

Soil Pit Exploration

Title: Soil Pit

Grade Level: 10-11, 20 students

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Science Concepts to be learned

Concept- The properties of soil vary from the ground surface until the depth of the bedrock. Varying layers within the soil are called horizons. Each horizon is characterized by the soil texture, water content, pH, color, organic content and weathering.

Secondary Concepts- Soils are named by their unique properties. There are characteristic soil types found within each biome. Those soil types help define the biome.

Learning Objectives

Science Objectives: Taken directly from ODE Earth/Space Science Standards

1. Summarize the relationship between the climatic zone and the resultant biomes.
2. Explain climate and weather patterns associated with certain geographic locations and features.

Technology Objectives:

1. Basic operations and concepts- Students are proficient in the use of technology

2. Social, ethical, and human issues- Students practice responsible use of technology systems, information, and software. Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

3. Technology productivity tools- Students use technology tools to enhance learning, increases productivity, and promote creativity. Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

4. Technology communications tools - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools- Students use technology to locate, evaluate, and collect information from a variety of sources.

6. Technology problem-solving and decision-making tools- Students employ technology in the development of strategies for solving problems in the real world.

Materials

Computer Functions: Venier Probeware- ph sensor, Microsoft Office: Excel and Power Point, Internet, and Projector for presentations

Software Needed: Microsoft Office, Windows Explorer and Firewall Software

Science Materials Needed:

Soil Pit- four measuring tapes, four trowels, box of plastic bags, standard field book, Palm Pilot and Venier Probeware Interface/ph probe

Expansion- Colored Pencils and Paper

Classroom Management/Teaching Strategies

How will you organize the students?

For soil pit activity: 4 groups of five, 2 groups per pit (groups will switch pits half-way through activity) each group will be responsible for recording its own data and collecting its own samples. The groups will choose roles before entering field as follows: Recorder, Project Manager, and Materials Manager, Two Data collectors. Students will switch roles for work on second pit as determined before entering field.

For expansion activities: Students will maintain groups as previously assigned. Each group will divide, involving three students in cooperatively developing spreadsheet and two students constructing soil diagram.

How will you use the computers available with your students?

Have them use Venier Probeware to test soil pH. Have them use excel to create spreadsheet organizing field data. Have them research and prepare Power Point presentations on the eight biomes.

What are the safety issues you should address as the students participate in each of the unit activities?

Exploration- Clear study area of all hazards. Appropriate attire. Instruct students to be safe will working in pits, especially when using trowel. USE SAFE SCIENCE!

Activities to Support Concept Development

Exploration Phase:

Which process skills will be used?

Basic Skills

- Observing
- Classifying
- Space/time relations
- Measuring
- Inferring

Integrated Skills

- Formulating models
- Interpreting data
- Hypothesizing

Soil Pit –

Dig two soil pits sufficiently deep to allow viewing of all horizons, one facing north and one facing south. Divide the class into two groups and have each group member observe and record soil properties using a standard field book as outlined by handout. Students will take soil cores for in class reference and a soil sample of each horizon from both soil pits to analyze pH in class using Vernier ProBeware.

NOTE: See attached soil pit instruction guide!

Explanation Phase:

Use questioning format-direct instruction to assist the students in constructing meaning to specific concepts such as soil properties, soil horizons, textures, moisture content, organic content, weathering and relation to biome/climate.

Key questions to ask include:

What differences did you observe as you went from the ground surface to the bottom of the soil pit in the soil's texture? In the soil's color?

Did you observe any differences in the size of the particles found in the soil from the surface to the bottom of the pit?

Did the moisture levels vary from the surface to the bottom of the pit?

What conclusions can you draw about changes in soil from the surface until one hits bedrock?

Expansion Phase:

Which process skills will be used?

Basic Skills

- Observing
- Classifying
- Measuring
- Inferring
- Predicting

Integrated Skills

- Formulating models
- Interpreting data
- Hypothesizing

1. Students will organize data collected from soil pit in field book using excel and create an accompanying hand-drawn diagram of soil pit horizons. Students will then hand in excel worksheet with separate diagram sheet attached.

NOTE: Refer to attached example for expected format of spreadsheet and soil diagram.

2. Assign groups of two students a biome to research using Internet and print materials. Have them create a Power Point presentation to present to the class on Biomes and their relationship to soil formation using slide format as follows:

1. Biome Characteristics- Geography and Climate
2. Vegetation and Wildlife- type, diversity and density
3. Soil Properties- Include properties recorded in soil pit exercise
4. Relate soil properties to biome characteristics
5. References

Student Assignments

Study class notes taken from soil pit, class discussion and Power Point presentation for unit test.

Evaluation Phase

1. Evaluate Excel spreadsheet and diagram for accuracy, effort and proper use of technology
2. Evaluate Power Point presentation for effort, accuracy and appropriate use of technology using
3. Test students pulling information from soil pit activity, expansion discussion and Power Point Presentation

References

Ohio Department of Education. *Academic Content Standards*. (2002)

National Education Technology Standards for Students. (2002). http://cnets.iste.org/students/s_stands.html

NOTE: Useful and engaging activity removed from lesson during revision:

United States Department of Agriculture: National Resource Conservation Service. (2003). *Painting with Soil*. <http://soils.usda.gov/education/resources/lessons/painting/painting.htm>