DIRT:
A RESOURCE PACKET FOR INTEGRATED LEARNING

Prepared by
Connie Stewart, Executive Director
Center for Integrated Arts Education
&
Alicia Cepaitis
Secondary Science Teacher
Mountain View High School

Brought to you by The Center for Integrated Arts Education at the University of Northern Colorado
We are made of dirt.

We return to dirt.

We spend our lives cultivating, moving, wiping, scrubbing, using and misusing the dirt that we depend on for existence.

We scrub the dirt off our faces and try to “find the dirt” on our celebrities.

At some point we may realize that civilizations live and die in accordance with the cycles of their dirt.

To understand dirt we must use scientific, social, historical, literary and artistic modes of inquiry.

This Teaching Packet contains multi-discipline and multi-grade level ideas, resources, and lesson planning tools for teachers to use and adapt for their own classrooms. It is intended to be used in conjunction with artist, Mel Chin’s FUNDRED and PAYDIRT projects for cleaning up the contaminated soil of New Orleans.

This packet is only the beginning of a study of DIRT. It is hoped that these ideas will stimulate your own questions, lesson ideas and connections with your own reading. Please feel free to use these suggestions and to add your own.

If you would like your ideas to be included in the online version of this packet, please contact connie.stewart@unco.edu.

The online version will be available at http://ciae.arts.unco.edu.
These sample Essential Questions are provided to guide the instructor in choosing a focus for a unit on DIRT.

1. How has dirt influenced the historical cycles of culture?

2. How can art be used in a democracy to bring about change?

3. How do scientists understand dirt?
   Soil Science
   Rock Cycle

4. How do artists understand dirt?
   Color
   Texture
   Form

5. What does “dirt” and “dirty” mean in contemporary culture?

6. How does dirt provide the materials for artmaking?
   Pigments
   Precious metals and stones
   Dyes
   Earthworks

7. What is the relationship between dirt and the substances we need to survive?

8. How does a scientific understanding of dirt help us read and interpret literature?

9. How do artistic experiences with dirt help us to interpret its importance in our lives?

10. How do artistic experiences with dirt help us to understand our own stories?

11. How can the things found in dirt inform us of our past?

12. Is dirt different in an urban vs. a rural environment? Is dirt perceived differently?

13. How do we contain dirt? How do we make containers from dirt?

14. How does contemporary language use the term “dirt?”

15. What ultimately does not come from dirt?

16. How does dirt sound?
Colorado Model Content Standards – ART

Standard 1: Students recognize and use the visual arts as a form of communication.
Grades K-4
• identifying visual images*, themes, and ideas for works of art;
• selecting and using visual images, themes, and ideas to communicate meaning.
Grades 5-8
• identifying & discussing how and why visual images, themes, and ideas communicate;
• evaluating meaning and communication in works of art.
Grades 9-12
• interpreting & distinguishing intended meanings of visual images, themes, and ideas in works of art;
• researching & synthesizing visual images, themes, and ideas to create works of art which reflect personal experiences and intended meanings; and
• evaluating & defending the use of visual images, themes, and ideas to communicate intended meanings.

Standard 2: Students know and apply elements of art, principles of design, and sensory and expressive features of visual arts.
Grades K-4
• identifying elements of art and principles of design in works of art.
Grades 5-8
• describing and discussing characteristics of elements of art, principles of design, and styles* of art;
• using elements of art, principles of design, and styles of art to communicate ideas and experiences.
Grades 9-12
• creating multiple solutions to visual arts problems* by applying elements of principles of design, and sensory and expressive features

Standard 3: Students know and apply visual arts materials, tools, techniques, and processes.
Grades K-4
• using materials, tools, techniques, and processes to make works of art.
Grades 5-8
• selecting and using materials, tools, techniques, and processes that enhance communication of ideas through art; and processes.
Grades 9-12
• evaluating the relationship between ideas and materials, tools, techniques, and processes used.

Standard 4: Students relate the visual arts to various historical and cultural traditions.
Grades K-4
• create art based on historical and cultural ideas of diverse people.
Grades 5-8
• demonstrating how history and culture of various people influence the creation, meaning, and style of works of art.
Grades 9-12
• create works of art based on comparison and evaluation of various historical cultural contexts; and
• evaluating, analyzing, and interpreting works of art as related to the history and culture of various people.

Standard 5: Students analyze & evaluate the characteristics, merits, and meaning of works of art.
Grades K-4
• using specific criteria* to analyze works of art; and
• using specific criteria to evaluate works of art.
Grades 5-8
• formulating responses to works of art from personal and critical points of view.
Grades 9-12
• interpreting meaning in works of art;
• evaluating works of art using critical analysis and aesthetic inquiry; and
• demonstrating the ability to form and defend appropriate judgments.
Standards Used

Colorado Model Content Standards – SCIENCE

**Standard 1:** Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

**Grades K-2**
1. use their senses to make and describe careful observations
2. ask questions and make predictions

**Grades 3-5**
1. design, plan and conduct a variety of simple investigations (for example: formulate a testable question, state a hypothesis, make systematic observations, develop and communicate logical conclusions based on evidence)

**Grades 6-8**
1. ask questions and state hypotheses that lead to different types of scientific investigations (for example: experimentation, collecting specimens, constructing models, researching scientific literature)
3. interpret and evaluate data in order to formulate logical conclusions

**Grades 9-12**
1. ask questions and state hypotheses using prior scientific knowledge to help design and guide development and implementation of a scientific investigation
4. recognize and analyze alternative explanations and models

**Standard 2:** Physical Science: Students know and understand common properties, forms, and changes in matter and energy. (Focus: Physics and Chemistry)

**Grades K-2**
1. solids and liquids (matter) can be identified, compared, sorted/classified by their physical properties (for example: size, shape, texture, flexibility, temperature, color and patterns)

**Grades 3-5**
1. objects have physical properties that can be measured (for example: length, mass, volume and temperature)
3. matter is made up of parts that are too small to be seen

**Grades 6-8**
10. white light is made up of different colors that correspond to different wavelengths

**Grades 9-12**
1. elements can be organized by their physical and chemical properties (Periodic Table)
2. the spatial configuration of atoms and the structure of the atoms in a molecule determine the chemical properties of the substance
3. there are observable and measurable physical and chemical properties that allow one to compare
Standards Used

Colorado Model Content Standards – SCIENCE continued

**Standard 4:** Earth and Space Science: Students know and understand the processes and interactions of Earth’s systems and the structure and dynamics of Earth and other objects in space. (Focus: Geology, Meteorology, Astronomy, Oceanography)

**Grades K-2**
1. There are different types of Earth’s materials that come in different shapes and sizes (for example: rocks and soil)
2. The Earth’s materials (rocks, soil, water) provide many of the resources that humans use and reuse

**Grades 3-5**
1. Fossils are evidence of past life
2. Natural processes change Earth’s surface (for example: weathering, erosion, mountain building, volcanic activity, earthquakes and floods)
3. Many of the Earth’s resources can be conserved, recycled and depleted

**Grades 6-8**
1. Inter-relationships exist between minerals, rocks, and soils
2. Humans use renewable and nonrenewable resources (for example: forests and fossil fuels)
6. Successive layers of sedimentary rock and the fossils contained within them can be used to confirm age, geologic time, history, and changing life forms of the Earth; this evidence is affected by the folding, breaking and uplifting of layers

**Grades 9-12**
4. There are costs, benefits, and consequences of natural resource exploration, development, and consumption (for example: geosphere, biosphere, hydrosphere, atmosphere and greenhouse gas)
5. There are consequences for the use of renewable and nonrenewable resources

**Standard 5**

**Grades K-2**
1. Basic observable patterns and changes in the world can help to predict future events based on those patterns (for example: seasonal weather patterns, day/night)

**GRades 3-5**
2. Models are used to represent events and objects (for example: comparing a map of the school to the actual school; a model of the Earth to the Earth itself)

**GRades 6-8**
3. Contributions to the advancement of science have been made by people in different cultures and at different times in history
4. Models can be used to predict change (for example: computer simulation, video sequence, stream table)
5. There are interrelationships among science, technology and human activity that affect the world

**Grades 9-12**
1. Print and visual media can be evaluated for scientific evidence, bias, or opinion
4. There are cause-effect relationships within systems (for example: the effect of temperature on gas volume, effect of carbon dioxide level on the greenhouse effect, effects of changing nutrients at the base of a food pyramid)
6. Interrelationships among science, technology and human activity lead to further discoveries that impact the world in positive and negative ways
Sample Goals

A unit on Dirt could have a variety of learning goals. Here are a few suggestions:

Students will appreciate the lines, colors, shapes and textures of natural forms.

Students will experience art as a part of democratic empowerment.

Students will understand how dirt is an important part of life and life experience.

Students will explore the importance of dirt through science, history, social sciences, literature, art, music and creative drama.

Students will appreciate metaphor as a way to communicate life experiences.

Students will experience empathetic connections with all people whose lives are directly affected by the quality of the dirt.

Students will see the connection between natural physical and chemical cycles and the commodities of beauty.
Sample Objectives

FUNDRED PROJECT

Students will defend an opinion on whether art should be part of a political and democratic process.

Students will explain how completion of a creative Fundred dollar bill is part of a larger, collaborative artwork and part of the American democratic process. VISUAL ART CMCS #1

OTHER RELATED LESSONS

Students will demonstrate how a common element (dirt) can communicate multiple meanings in our society.

Students will understand the physical and chemical properties of precious stones.

Students will relate the processes of the rock cycles to the creation of pigments.

Students will understand soil composition and its importance to healthy ecosystems.

Students will thoughtfully and intentionally use textures and colors derived from dirt in an artwork. VISUAL ART CMCS #2

Students will learn traditional processes of artmaking using earth elements and dirt. VISUAL ART CMCS #3 and #4

Students will identify varying metaphorical cultural meanings given to dirt. VISUAL ART CMCS #4 and #5

Students will create an artwork exploring the metaphorical cultural meanings of dirt. VISUAL ART CMCS #1
Science & Art Lesson Ideas and Resources

http://eelink.net/pages/EE+Activities+-+Soils
Guide to many websites featuring soil lesson plans

http://soils.usda.gov/education/resources/k_12/lessons/crayons/
Students make wax and soil crayons to create an original artwork and appreciate the natural beauty of soil.

http://soils.usda.gov/education/resources/k_12/lessons/color/
Students learn how to determine the composition of soil from its color using the Munsell color system.

http://soils.usda.gov/education/resources/k_12/lessons/profile/
Students create a card showing the horizon layers of their local soil and learn how each layer functions.

http://soils.usda.gov/education/resources/k_12/lessons/experiments/erosion/
Step by step instructions for a demo or small group experiment showing how different soils erode and create runoff.

http://soils.usda.gov/education/resources/k_12/lessons/experiments/SOM/
A demo or small group experiment showing the importance of organic matter in soil in the prevention of erosion.

http://soils.usda.gov/education/resources/k_12/lessons/experiments/particle_size/
Students explore particle size in soils in a simple, inexpensive experiment.

http://soils.usda.gov/education/resources/k_12/lessons/texture/
This is a guide to determining soil texture that students can easily follow.

http://school.discoveryeducation.com/schooladventures/soil/
Lots of information and activities for upper elementary and middle school students on the science of dirt.

http://www.sd5.k12.mt.us/glacierft/geoso3-8.htm
Grades 3-6. Observation and description of soil particles.

http://www.k12.atmos.washington.edu/k12/modules/soils/index.html
Elementary level lesson plans comparing Earth soils to Mars soils.

http://www.txfb.org/AgClass/resource/soillesson.htm
Questions for Class Discussion

Reflective questions can be used in worksheets, as creative stimuli visible in the artroom, as “story starters” for written assignments or as small group discussion starters. These questions can be used to introduce the cultural metaphors that are associated to dirt and to relate the study of dirt to the students’ personal experiences with dirt or soil.

- What is your earliest memory of dirt?

- What does dirt feel like?

- What does dirt smell like?

- What do you imagine dirt tastes like?

- Do you like to feel dirt? Feel dirty?

- Where is your favorite plot of dirt?

- What is dirt made out of? What is made of dirt?

- When have you felt grounded?

- When have you been grounded?

- How much time do you spend getting rid of dirt?

- When have you given someone else a “dirty” look?

- Do you give dirty looks?

- Have you ever “had the dirt” on someone else?

- Has any one “had the dirt” on you?
Suggested Activities #1

Cleaning Up the Dirt – Lesson Plan, Page 1

FUNDRED DOLLAR BILL LESSON PLAN

DEAR INSTRUCTOR:

This is a national project intended to support the rebuilding of New Orleans from below the ground up making the environmental conditions safer for its residents. The “artworks” created by your students will be collected by armored truck and delivered to Washington D.C., where an even exchange of the value of their art currency for actual funds will be requested. The awareness raised by FUNDRED is intended to support a citywide solution to health and quality of life issues still challenging the post-disaster city. It is a method for your students to have a meaningful hand in a coordinated national process.

LESSON PLAN

In your classroom you can use the FUNDRED WORKSHEET as a tool to introduce social studies, political science, or art and design. Originality and personality will be valued. Emphasize to your students that there is no such thing as a “bad bill” if they participate and express themselves. We hope their contributions will eventually demonstrate that their creative actions can make a difference. If you have a student from New Orleans this project can be a method of reconnecting with their home in a positive and tangible way.

ESTIMATED CLASS TIME: 20-30 MINUTES

MATERIALS

- FUNDRED WORKSHEETS printed or copied in COLOR on BOTH SIDES
  - Download: FUNDRED.PDF - IT IS THE WORKSHEET TEMPLATE PROVIDED ON THE WEBSITE
- BLACK BALL POINT PENS

PROCESS

1. Print enough FUNDRED WORKSHEETS to distribute one FUNDRED BILL per student.
2. Printing instructions:
   a. Print the FUNDRED.PDF from your home or school's COLOR printer or a local copy/print service.
   b. Be sure to print double-sided (e.g., front and back).
   c. Be sure that the registration allows the face of the FUNDRED BILL and back of the FUNDRED BILL to be aligned.
3. Introduce the project to your students.
   a. Ask if he/she is willing to DONATE their finished ART to be part of a nationwide art collection.
4. NOTE: Students should use a BLACK BALL POINT PEN on the COLOR copied or printed FUNDRED WORKSHEET.
5. Instruct as you see fit for the grade level.
   a. Use directions on the FUNDRED WORKSHEET to guide the students in their creative development.
6. After the student finishes his/her drawing, ask the student (or a designated class person) to cut along the thin blue line to free the FUNDRED DOLLAR BILL. Collect the “cash”.
7. Try to accumulate bills in 100 counts.
   a. It's OK to send less or more than 100 just note amounts on the bundle wrap. Fill in your school name and location.
8. Send bundles to the contact at the COLLECTION CENTER closest to your school as LISTED on the fundred.org website.
   These COLLECTION CENTER will RECEIVE and HOLD the artwork until the appointed pickup date arrives.

100 FUNDRED CURRENCY BUNDLE WRAP. CUT OUT TO USE.

CHECK THE WEBSITE FUNDRED.ORG FOR DOWNLOADS OF FUNDRED WORKSHEET, LESSON PLAN, AND FAQ. ALSO SEE WEBSITE TO VIEW SAMPLE BILLS AND THE VAULT AS IT FILLS UP!
Suggested Activities #1

Cleaning Up the Dirt – Lesson Plan, Page 2

[Map of the United States with a network of routes and labels indicating collection centers and a route to Washington, D.C.]

**BUNDLES OF 100 DRAWINGS** with your school name, city & state should be mailed to the nearest regional school that has volunteered to be a “VAULT.”

**Example:** Fundred bill drawn by teen evacuated to Tennessee.
Suggested Activities #1

Cleaning Up the Dirt – Worksheet, Page 1

Draw a Hundred Dollar Bill

Here’s a picture of a $100 dollar bill. Can you make your version of this money?

Instead of Benjamin Franklin, draw:
- Yourself
- A friend
- A pet
- A flower
- A hero
- A monster
- Your mom
- Your dad
- Your grandpa or ma.

Make up your own serial number.

Write in the name of city, state, country where you were born.

There is an eagle in the circle but draw your own bird like a pelican!

Try to put in five 100s in four different ways!

Sign your name here.

Your teacher can sign here and write it too.

Name your drawing.

Fill in the blank bill.
Suggested Activities #1

Cleaning Up the Dirt – Worksheet, Page 2

BE SURE TO ADD TREES!
WERE THEY PALM TREES?
OR LIVE OAKS?
OR MAPLES?
OR SOMETHING ELSE?

INDEPENDENCE HALL is sort of a HOME to AMERICA
DRAW a picture of WHERE you used to live,
OR a picture of WHERE you live now
OR an imaginary apartment, house or castle

ADDITIONAL HINTS FOR MORE

100 S. ON THIS SIDE!

There are cool symbols
and Latin sayings on money
“He has favored our undertakings”
flanks the eye of providence
and
“A new order of the ages”
below the pyramid
A symbol of strength and duration,
Make up your own
symbols & phrases
and put them on!

You can add plants
to make things
greener!

Find this worksheet, where to send your completed bill,
And more information about the project at
funded.org [password: PayDirt]

THIS SIDE TOO!
Suggested Activities #1 - Items for Follow Up

Other Service Learning Projects
1. Community clean up and renewal
2. School wide clean up and renewal

For an example see
Future Farmers, Neighborhood Beautification
http://www.futurefarmers.com/survey/
Suggested Activities #2

View and Create Zen Gardens

http://www.aboutzen.info/perceive/zengarden.htm

For over 600 years Japanese monks have been creating metaphors in dirt. In Japanese they are called KareSan Sui (Dry-Mountain-Water)

Procedure: Table Gardens can be made in the classroom using a shallow container, different colors of sand, small rocks and tools to make designs in the sand.

Art Concept: The gardens can be used on many different levels. One aspect of a Zen garden is learning to see. All of these types of seeing are part of art seeing and art making.

Some people see and label what they see (sand, rock etc)

Some people see larger landscapes

Some people connect what they see with stories they know.

Some people notice, observe details and experience the materials directly.

Some people look closely, experience directly and may NOT be able to describe what they see with words. The experience is non-verbal.
Suggested Activities #3

Leaving YOUR Footprint

This activity idea is based on the work of artists, Jennifer Allora & Guillermo Calzadilla, and their image *Land Marks (Footprints)*

**Art Concept: Index**
When artists use an “Index” in artmaking they leave a physical trace of the presence of an object rather than creating a representation of the object. In the project the student will leave an “index” of their presence (a footprint) superimposed with telling of a personal story or expression of an opinion on a current issue.

**Procedure:**
The students will create a footprint that says something about a point of view on:
- A personal story (K-3)
- School rules and conduct (4-7)
- Social issue (8-12)

Write a paragraph telling the story or explaining the opinion. Choose the most important points to place on your footprint. Decide if words or pictures best explain the idea and think about placement, scale, font etc.

Leave your footprint behind in mud or paint.

- Use paint to make a print and pastels to draw on top
- OR
- Make footprints from stepping in mud and alter while wet

Draw and/or write your story or idea on the footprint.
Suggested Activities #4

Fabric Dying from Dirt

Science Concepts:
Protein Chemistry
Rock formation
Soil Composition

The colors of dirt can be transferred to fabric using a soymilk (protein binder).

Make a Soymilk Binder
1. ¼ cup soybeans
2. Soak overnight in water.
3. Next day, rinse soaking water off.
4. Add soybeans to blender.
5. 3 cups warm water
6. Add to blender, and run on medium for 4 minutes.
7. Strain liquid through muslin. Retain liquid.
8. Return soybean residue to blender.
9. 2 cups warm water
10. Add water to blender, and run 4 minutes.
11. Strain liquid through muslin. (Discard soybean residue. Wash muslin. Hang to dry.)
12. Thin soymilk by adding more water until it looks like ‘skim milk’. (Until it has that ‘blue’ sheen that only skim milk has.)
13. Apply soymilk to fabric with a wide brush. Mix soymilk with oxides or indigo.
14. Keep remaining soymilk up to 24 hours in fridge.

One idea is to brush the soymilk on the fabric, then wrinkle it up and bury it in dirt for several weeks. (It helps if it rains) You can add added rusty nails too or other pigment rich materials also. Other ideas for adding pigment from soil are found in the websites below. For a detailed set of instructions, or a list of suppliers for the ingredients needed, please contact the CIAE office at ciae@unco.edu.

Helpful Websites

Can Soil Be Used as a Natural Dye? How to Make Dirt Shirts
http://www.wtamu.edu/~crobinson/DrDirt/dirt_shirt_act.html
Lesson plan available

http://www.dirtshirts.com/
Commercial site providing background concepts

http://www.prairiefibers.com/Pigment%20Painting.htm
Commercial site providing different media and methods
Suggested Activities #5

Containers and Dirt

Art Concept: Metaphor

Procedure:
Examine various ways cultures use dirt to create containers or containers to contain dirt.

Brainstorm container types and uses with students

- Egyptian Sarcophagi
- Archeological studies from containers and shards
- Traditional grain and water pots
- Landfills, nuclear waste storage (dirt containing dirt)

Create a clay container to protect a valued item or contain a hazardous waste by either handbuilding or throwing on a potters wheel.

The valued item or hazardous waste product could be actual or metaphorical (ie a container to hold love, hate, envy, prejudice). The form of the container should indicate its purpose
**Suggested Activities #6**

**Chemistry of Pigments and Precious Stones**

Research origins of artist’s pigments as the students use the pigments in drawing and painting.

*Ball, Phillip. (2001) Bright Earth; Art and the Invention of Color*
Examines the chemistry and physics behind the colors we see

Finley travels to Europe, India, Australia, Mexico, Afghanistan, China, and Tibet to provide the stories behind minerals, plants, and insects used to make the dyes and colors artists use. The book is useful for its facts, fables and anecdotes.

**Additional studies:**
- Examine the chemical principles behind color changes in pigment.
- Examine mineral contents of precious and semi precious stones.
Suggested Activities #7

COLLECTIONS (K-5)

Collect different things in or on the ground: colored soils, rocks with different compositions, fallen leaves, twigs, seeds, etc., trash on ground.

For younger children, the items can be chosen by the teacher and “collected” in the classroom.

Describe the chosen items (verbally or in writing)

Students sort according to personally chosen categories
OR
Teacher provides categories for classification ie organic (living) / non organic (never been alive); use; etc

Students create containers or display boards to preserve collection (clay, cardboard, etc.), thinking how the form of the display will convey meaning about the collection. See the work of Nicolas Lang, *Culture Heap*

Or create an artistic model of the layers of soil using colors and forms found in cartoons.

Left: Damien Hirst, *Sensation*
Suggested Activities #8

Create a Civilization

Students study elements of a city or society.

They create a miniature civilization using found materials and simple art media. See the work of Charles Simonds (below left) of miniature civilizations created in building cracks and hidden places.

The civilization is buried in dirt and left for another class to dig up.

The “Archeologists” describe what they find and hypothesize the function of the items and the structure of the society.

The two classes come together in a “Time Warp”; and compare the intentions of the original creators with the subsequent interpreters.
**Suggested Activities #9**

**Story Rope**

Artistic concept: The narrative quality of materials; materials as metaphor.

Students view the Art 21 segment “Moor” created by Janine Antoni. (ART 21: SEASON 2)
http://www.pbs.org/art21/artists/antoni/index.html#

*note: you may only want to show the segment on “Moor”*

Students write a story about a time they have been “grounded.” The term may be understood as being restricted, stabilized, dirty, etc.

Students choose materials to provide visual metaphors for the experience and tie them together to create a “story rope.” The stories are shared in a group circle and the rope pieces are tied together to create a class project.
Suggested Activities #10

Music Integration – How does dirt sound?

Experiment with sounds - in a can, in a bag, on glass, in a jar, on a drum head etc.?

Use different textures of dirt by adding sand - Create high, middle and low sounds in or on the above items?

Go on a sound walk. Listen for the sounds of footsteps on different kinds of dirt? Find five different sounds produced by different means?

Discuss: What is the sound of mud?

When do you hear it?

Could you make music with it?
Suggested Activities #11

Creative Drama from the Dirt

Choose a term that refers to the soil. (see list below)

Create a Character Sketch (personification) of the term.

   Name?
   Age?
   Family?
   Where do you live?
   What do you want more than anything in the world?
   What is your worst fear?
   What is the major problem in your life right now?

Write a paragraph about your character confronting their worst fear. With your body and facial gestures, show your experience as someone else reads your paragraph.

<<OR>>
In groups of two, create a dialogue between your character and the personification of their worst fear.

Soil Terms

**Soil** is the naturally occurring, unconsolidated or loose covering of broken rock particles and decaying organic matter (humus) on the surface of the Earth, capable of supporting life.

**Compost** also known as brown manure, is the aerobically decomposed remnants of organic matter. It is used in landscaping, horticulture and agriculture as a soil conditioner and fertilizer. It is also useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover (see compost uses).

A **shovel** is a tool for lifting and moving loose material such as coal, gravel, snow, soil, or sand and is an extremely common tool which is used extensively in agriculture, construction, and gardening.

**Erosion** is the carrying away of displacement of solids (sediment, soil, rock and other particles) usually by the agents of currents such as wind, water, or ice by downward or down-slope movement in response to gravity or by living organisms.

A **solid** object is in the states of matter characterized by resistance to deformation and changes of volume.

**Liquid** is one of the principal states of matter. A liquid is a fluid that has the particles loose and can freely form a distinct surface at the boundaries of its bulk material. The surface is a free surface where the liquid is not constrained by a container.

A **gas** is a state of matter, consisting of a collection of particles (molecules, atoms, ions, electrons, etc.) without a definite shape or volume that are in more or less random motion.

**Sediment** is any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid. **Sedimentation** is the deposition by settling of a suspended material.

**Fossils** (from Latin fossus, literally “having been dug up”) are the preserved remains or traces of animals, plants and other organisms from the remote past.
Culminating Activity

In a small groups the students will examine one of the essential questions of the unit and create a Zine, Graphic Novel, Anime or Illustrated Textbook using the concepts they had studied and their own reflections on Dirt in their Lives.

Alexis Rockman/Mark Dion - Concrete Jungle
“In the spring, at the end of the day, you should smell like dirt.”
Margaret Atwood

“I love dirt. I love dirt. It can’t hurt
On my shirt.
I love to squirt it with my hose.
I love to squeeze it between my toes.
The fun we have just grows and grows.
Oh, I love dirt. I love dirt.”
Sing to the tune of “Three Blind Mice”

“A nation that destroys its soils destroys itself. Forests are the lungs of our land, purifying the air and giving fresh strength to our people.”
Franklin D. Roosevelt

“The violets in the mountains have broken the rocks.”
Tennessee Williams

“All that we did, all that we said or sang must come from contact with the soil...”
William Butler Yeats

“Life is hard. Then you die. Then they throw dirt in your face. Then the worms eat you. Be grateful it happens in that order.”
David Gerrold

“When you throw dirt, you lose ground.”
Texan proverb

“French is the language that turns dirt into romance.”
Stephen King

“Give me strength to walk the soft earth, a relative to all that is.”
Black Elk
“Remain true to the earth.”
Friedrich Nietzsche

“Ignorance...is a painless evil; so, I should think, is dirt, considering the merry faces that go along with it.”
George Eliot

“You may write me down in history
With your bitter, twisted lies,
You may trod me in the very dirt
But still, like dust, I’ll rise.”
Maya Angelou

“It always comes to the same necessity; go deep enough and there is a bedrock of truth, however hard.”
May Sarton

“To the illumined man or woman, a clod of dirt, a stone, and gold are the same.”
Bhagavad Gita

“A pig used to dirt turns its nose up at rice.”
Japanese Proverb

“If a healthy soil is full of death, it is also full of life: worms, fungi, microorganisms of all kinds...Given only the health of the soil, nothing that dies is dead for very long.”
Wendell Berry
The history of dirt suggests that how people treat the soil can impose a life span on civilizations (p3)

Soil is an intergenerational resource, natural capitol that can be used conservatively or squandered. (p5)

Soils provide us with a geological rearview mirror that highlights the importance of good old dirt from ancient civilizations right on through to today’s digital society. This history makes it clear that sustaining an industrialized civilization will rely as much on soil conservation and stewardship as on technological innovation. Slowly remodeling the planet without a plan, people now move more dirt around Earth’s surface than any other biological or geological process. (p6)

Soil is a dynamic system that responds to changes in the environment. If more soil is produced than erodes, the soil thickens…. Conversely stripping the soil off a landscape allows weather to act directly on bare rock, either leading to faster soil formation or virtually shutting it off, depending on how well plants can colonize the local rock. (p13)

Plants need nitrogen, potassium, phosphorus, and a host of other elements. Some, like calcium and sodium are common enough that their scarcity does not limit plant growth. The processes that create soil also cycle nutrients through ecosystems and thereby indirectly make the land hospitable to animals as well as plants. ….The whole biological enterprise of life outside the oceans depends on the nutrients soil produces and retains. (p. 15)
Related Artists

A few of the many artists that use or interpret dirt

Andy Goldsworthy

See the DVD, *Rivers and Tides*
docurama.com

Carroll Dunham

Carroll Dunham: *Beautiful Dirt Valley*, 1997
Mixed media on linen

Mario Merz

Mario Merz, was a leading member of the Italian artistic movement known as Arte Povera including his wife Marisa. They used ordinary, "poor" materials and the repeated motif of an igloo to comment on contemporary industrial society.

Metal tubes, wire mesh, neon tube, dirt, 9ft 10 1/8in (3m) diameter
Robert Smithson

Smithson questioned personal identity and struggles of good and evil compared with the sublimity of nature and questions of personal identity. Smithson created this large spiral from earth, dirt, rocks, mud, and water from the Grate Salt Lake of Utah, where this landwork stands. The spiral measures 1,500 feet in length and 15 feet wide. Smithson chose this remote corner of the lake because it is an abandoned industrial site. Smithson said, “each cubic salt crystal echoes the Spiral Jetty in terms of the crystal’s molecular lattice (Finberg 329). The matter collapsing into the lake was also mirrored in the shape of the spiral, according to the artist (Finberg 329).

James Turrel - Roden Crater

See http://www.pbs.org/art21/artists/turrell /clip1.html
Dirt, Art and Ways to Integrate

to accompany Julia Marshall PowerPoint
Julia Marshall, San Francisco State University, jmarsh@sfsu.edu

Artists/art addressing themes related to “DIRT”

1. Natural Sciences:
   - Geology: scientific illustration, natural history dioramas
     - Landscapes: Thomas Moran; Grant Wood
     - Caves: Longmen caves, China; Bamyan
     - Earth Art: Robert Smithson; Richard Long
     - Monuments: Maya Lin
     - Earth materials: Richard Long; Walter de Maria
   - Physics: Land processes, Andy Goldsworthy
   - Life Sciences: Botany: Carolus Linnaeus
   - Biology: Cornelia Hesse Honegger; Maria Sybilla Merian
   - Ecology: Joesph Beuys; Mark Dion
     - Urban Landscapes/ecosystems: Alexis Rockman
     - Techno/eco art: Poultry Internet
   - Paleontology: Clayton Bailey
   - Geography: Mapping: Richard Long

2. Social Sciences:
   - Archeology/history: Xian Warriors; Venus of Willendorf
   - Social/cultural commentary: Mark Dion, Marian Heyerdahl

3. Mathematics:
   - Simple Geometry: Andrew Goldsworthy; Robert Smithson; Richard Long
   - Complex Geometry: Julie Netaratu; Matthew Ritchie

4. Language Arts: Metaphor

Related fields:

5. Architecture:
   - Chris Drury; Sanfte Strukturen; Giuliano Mauri

6. Agriculture: Laura Stein; Amy Youngs

7. Gardens: Zen garden; Tigerbalm garden
Other Resources - Websites

Websites that you might want to check out:

All About “Fundred”: Interview with Mel Chin

Artful Thinking
http://www.pz.harvard.edu/Research/ArtThink.htm

Dirt Detective – Junior Archaeologist - Kids Games
http://www.history.org/kids/games/dirtDetective.cfm

Dirt! The Movie
http://dirtthemovie.org/

e2: The Economies of Being Environmentally Conscious
http://www.pbs.org/e2/index.html

Hand Print Press
http://www.handprintpress.com/

Is Dirt Just Dirt? K-12 Classroom Activity
http://www.beg.utexas.edu/education/dirtisdirt/dirt01.htm

Japanese Zen Gardens
http://www.phototravels.net/japan/photo-gallery/japanese-rock-gardens.html

Math Insight Activities
http://mathinsight.ctl.sri.com/activities/digging.htm

The Dirt on Dirt
http://childrens-non-fiction.suite101.com/article.cfm/the_dirt_on_dirt

What is in Dirt? K-5 Classroom Activity
http://www.fi.edu/fellows/payton/rocks/act/payton2.htm
Other Resources - Books

Books that you might want to check out:

Arnold, C., *Easter Island: Giant Stone Statues Tell of a Rich and Tragic Past*  
Clarion Books

Ball, Phillip. (2001) *Bright Earth; Art and the Invention of Color*  
Examines the chemistry and physics behind the colors we see

Chelsea Green Publishing, handprintpress.com  
Social Sciences/Philosophy

Denzer, Kiko; Field, Hannah, *Build Your Own Earth Oven*, 3rd Edition  
Hand Print Press, handprintpress.com  
Stoves/Earth Construction

Denzer, Kiko, *Dig Your Hands in the Dirt*, 1st Edition  
Hand Print Press, handprintpress.com  
Handicraft/Art/Community Education

Denzer, Kiko, *Earth Art*, 1st Edition  
Hand Print Press, handprintpress.com  
Exhibit Program/Catalogue

Finley travels to Europe, India, Australia, Mexico, Afghanistan, China, Tibet to provide the stories behind minerals, plants, and insects used to make the dyes and colors artists use. The book is useful for its facts, fables and anecdotes.

For Ages 4-7


Logan, William Bryant, *Dirt, The Ecstatic Skin of the Earth*, 1st Edition  
W.W. Norton

University of California Press

Hand Print Press, handprintpress.com  
Handicraft/Art
Composting with Earthworms

Definitions

Vermicompost is a term for the compost produced by earthworms. It is created when earthworms eat their way through a pile of organic matter.

Castings is just a fancy word for earthworm excrement.

Earthworms are often grouped according to their location in the soil:

Aric worms are usually larger worms that build permanent burrows in the soil and come to the surface to pull bits of humus or other organic matter into their burrows.

Epigeic worms live in decaying organic matter, not in the soil.

Endogeic worms rarely come to the surface. Some endogeic worms inhabit the earthworms, the area immediately around plant roots, where they feed on root that has been enriched by decaying roots, roots, and fungi.

Lumbricus terrestris, the night crawler, is a large earthworm with a flattened tail that is good for your soil, but will not survive in a closed compost bin.

Eisenia fetida, the red wiggler or redworm, is a small epigeic worm. These worms live in or on compost. Some of these worms have yellow bands between their segments, others do not.

Aporrectodea caliginosa, often called a grey worm or a southern worm, is one of the most widespread endogeic species. It is often found in the leaves of plants. As its common name implies, it is a grey or slightly pink worm about two or three inches long.

Worms prefer a healthy, vegan diet!

When you set up your worm bin, start feeding them right away to build a pound of food per day. However, this depends greatly on conditions in the worm bin and how often you have been feeding the food. Some worms like melon and banana skins. Also, finely chopped food is easier for worms to eat than, for instance, a head of lettuce thrown whole in.

Putting in more food than the worms can eat might lead to infections of other pests in the bin. It can also consume the acidity and create the bin small unpleasant. Over time, you will get to know how much food your worms can take at once.

What to feed worms

- Vegetable scraps
- Shredded newspaper or office paper
- Coffee grounds
- Eggshells
- Dryer lint
- Plain pasta or rice
- Plain bread

What NOT to feed worms

- Meat or bones
- Fats such as olive oil or salad dressing
- Dairy
- Animal feces
- Very spicy foods
- Glossy magazine paper
- Chines, hot peppers, onion or garlic (small amounts are O.K.)

Types of worm bins

- Compost Worms
- Wigglies Worms
- The Worm Factory
- Homesteading bin—plastic tub
- Large-scale bins are also available for schools, restaurants, and institutions.

Conditions in the worm bin

- Find a cool, shaded spot (in a porch or in a garage or basement)
- Protect from extreme temperatures (the ideal temperature range is 65-70 degrees)
- Keep clean but do not soggy (above your center through your bin)
- Start with a layer of peat moss or one (or two) plastic beds
- Keep a layer of shredded newspaper or office paper or top
- Add crushed eggshells or a pinch of powdered limestone or rock dust to reduce acidity
- Add a small amount of garden soil to provide pH

Other critters in the worm bin

Even an indoor bin could attract other critters. Most other bugs are harmless and may, in fact, help to break down the compost so the worms can better digest it. Keeping a tight fitting lid on your bin and putting your kitchen scraps directly in the bin (as opposed to, for instance, chopping them in a bucket outside and adding them later) will help keep bugs out of your bin.

Here are some examples of other bugs you might find in your worm bin:

- Fruit flies: These tiny creatures are annoying but harmless. Reducing the acidity of your bin and keeping food barriered under a layer of newspaper will help discourage them.
- Ants: Ants are great decomposers. However, if you don’t want them around, try sprinkling cornmeal around the base of the composter or using store-bought talc. Just be sure the talc is not accessible to worms (and pets and children).
- Sow bugs: Also called pill bugs. These are the little hard-shelled bugs that roll up into a ball. They are harmless, but you can pick them out of your bin (a garden spade works great for this) if you don’t want them.
- Potworms: These tiny white worms that you might mistake for baby worms. They are great decomposers and there is no reason to discourage them.
- Slugs and snails: Yuck! Pick them out with a garden spade and toss them into the street for them to squelch under your foot, or drown them in a bowl of salt water.
Life as an Earthworm

- Most worms look just a few years.
- Worms are hermaphroditic; they have both sets of sexual organs and can produce eggs to fill new holes.
- You will find worm castings in your bin from time to time. They are tiny, brownish, sausages, which two or three baby worms will produce.
- Baby worms are fun to observe with a magnifying glass as they burrow through them.
- Some people say that earthworms will drive away slugs.
- Epsom salts, a form of magnesium sulphate, are harmful to earthworms. It is used in some garbage collections to repel slugs.

Harvesting and Using Vermicompost

Draining the liquid
Most composters have some way of draining off liquid from the bottom of their compost bin. Some bin manufacturers claim that this liquid is a very healthy "compost tea" that makes a great plant fertilizer. Other worm experts think this liquid is too acidic and too full of anaerobic bacteria to be of benefit to most plants. I pour mine into my flower beds and I've never seen any problems, but you'll have to judge for yourself.

Harvesting castings in a stacking bin system
Most worms will have left the bottom tray that you plan to harvest. If some worms remain, you can put the tray of castings on top of the stack and leave the lid off. The exposure to light may speed them for a few days. This is a very optimistic figure; however, in the very best conditions, an initial quantity of 1,000 worms (one pound) will expand to fill a bin within a few years.

Harvesting castings in a single-layer system
Once your bin is stable and full of castings, start feeding only in one corner of the bin. That will attract worms to that corner and encourage them to leave the other end of the bin, where you want to harvest your castings. After a few weeks, you will see a lot of worms in the side of the bin without food, and you can place the mixture in a flower bed or use it to feed some small plants. Once you add the worms to your garden, they will spread out if there are a very rich, deep pile of compost or soil to investigate.

Using vermicompost
New studies on composting show that vermicompost can not only enrich soil, but also help improve plant health. Add a teaspoon or small handful to potting plants or transplanted seedlings. Work it into the soil where you’re planting vegetable beds. Add a little to a compost and use within 24 hours as compost tea.

Amy Stewart lives in southern California with her husband, two cats, and several thousand worms. She is the author of *From the Ground Up: The Story of a Pest, a Garden, and the Garden Industry in the North Coast Journal*. Her articles appear in a number of magazines and newspapers, including Organic Gardening, Bird Watcher’s Digest, the San Francisco Chronicle, and the San Francisco Union-Tribune.

WORMS OF ENDERMENT:

- Amy Stewart also maintains a blog for the North Coast Journal. She is the author of *From the Ground Up: The Story of a Pest, a Garden, and the Garden Industry in the North Coast Journal*. Her articles appear in a number of magazines and newspapers, including Organic Gardening, Bird Watcher’s Digest, the San Francisco Chronicle, and the San Francisco Union-Tribune.
- Amy Stewart also maintains a blog for the North Coast Journal. She is the author of *From the Ground Up: The Story of a Pest, a Garden, and the Garden Industry in the North Coast Journal*. Her articles appear in a number of magazines and newspapers, including Organic Gardening, Bird Watcher’s Digest, the San Francisco Chronicle, and the San Francisco Union-Tribune.
**Dirt: Easter Island Resources**

One of the theories surrounding Easter Island is that the inhabitants used all of the natural timber to create log rollers to move the giant statues. The subsequent erosion led to collapse of the society.

Rapa Nui, also known as Easter Island, is a remote patch of rocky ground in the middle of the South Pacific. Its 63 square miles are more than 2,000 miles west from Santiago, Chile. Its 887 massive stone Moai are protected as a national park of Chile. Rapa Nui has a rich history of culture and religion, a tragic narrative of ecological collapse, and a treasure of ancient art. Today, this isolated island is no longer deserted. Residents, descendents, tourists, scientists, historians, and artists all share Easter Island now. They each have a different story to tell about its dirt.

**Internet Resources**

- [http://www.pbs.org/wgbh/nova/easter/](http://www.pbs.org/wgbh/nova/easter/) NOVA documents a crew of engineers, historians, scientists, archeologists and even a middle school teacher as they attempt to move and erect a Moai sculpture. Companion video, move the Moai game, and virtual island tour highlight this site.

- [http://www.islandheritage.org/](http://www.islandheritage.org/) This is the official website of the non-profit, Easter Island Foundation. The site contains primary source information, academic articles, EIF published books and a very informative FAQ page.

- [http://www.livescience.com/history/060309_easter_island.html](http://www.livescience.com/history/060309_easter_island.html) Ker Than, Livescience.com staff writer, reports an update to the history of the culture that disappeared from Rapa Nui. He describes a study published in the journal, Science. Some scientists and anthropologists are debating the accuracy of the most accepted theories on the demise of this population. The article contains links to other information about Easter Island and the statues. This is suitable for high school reading.

- [http://www.bbc.co.uk/dna/h2g2/A2309582](http://www.bbc.co.uk/dna/h2g2/A2309582)
Other Resources for Lesson Extensions

Dirt: Easter Island Resources continued

Easter Island culture seeks to survivePolynesians guard language, customs
By Hector Tobar, Los Angeles Times  |  February 8, 2004

http://www.lorenzodominguez.com/CATALOGO/HTMLES/CATMO1.HTM
http://en.wikipedia.org/wiki/Easter_Island
http://www.metmuseum.org/toah/hd/eais/hd_eais.htm
http://www.britishmuseum.org/explore/highlights/highlight_objects/aoa/b/birdman_boulder.aspx
http://www.adprima.com/social23.htm
http://sunearthday.nasa.gov/2005/locations/easter.htm
Other Resources for Lesson Extensions

The Dust Bowl

Legacy of the Dust Bowl
By Linda C. Joseph • Columbus Public Schools • Library of Congress

“As the billowing black clouds of dust rolled and swirled across the plains in the 1930s, the American landscape was drastically changed...John Steinbeck wrote vividly about the migrant camps in The Grapes of Wrath, Dorothea Lange documented the harsh conditions with compelling photographs, and Woody Guthrie, a refugee himself, sang Dust Bowl ballads. Let's travel down the highway of time and view firsthand eyewitness accounts, pictures, and music archived on a variety of Web sites.”

- Excerpted from http://www.infotoday.com/MMSchools/nov03/cyber1103.shtml

Websites:

Historical Background
Dust Bowl During the Depression
http://memory.loc.gov/ammem/ndlpedu/features/timeline/depwwii/dustbowl/dustbowl.html

National Historic Route 66

New Deal Network
http://newdeal.feri.org/

Surviving the Dust Bowl
http://www.pbs.org/wgbh/amex/dustbowl/

Art
America from the Great Depression to World War II: Photographs from the FSA-OWI, 1935-1945
http://memory.loc.gov/ammem/fsowhome.html

Documenting America
http://memory.loc.gov/ammem/fsahtml/fadocamer.html

A New Deal for the Arts
http://www.archives.gov/exhibit_hall/new_deal_for_the_arts/index.htm

Literature

The Great Depression and Children's Books
http://www.carolhurst.com/subjects/ushistory/depression.html