

**SCIENCE**

**ZOOLOGY**

**Skills and Activities**

- Observes detail and recognizes a variety of animals by appearance or description
- Uses correct terminology for basic external parts of fish, amphibians, reptiles, birds and mammals
- Distinguishes vertebrates and invertebrates
- Considers specific needs of several kinds of animals
- Understands various ways animals prepare for winter
- Cares for and observes class pet
- Knows simple human anatomy
- Distinguishes among plant, animal and mineral categories

**NATURAL SCIENCE**

**Skills and Activities**

- Observes and records daily weather
- Recognizes cloud types
- Makes land and water forms with clay and paper
- Studies the nature of the globe
- Experiences the forces of magnets
- Explores with magnifying glass and correctly classifies discoveries

**BOTANY**

**Skills and Activities**

- Continues to study plant structures
- Understands significance of interdependence of plants and animals
- Studies simple plant kingdom classification

-Creates a time line of a week with the day as the unit of measurement

-Creates a child's life timeline with the year as the unit of measurement--for each year there is one picture of the child and a short paragraph about an important occasion during that year

-Creates a time line of the child's life with the month as the unit of measurement--birthdays are prominently marked

-Creates a time line of the universe with man as a means of introducing the fundamental needs of man

-Understands the concept of B.C. and A. D.

-Identifies Roman numerals: I - XX

-Understands the basic needs of human beings

-Studies the technological and cultural developments for meeting those basic needs e.g. housing clothing, food

Resource Materials

Ranger Rick

National Geographic's World

**ZOOLOGY**

Skills and Activities

- Identifies, names and labels the external parts of human beings, fish, amphibians, reptiles, birds, mammals, insects
- Compares physiological features of various types of animals: respiratory, circulatory, and reproductive systems
- Compares the degree to which various types of animals care for young
- Considers what various animals eat and how they pursue their food
- Begins classification of the animal kingdom

**NATURAL SCIENCE**

Skills and Activities

- Begins study of the formation of the universe
- Performs simple demonstrations of various physical laws such as gravity, inertia, centrifugal force, centripetal force
- Distinguishes the three states of matter and the properties of each
- Observes how matter moves from one state to another by cooling, heating or applying pressure
- Understands the mechanism of a volcano
- Understands the difference between energy and matter
- Observes basic chemical properties and the nature of chemical reactions
- Identifies members of the solar system and understands the nature of their movements

- Studies process of fossilization and types of fossils
- Identifies a variety of astronomical features as planet, moon, solar system, galaxy, constellation, supernova
- Identifies various rock and geological formations

## **BOTANY**

### Skills and Activities

- Observes detail of basic parts of plant structures and applies terms and simple descriptions: roots, stems, corollas, leaf shapes, leaf margins, leaf venation, fruits
- Observes detail of various leaf shapes and applies terms and simple descriptions: needle, pinnate, palmate, simple and compound leaves
- Learns parts of seeds: embryo, endosperm, seed coat
- Investigates various methods of seed dispersal
- Understands common needs of green plants
- Understands seasonal changes in plants
- Cares for plants in classroom
  - o Washes large leafed plants
  - o Waters plants
  - o Removes dead leaves and flowers
  - o Plants seeds and grows plants
- Compiles and labels collections of leaves and/or seeds
- Recognizes plants as food source for all animals and people
- Able to identify and label parts of flower: sepals, petals, stamen and pistil



PARENTS FOR MONTESSORI EDUCATION, INC.  
T/A MONTESSORI INTERNATIONAL CHILDREN'S HOUSE

GRADE THREE CURRICULUM

SCIENCE

General Materials Used (Always Available):

Texts: Holt, Life Science  
Harcourt, Brace Life, Its Forms and Changes  
Van Nostrand, Reinhold The New Elementary School Science

Miscellaneous: Life Science Nomenclature Cards for Plants and Animals  
(50 sets)

Experiment Cards and Boxed Sets:

Elementary Science, Intermediate Science, Magnets,  
Electricity, Plants, Animals, Earth Science,  
Weather, Planets, Solar System

<u>Objective</u>	<u>Procedure</u>	<u>Materials</u>
Energy		
Demonstrates a device to show the effect of moving water.	Oral lesson. Child observes toy boat in still, then moving water (water blown with straw).	Pictures, Straw, Large Basin, Toy Boat, Water Wheel, Cardboard, Nail, Clear Contact Paper
Demonstrates that moving air can be a working force.	Oral lesson. Show pictures, discussion, making a pinwheel.	Pictures, Pinwheel, Stick, Cardboard
Demonstrate that an electromagnet can do work.	Oral lesson. Make an electromagnet, discussion.	Dry Cell Battery Nail, Wire, Paper Clips, Paper
Demonstrates electricity as energy.	Oral lesson. Make a circuit with a battery, wire, and light bulb. Interrupt circuit, energy stops.	Dry Cell Battery Wire, Flashing Light Bulb
Demonstrates that a magnet can do work.	Oral lesson, demonstration.	Bar Magnet, Iron Filings, Paper, Paper Clips

Third Grade Curriculum  
Science

(Energy Continued)

Demonstrates differences between stored energy, motion energy, electrical energy.

Discussion, demonstration, pictures. Child classifies each.

Pictures, Ball, Can of Water, Skate

Demonstrates differences among a variety of simple machines. Identifies purpose of each.

Oral lesson, discussion. Demonstration of lever, screw, pulley, inclined plane, balance.

Demonstrates that light energy from sun can change to heat energy and sun is chief source of energy on Earth.

Oral lesson and discussion. Child uses sun's light to burn paper. Place over tin cup of water in sun, one in shade. Use thermometer to check for temperature of each.

Sun, Magnifying Glass, sun Paper, Thermometer, Water in Foil Cups

Demonstrates that chemical changes can generate energy, but no physical changes.

Oral lesson. Discussion. Mix chemicals together which are room temperature. They become hot upon mixing together. Show pictures.

Skilcraft Chemistry Set, Pictures, Red Car Blue Car, Marbles

Plants

Demonstrate difference between deciduous, evergreen trees.

Oral lesson, teacher shows samples during winter months of both kinds, than also during late spring or early fall.

Tree Samples of twigs with and without leaves

Identifies green plants as makers of food for all living things (producers), and along with this demonstrates the food chain.

Oral lesson, discussion.

Sample of Food Food Chain Chart

Demonstrates needs of plants: light, water, air, soil and nutrients.

Child does individual experiments to prove need for each. Two plants are needed for each proof.

Live Plants, at least 6, in pairs of 2

(Plants Continued)

Demonstrates how water gets from one place to another in a stem of a plant - osmosis.	Child performs experiment of celery in colored water.	Celery, Dye, Water
Demonstrates process of photosynthesis.	Oral lesson, discussion.	Montessori Photosynthesis Chart
Demonstrates characteristics of plants and their "tropisms", both positive and negative: geotropism phototropism hydrotropism	Child does experiments for each "tropism" - then observes and records results.	Plants in Pots, Water, Sun, Closet
Demonstrates that plants without chlorophyll do not need sun in order to grow.	Child cuts up mushroom plants in vermiculite, waters daily, puts in dark closet and observes results.	( Knife, Mushrooms, Vermiculite, Closet
Demonstrates that plants in different geographical zones have had to adapt to suit their environment.	Oral lesson, discussion.	Pictures of Plants in Different Geographical Locations
Demonstrates the evolution of plants on earth since their inception on earth.	Oral lesson, discussion. Afterwards, child places plants on proper place on time line.	Montessori Evolution Time Line, Individual Pictures, Blank Time Line
Demonstrates differences between monocotyledonous and dicotyledonous with respect to seeds, leaves, stems, flowers and	Child compares and notes characteristics initially for each. Summary and conclusion lesson follows.	Specimens of Each Kind, Knife, Trowel



(Plants Continued)

Demonstrate variety of ways seeds are dispersed.

Children draw on personal experiences with seed dispersal. Oral lesson/discussion.

Specimens of a Variety of Seeds

Demonstrates uses of plants for man in industry.

Children view chart, discuss. Oral lesson. Specimens discussed. Further research by children.

Specimens  
Montessori Plant Chart, Pictures of Plants Used in Industry

Demonstrates common "vegetables" and fruits, and classifies them according to which part of the plant they come from: leaves, flower, stem, root or seeds.

Oral lesson, discussion. Discuss plant chart. Child lists further examples.

Montessori Plant Chart

Classifies fruit according to dry or fleshy, simple or complex, accessory, aggregate, drupe, pome, berry, false berry, or pepo.

Oral lesson and discussion. Children examine specimens, look for similarities, then classify.

Manipulative Activity, Actual Specimens, Dairy Council Pictures, Other Pictures

Demonstrate the difference between angiosperms and gymnosperms, and their characteristics.

Oral lesson, discussion.

Specimens of Each, Pictures of Each

### Animals

Classifies both vertebrate and invertebrate animals according to their individual characteristics and likenesses.

Oral lesson, discussion. Child has chart placed at top of work space. Animals for each class are placed directly below that class's heading.

Animal Kingdom Chart, Plastic Toy Animals, Both Vertebrate and Invertebrate, Small Pictures of Vertebrates and Invertebrates



(Animals Continued)

Demonstrates animals place in the food chain (primary and secondary consumers, decomposers).

Oral lesson, discussion.  
Children draw their own food chains and label.

Chart of Food Chain

Demonstrates concept of adaptation, protective coloration, and mimicking.

Oral lesson, discussion.  
Specimens shown for discussion. Story of "Peppered Moth".

Preserved Specimens, Pictures of Peppered Moth

Demonstrates adaptation of animals to their geographical zones.

Oral lesson, discussion.

Pictures of Animals in Their Natural Environments: Arctic, Temperate, Tropic

Demonstrate evolution of animals on earth since their first inception on earth.

Oral lesson, discussion. Child places pictures of extinct and current animals on blank chart.

Montessori Evolution Time Line  
Pictures of Extinct and Current, Vertebrates and Invertebrates

Demonstrates uses of animals for man, both today and in the past, both personally and industrially.

Oral lesson, discussion.  
Discuss pictures. Children make lists.

Pictures of Early Man and Animal Products He Used, Pictures of Modern Man and Some He Uses.

Demonstrates the differences among the terms herbivorous, carnivorous, omnivorous, viviparous, oviparous.

Oral lesson, discussion.

Pictures of Animals Eating Plants, Animals or both. Pictures of eggs, and live newborn young.

Third Grade Curriculum  
Science

Human Nutrition

Recognizes values of six basic food groups.	Oral discussion, use of graphs booklets, and charts from Dairy Council. With graphs, child compares and contrasts nutritive values of each selected food item.	Dairy Council Packet
Develops nutritious sample breakfasts, lunches and dinners, based on the six food groups.	Child lists menus and collects pictures from magazines. Pastes pictures on a chart for discussion with rest of class.	Old Magazines, Scissors, Paste, Dairy Council Packet
Understands that vitamin deficiencies have caused maladies for man in the past, and that in third world countries this still happens today. Understands, too, that much research done over many years is why man knows so much today.	Child reads about scurvy, rickets, night blindness, beri-beri and other maladies - how they were identified, researched and treated.	Dairy Council Packet
<p>Earth and Weather</p>		
Demonstrates differences between seasons.	Oral discussion. Show pictures from different times of year. Have children list characteristics of each season.	Pictures
Demonstrates the reasons for different numbers of hours of night and day during different seasons: equinox solstice	Oral lesson, discussion. Globe sits on table, flashing light held still globe is spun slowly and gently.	Globe, Flashlight
Demonstrates that the position of the sun and the revolution of the earth are what causes seasons.	Same as above.	Globe, Flashlight, Piece of Colored the Tape

(Earth and Weather Continued)

Demonstrates that the seasons in the northern hemisphere are the exact opposite from the seasons in the southern hemisphere.

Same as above.

Same as Above

Demonstrate that the sun is the chief source of energy on Earth.

Discussion. Child investigates how heat is trapped in a plastic bag by placing 2 thermometers in the sun. One in a bag, the other not in a bag. Compare to Earth's atmosphere. Investigate how much on earth is dependent upon the sun. Show pictures. Child makes exhaustive lists of all he can think of.

Thermometers,  
Plastic Bag,  
Pictures

Demonstrates the reasons for the different phases of the moon.

Oral lesson.

Moon Chart With  
Phases

Demonstrates the movements and positions of the sun, moon and earth. Also demonstrates eclipses, both solar and lunar.

Children act out the parts of sun, moon, and earth for demonstration. They stop whenever there is an eclipse.

Children

Demonstrates awareness of daily weather patterns as far as:  
temperature  
precipitation  
sun  
clouds  
breeze

Oral lesson. Child investigates weather on a daily basis, then places appropriate pictures and gauges on the chart.

Daily Weather  
Chart With Re-  
movable Pic-  
tures, and Tem-  
perature Gauges



(Earth and Weather Continued)

Demonstrates differences in sizes, patterns, and heights of clouds in the atmosphere: cumulus, nimbus, stratus, cirrus, cumulonimbus, cirrostratus, cirrocumulus, nimbostratus, cumulostratus. Also demonstrates what weather patterns will result upon seeing these formations.

Demonstrates characteristics of all three zones: Artic, Tropic, Temperate, and varying temperatures for each.

Understands how winds are formed: global local: trade winds, prevailing westerlies, polar easterlies, horse latitudes, monsoons, local sea-shore winds; also understands high pressure and low pressure and weather each brings; understands "fronts".

Oral lesson. Pictures and chart are discussed, children draw their own charts.

Oral lesson, discussion with pictures. Child places sun at a particular place on chart; Tropic of Cancer, Tropic of Capricorn, or equator. Then, child places colored strips (indicating freezing cold, cold, mild, warm, hot, or very hot) on the chart where they belong.

Pictures of Clouds, Chart of Heights of Clouds

Pictures, Zone Chart, Seasons Chart With Movable Colored Strips and Sun

Montessori Winds Charts, and Montessori Geography Chart, Montessori Working Winds Chart, Newspaper Weather Charts



(Earth and Weather Continued)

Understands terminology of evaporation, condensation.

Experiment: Boil water with cold glass plate held over it. Oral lesson, discussion. Child discusses each and records.

Water, Pot, Burner, Glass Plate

Understands the water cycle, and also how temperature can affect it.

Oral lesson, discussion. Child draws own water cycle.

Chart of Water Cycle

Space

Identifies all 9 planets in our own solar system by their proximity to the sun, their number of moons, their size, and their orbits.

Oral lesson, discussion. Children follow-up by drawing their own solar system on paper.

Solar System Ceiling Model

Recognizes that the length of any planets' orbit determines the length of one of its years.

Oral lesson, discussion.

Ladybird Book, Planets

Understands that orbits of Neptune and Pluto are sometimes crossed and why.

Oral lesson, discussion.

Pictures of Orbits of Neptune and Pluto

Understands that gravity, atmosphere, and physical composition are different for each planet.

Oral lesson, discussion.

Ladybird Book, Planets

(Earth and Weather Continued)

Understands the magnitude of the Universe based on our solar system being only one among millions in our galaxy, and our galaxy being only one among billions in our universe.

Oral lesson, discussion.

National Geographic Pictures, With Each Picture Blown Up Larger to Get to the Next Step

Matter

Demonstrates matter, defines matter as having weight, taking up space, having capability of being neither created nor destroyed.

Oral lesson, experiments.

Specimens of Matter: Water, Beaker, Scale, Bottle, Funnel, Play-doh, Brick, Hammer

Demonstrates three states of matter; classifies variety of classroom materials, supplies, and equipment according to all three states.

Oral lesson. Child makes lists for each of the three states of matter.

Assorted Classroom Supplies and Materials

Demonstrates that matter can change from one state to another.

1) Shake aerosol can to hear liquid (spray air deodorizer).  
2) Heat ice cube in pan to liquid - keep heating until liquid evaporates. 3) Put perfume on child.

Ice Cube, Candle or Burner, Air Deodorizer, Perfume

Demonstrates terms elasticity and rigidity, viscosity, and fluidity.

Child compares and contrasts each.

Rubber Band, Glass Rod, Honey, Water

(Matter Continued)

Demonstrates elements in compounds and the molecules they form: water, salt, ammonia, carbon dioxide, carbon monoxide.

Child refers to demonstration cards to build models of familiar compounds. (Each color represents a different element.

Play-doh, Assorted Colors, Toothpicks, Demonstration Cards, Labels

Demonstrates formation of atoms with energy rings, nuclei, protons, neutrons.

Oral lesson originally. Child builds models of atoms while referring to periodic table of elements.

Handmade Manipulative Materials for Building Models of Atoms: Energy Rings, Protons, Nuclei, Neutrons, Electrons; Periodic Table

Understands difference between a mixture and a compound.

Teacher performs experiments to show mixtures can be easily separated, while a compound cannot.

Iron Filings, Salt, Water, Nickel or Quarter, Stainless Steel Fork, Air



## EARTH SCIENCE OUTLINE- THIRD GRADE

### I The Atmosphere and its Phenomena

The child is introduced to the atmosphere and the phenomena of it. The materials and presentations are impressionistic and lead the child to further exploration of those areas that interest him for deeper study.

The concepts learned by the child are:

- A. The winds and why they form
- B. The formation and effect of high and low pressure
- C. The regular winds and variable winds
- D. The winds and their directions at the solstices and equinoxes.
- E. The winds formed by the sea.
- F. The local winds and land breezes
- G. The work of the winds in rain distribution
- H. The child works with constructing wind patterns at different times of the year on a map of the world.
- I. The work of the wind in forming marine currents and a study of the currents of the world.
  1. directions
  2. names
  3. characteristics of hot and cold currents
- J. The work of the wind in eroding rocks.

### II The Hydrosphere and its Phenomena

The child is introduced to these using impressionistic materials and presentations which lead him to further exploration of those areas of deep interest.

The concepts learned are:

- A. How rain forms e.g. clouds forced upon a mountain and cooling.
- B. How rain forms at sea.
- C. The child learns to perform experiments showing how warm air rises and evaporation takes place.



## EARTH SCIENCE OUTLINE FOR THIRD GRADE CONT

- D. The child learns to perform experiments showing how condensation is formed.
- E. The location of the most important rivers of the world and their names.
- F. The location of the major rivers and bodies of water on the North American continent and their names.

### III Geographical Nomenclature: see list attached for names learned

#### A. Earth and its parts

- 1. earth
- 2. parts of the earth
- 3. atmosphere
- 4. lithosphere
- 5. hydrosphere
- 6. barysphere
- 7. surface of the earth

#### B. Landforms

- 1. islands
- 2. reefs
- 3. coasts
- 4. low coasts
- 5. high coasts
- 6. irregular coastlines that project
- 7. irregular coastlines which bend in
- 8. relief forms
- 9. plains
- 10. parts of a mountain
- 11. Mountains in a group
- 12. parts of a mountain chain
- 13. valleys
- 14. parts of a valley

#### C. Hydrosphere

- 1. seas
- 2. water courses
- 3. parts of a river
- 4. parts of the course of a river

EARTH SCIENCE FOR THIRD GRADE CONT.

5. kinds of river mounths
6. the river basin
7. pooled water
8. lakes
9. glaciers
10. parts of glaciers
11. parts of an alpine glacier
12. kinds of crevasses
13. moraine
14. precipitaition
15. kinds of rain

D. Geo-Dynamics

1. Volcano
2. volcanic products
3. kinds of volcanoes
4. pseudovolcanic phenomena

**The River: Preliminary Work of Water**

**The River Model**

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Purpose	Awareness that the work of the water is to carve, carry, and deposit
Material	River model (base, aluminum foil, water soluble clay, newspaper, water source--hose or watering can). Smooth pebbles of varying sizes, one large enough to be a boulder. If inside, large tray to hold water and debris. Colored sands (red, white, natural, black). Container to hold the sediment. Water.
Child's work	Repeat as for the presentation. Learn about sedimentation, water-polished rock, and other features formed by the work of water. Take trips to see a river and examine the associated topography. Collect pictures of rivers. Explore the presence of the idea of a river in literature, art, and music.

**Preparation:**

Construct the river base as follows:

Using a large wooden base (or this can be done outside using a mound of earth).

Cover the base with plastic to protect the base.

Use newspaper to form the major contours making it higher on the sides and forming a channel in the center. The bottom should flatten out more so that a delta can form.

Put of layers of clay to form the following features: natural bridge, cave, gorge walls, waterfall. (It is recommended to get a fairly soft clay so it is easy to mold)

Use wet sand to cover over the clay.

Hide pebbles and larger rocks inside the sand. A spray bottle can be used to wet the sand as you work.

To set the model up, place a large flat try at the bottom of the model. This will catch the run off and act as the "sea".

**Presentation:** This can be done in the classroom or outside

Gather children around the river model.

Here is a model of some area of land. We are going to make it rain and observe what happens.

Begin the water source flowing observing the formation of run off and how the water begins carving and carrying the earth away. As it continues, note the formation of the waterfall, natural bridge, and cave. Also point out that the soil is being carried into the "sea".

We can see the water has formed a river. The water has carved and carried the soil.

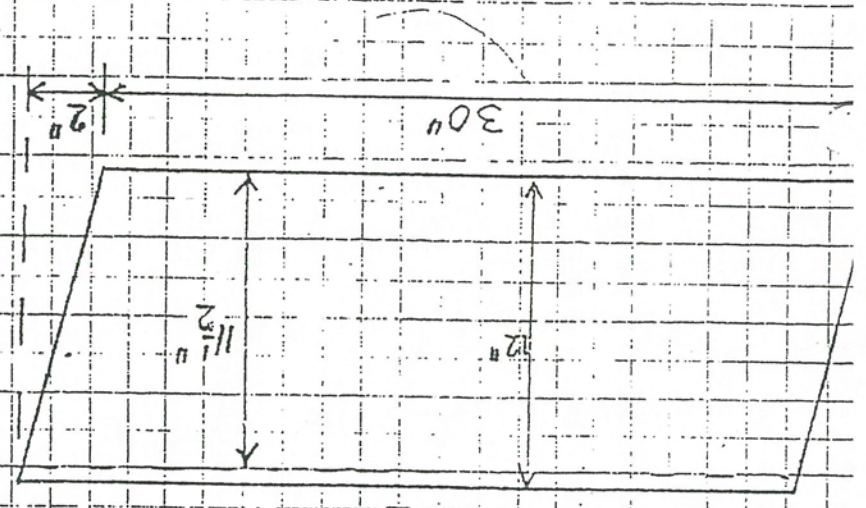
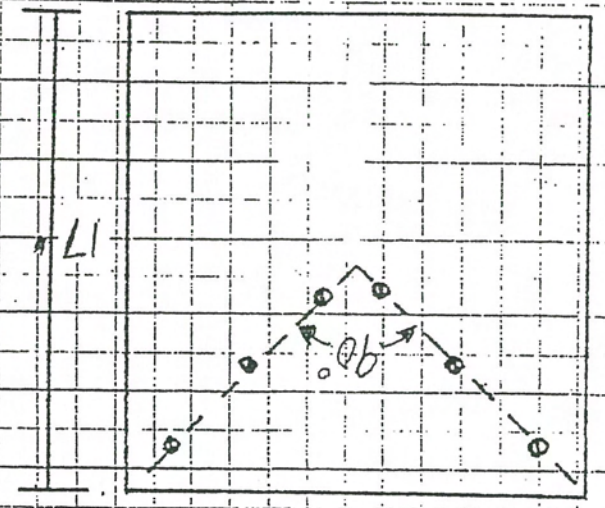
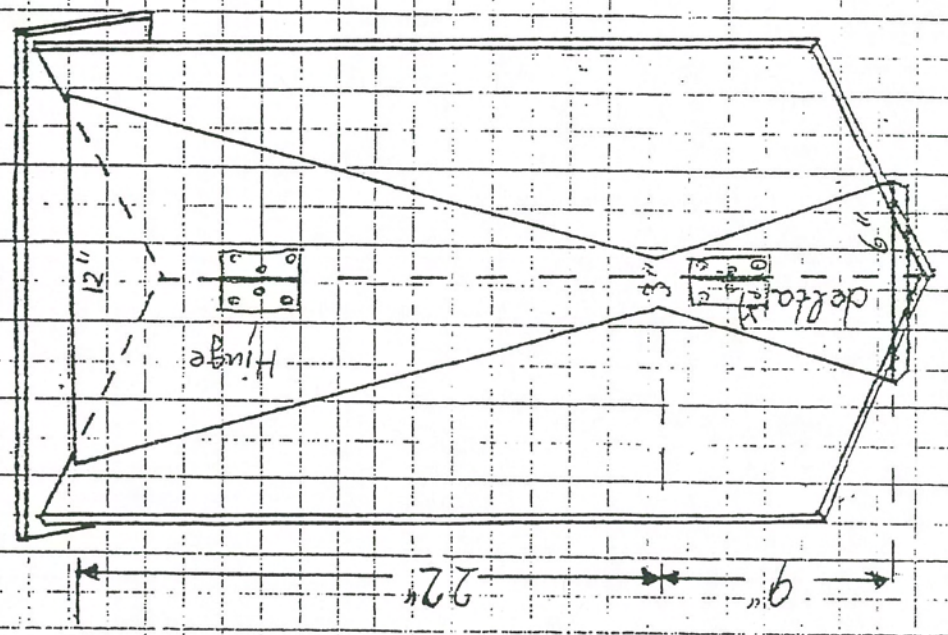
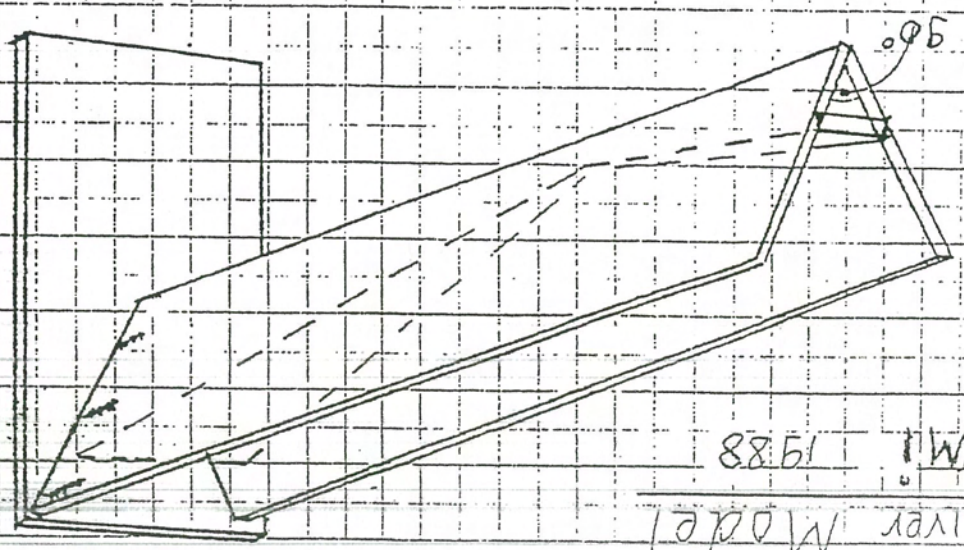


gg handout 7/91

River Model  
W.M. 1988

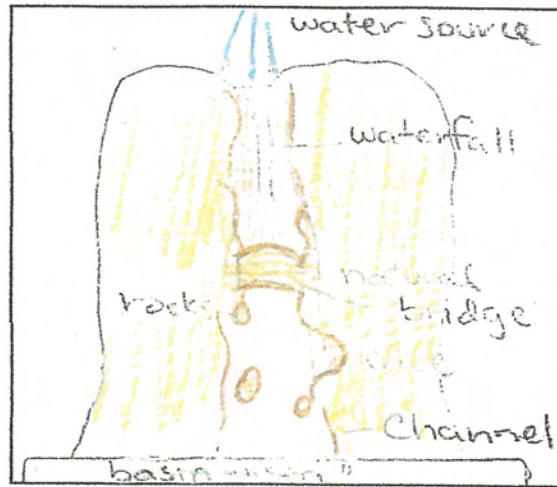
- Material:
- 1/2" Ply wood
  - 1 x 3 : 2 x
  - 1/2 x 1/2 : 1 x
  - Polyurethane
  - 4 screws 2"
  - (brass)
  - 2 hinges (brass)
  - 1/8" Masonite
  - 1' x 3'

at the end of the river flaps out into a horizontal plane; insert a bit triangular sheet of masonite into the V-shaped structure to create 2 different slots



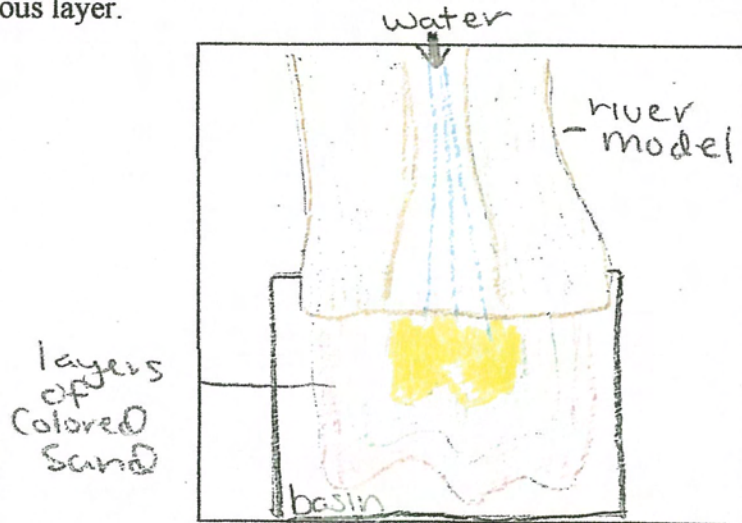
2 pieces: one 12" one 11 1/2"





\* labels are for instructor information only, not part of presentation.

Show how the earth is deposited in layers as it is carried to the river delta.  
 Sprinkle colored sand in a thin layer along the river channel.  
 Place a small basin at the bottom of the river model and then start the water again.  
 Observe that the colored sand is deposited in a thin layer over the previous sand.  
 Repeat with several different colors of sand.  
 Observe that with each new rain, the soil is deposited in a thin layer on top of the previous layer.



\* see note above

So the water also deposits soil to new locations on earth. The water helps to create the features of the earth.  
 The children can now work with the river model on their own.

### A River Flows from the Highlands to the Lowlands

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Purpose	Awareness that rivers on earth flow from high to low places.
Material	Charts 12
Child's work	Locate the names and sources of the main rivers pictured on Chart 12. Make maps showing location and names of rivers.

**Presentation:**

Gather the children.

We are talking again about rivers. We know a river is composed of water and that water moves from up to down. On our planet, we have high areas like the mountains and low parts like the sea. So rivers will always flow from the high parts down to the low parts.

Show chart 12



This world map is colored to show where the high parts and the low parts are on our planet. The brown areas are the highest parts.

The yellow parts are the foothills, not quite mountains but higher than the sea.

The lighter green is the coastal plane. This sits just above sea level.

The darker green is sea level.

So we can see that water will flow from the higher brown parts down to the dark green parts.

Point out several rivers (ex. Mississippi) and indicate which direction they would flow.

So rivers will always flow from wherever the land is highest to wherever the land is lowest.



**Erosion by Rain**

- Purpose Awareness that water washes away (erodes) the soil; however, vegetation holds the land and prevents erosion.
- Material Two prepared hills, one covered with wet sand, one covered with wet sand and vegetation. Sprinkling can for rain source. Model of earth pillar covered with wet sand. Chart 19.
- Child's work Repeat as for the presentation. Collect pictures.

**Preparation:**

Hills -In 2 pans, make hills of soil (potting soil, dug up from outside)  
 In another pan, place a clod of grass dug out from outside

Earth Pillar- In a pan, place a mushroom shape of clay. Pack a mound of sand over top of the clay. Spray with water so it is packable.

**Presentation-**

Gather children.

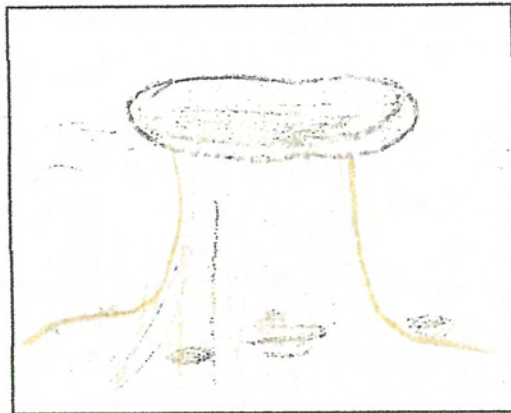
Today we are going to look more at the work of water.

Make it rain on the hill with out vegetation and observe that a lot of soil washes away. *See illustration next page*  
 Here we see that the rain falling on this hill is carrying quite a bit of soil away with it. The water at the bottom is very muddy.

Place the grass clod over top of the other hill. Make it rain on the hill and observe that the very little soil is washing away. *See illustration next page*

This time, the water running off the hill is much cleaner. The vegetation is helping to hold the soil in place.

Show chart 19 (earth pillar)

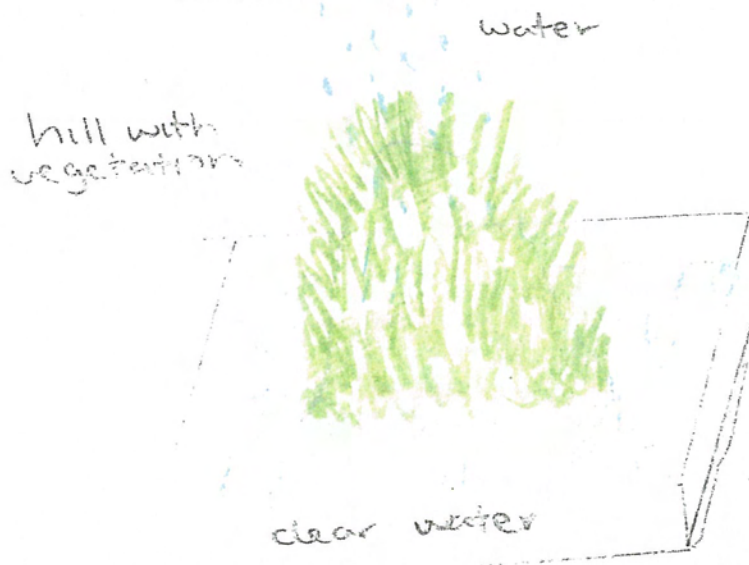
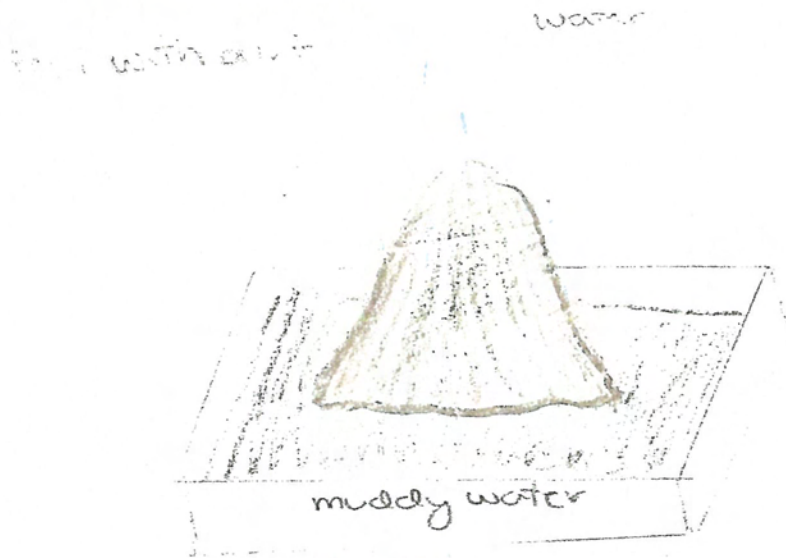


In some places, there is a sturdier rock protecting soil below it. When it rains over many years, the rock acts as an umbrella and you can get earth pillar formations.



Make it rain on the sand hill and observe the formation of the earth pillar.

You can repeat these demonstrations yourself and see if you get similar results.  
Children can now work on their own.



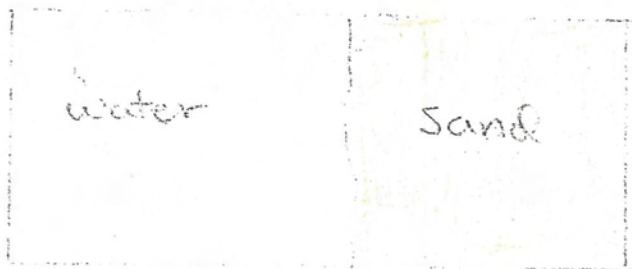
**Erosion by Waves**

Purpose	Awareness that water erodes the land along the seacoast.
Material	Flat metal tray containing model of seacoast (cave, natural bridge, inlet), covered with wet sand. Implement for making waves. Nomenclature booklets of land and water forms.
Child's work	Make models. Collect pictures. Visit any of these forms in nature.

**Preparation:**

On one side of a large pan, form clay to show different formations. Sea cave, inlet etc. Cover with wet sand.

Fill the other half of the pan with water.



**Presentation:**

Here we see a model of a seacoast and I'm going to make waves and we will see what happens.

Use whatever implement you have to make waves.



Children observe the sand washing away from the coast. Point out the features that are exposed as the sand washes out.

## II. Biological Science

### A. Botany

1. Needs of the plant and associated experiments
  - (a) study of one need at a time, also combination of several needs at one time
  - (b) emphasis on controls
  - (c) mineral intake experiments - study of one at a time and then in combination
2. Function of leaves
  - (a) photosynthesis
  - (b) kinds of leaves - simple, compound, etc.
  - (c) leaf arrangement on stem
  - (d) parts of leaves - stomata, veins, layers, etc.
  - (e) shapes of leaves - palmately, compound, etc.
  - (f) special leaves and their function
  - (g) pines, cactus, and other succulents - related experiments
3. Function of roots
  - (a) hydrotropism - experiments
  - (b) phototropism - experiments
  - (c) geotropism - experiments
  - (d) parts of a root
  - (e) kinds of roots
    - top versus fasciculated
  - (f) storage, anchoring and propagation
  - (g) varieties of roots
    - air roots
    - pillar roots
  - (h) collaboration between roots and leaves insofar as their position is concerned
4. Function of stems
  - (a) support
  - (b) herbaceous versus woody stems
  - (c) transportation of food and water - related experiments
  - (d) bark as protection
  - (e) parts of stem - phloem, etc.
  - (f) kinds of stems - rhizomes, tubers
5. Function of flower
  - (a) parts of flower and functions of each part
  - (b) dissection of flower
  - (c) terminology - e.g., complete, incomplete, perfect, imperfect
  - (d) position of ovary in flower and related terminology
    - hypogynous, etc.
6. Fruit
  - (a) parts of fruit - endocarp, etc.
  - (b) succulent versus dry fruit: berry, false berry, drupe, pome, aggregate, multiple
  - (c) 'vegetables' as fruit
7. Seed
  - (a) examination and terminology of monocots and dicots, ex. endosperm, testa, etc.
  - (b) germination of seeds and study of progression of growth
  - (c) dispersal of seeds



8. Classification of plants
  - (a) monocotyledonous plants
  - (b) dicotyledonous plants
9. Uses of plants
  - (a) edibility of roots, stems, leaves, flowers, fruits, seeds
  - (b) commercial uses of parts of plant

## B. Zoology

1. Distinction between vertebrates and invertebrates
2. Study of internal and external parts of vertebrates and invertebrates, terminology
3. Investigation of vertebrates and invertebrates, related to:
  - (a) environment (ecosystem)
  - (b) movement
  - (c) food consumption
  - (d) reproduction
  - (e) natural enemies
  - (f) care of young
4. Classification of vertebrates
  - (a) fish
  - (b) amphibians
  - (c) reptiles
  - (d) birds
  - (e) mammals
5. Classification of invertebrates
  - (a) protozoa
  - (b) porifera
  - (c) coelenterates
  - (d) annelids
  - (e) molluscs
  - (f) arthropods
  - (g) echinoderms
6. Dissections of vertebrates and invertebrates
7. Related experiments and field study
8. Specific terminology
  - (a) herbivorous, omnivorous, carnivorous
  - (b) predatory
  - (c) symbiotic
  - (d) commensalistic
  - (e) parasitic
  - (f) mutualism, etc.
9. Investigation of life cycles of specific vertebrates and invertebrates

## C. Ecology

1. Study of specific ecosystems
2. Interdependence of: man, animals, vegetations, air, water  
sun and land
3. Cosmic task of each worldly component
4. Terminology - abiotic versus biotic
5. Specific food chains
6. Practical applications and respect for man's environment:
  - (a) pollution
  - (b) preservation of natural resources
  - (c) endangered and extinct species

BOTANY ACTIVITIES/MINERAL NEEDS	✓	LIPIDS/VITAMINS & MINERALS	
VARIETY & FUNCTIONS OF LEAVES	✓	PROTEINS	
ROOTS	✓	ENERGY & RESPIRATION	
STEMS	✓	NUCLEIC ACIDS	
FLOWERS	✓	THE GENETIC CODE	
BOTANY CLASSIFICATION: FRUITS/SEEDS	✓	CHROMOSOMES	
PLANT CLASSIFICATION: DIVISIONS	✓	CELL DIVISION	
TRACING THE GENEALOGY W/TIMELINE	✓	HEREDITY	
CREATING THE TREE OF CLASSIFICATION	✓	ECOLOGY: CONCEPTS (9 TO 12)	
ANIMAL CLASSIFICATION: DIVISIONS		KINDS OF ECOSYSTEMS	
TRACING THE GENEALOGY W/TIMELINE		NUTRIENT CYCLES	
CREATING THE TREE OF CLASSIFICATION		FOOD CHAINS & WEBS	
AGES 10 TO 12: MICROBIOLOGY		HOW SPECIES INTERACT	
THE CELL: PLANT & ANIMAL CELLS		INDEPENDENT RESEARCH	
MOLECULAR MOVEMENT			
TISSUES & ORGANS			
CHEMISTRY OF LIFE			
CARBOHYDRATES			



## RECORD--GEOGRAPHY

AGES 9 TO 12

EARLY DISCOVERIES	✓	DRIFTING CONTINENTS/PLATE TECTONICS	
MODERN ASTRONOMY/THE UNIVERSE	✓	MOUNTAINS/BENDING & BREAKING	
THE NATURE OF MATTER/INSIDE THE ATOM	✓	ROCKS/MINERALS & GEMS	
FORCES & MOTION/GRAVITY	✓	THE ATMOSPHERE/CLIMATE	
FLUIDS & ELASTICITY	✓	WINDS & STORMS/TYPES OF CLOUD	
MACHINES	✓	RAIN & SNOW/WEATHER FORECASTING	
ENERGY & HEAT	✓	RIVERS/LAKES & SWAMPS	
GASES & HEAT TRANSFER	✓	OCEANS & SEAS/THE SEASHORE	
LIGHT/NATURE OF LIGHT	✓	WORK OF ICE	
THE EYE/ELECTROMAGNETIC WAVES	✓	SHAPING THE EARTH	
SOUND/HEARING SOUND	✓	POLAR REGIONS & THE TUNDRA	
STATIC ELECTRICITY/ELECTRIC CURRENTS	✓	TEMPERATE WOODLANDS/GRASSLANDS	
MAGNETISM/COMPUTERS		DESERTS/TROPICAL RAIN FORESTS	
RADIOACTIVITY/FISSION & FUSION		ECONOMICS: CONCEPTS	
ELEMENTS & COMPOUNDS		FARMING/MATERIAL & MINERALS	
THE GLOBE/KINDS OF MAPS		ENERGY/TRADE & INDUSTRY	
THE EARTH IN SPACE/GRAVITY/STRUCTURE		MONEY & DEBT/EDUCATION & HEALTH	
EARTHQUAKES & VOLCANOES		ECONOMICS PROJECT	