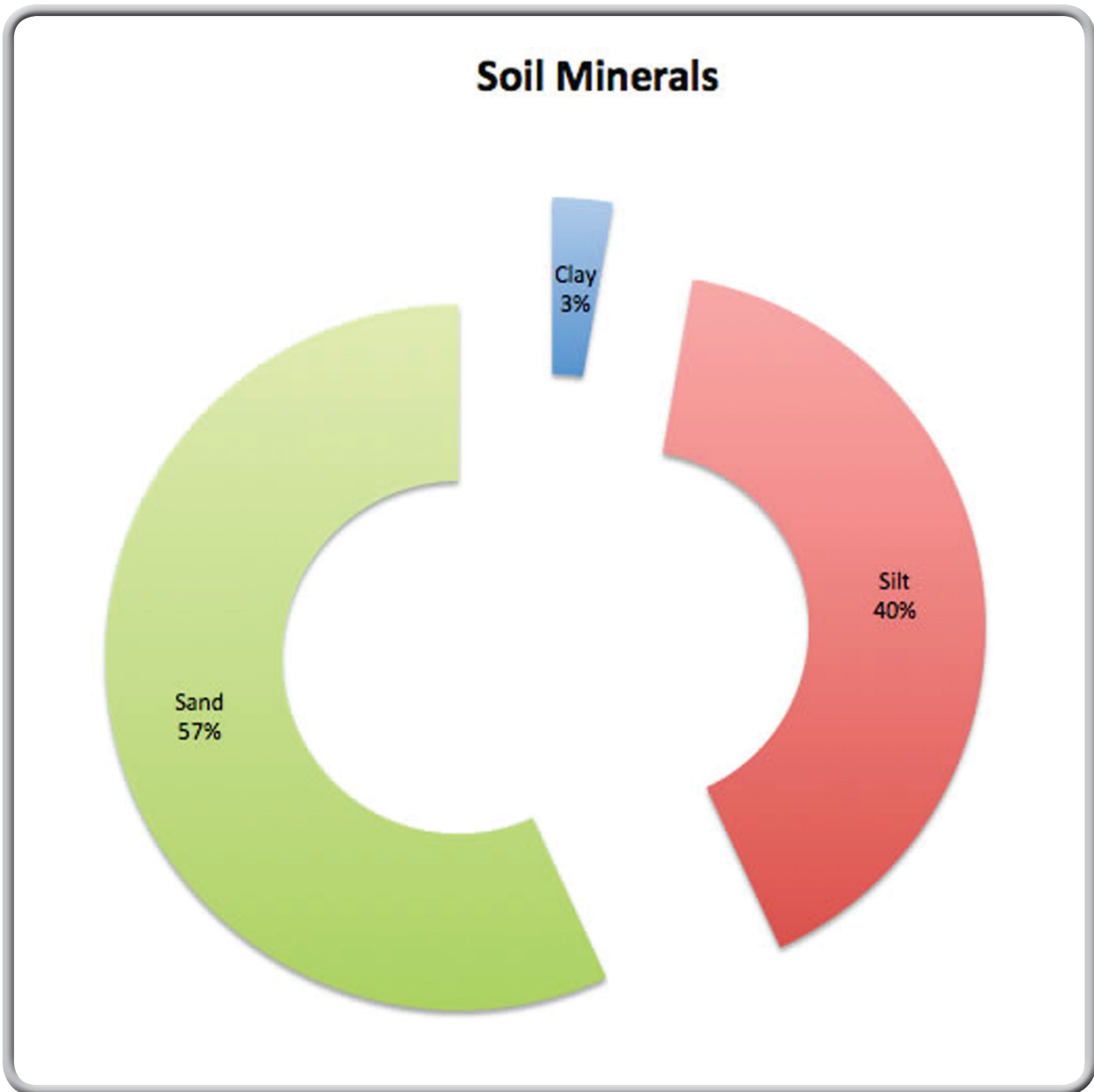


Figure 4-9