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Life Science

Organization of Living Things

By: Angelica Bigelow & Carly Lehman

Unit Overview:

Grade Level: Kindergarten

Benchmarks:

Strand 3: Use scientific knowledge from the life sciences in real world contexts.

Standard 2.1: The Organization of living things

Ideas and contexts:

- Animals can be classified on the basis of physical characteristics. (Such as backbone, skin, shell, limbs, fur, scales...)
- Animals can be classified in to mammals, amphibians, reptiles, birds, and fish.
- Animals have certain characteristics that help them to survive in their habitat.
- Animals that have similar characteristics may live in the same sort of habitat.

Practices:

- Become aware of the similarities and differences between different animals.
- Generate questions about the observable characteristics of animals.
- Discover different ways to compare and classify different animals.
- Compare and classify familiar organisms on the basis of observable physical characteristics.
- Construct a chart related to the classification of animals.

Our lessons are simple and based around discovery learning which is most developmentally appropriate for kindergarten age children. They use children's ideas and prior knowledge about animals to generate concepts relating to classification and sorting.

Activity One: Benchmark 1: Generate reasonable questions about the world based on observation.

Lesson: Students will be observing physical characteristics of animals in books. Then, they will be generating questions about the purposes of those physical characteristics.

Activity Two: Benchmark 2: Develop solutions to problems through reasoning, observation and investigation.

Lesson: Students will be reviewing the physical characteristics that they observed during the last lesson. Then, they will be suggesting ways to sort the animals into groups as we do it as a class.

Activity Three: Benchmark 5: Develop strategies and skills for information gathering and problem solving.

Lesson: After discussing the process of separating animals into groups and categories, the students use animal magazines to cut pictures of animals from. In small groups, the students make up categories for sorting the animals. After presenting their reasoning for sorting to the class, they watch a movie about how scientists classify animals into five categories.

Activity Four: Benchmark 6: Construct charts and graphs and prepare summaries of observations.

Lesson: Read an animal book and discuss the different types of classification systems. Using a T-Chart, the students place pictures of animals under each category.

LESSON ONE:

Angelica Bigelow

Grade Level: K-1

Subject: Science

Title: Observation of living things

Lesson Objectives:

- For the children to observe the physical characteristics of living things.
- For the children to notice similarities and differences in the characteristics of living things and record their observations.
- For the children to generate questions about the reasons for animals similarities and differences (habitat requirements)

Benchmarks: Generate reasonable questions about the world based on observations.

- Strand III.2 The Organization of Living Things: All students will use classification systems to describe groups of living things; compare and contrast differences in the life cycles of living things; investigate and explain how living things obtain and use energy; and analyze how parts of living things are adapted to carry out specific functions.
- Elementary Benchmark Content Standard 2: 1. Compare and classify familiar organisms on the basis of physical characteristics.

Key concepts:

1. Animals have certain characteristics that help them to survive in their habitat.
2. Animals that have similar characteristics may live in the same sort of habitat.
3. Sometimes animals are grouped by their physical characteristics.

Materials:

1. A children's reference book for each of the classifications of animals.
2. Paper/pencils
3. A large poster board

Introduction to lesson:

Discuss how we can observe many things in nature and about animals. Ask for suggestions about what characteristics some animals they have possess. (How many legs? Fur? Scales? Claws?) Tell them that we will be using books to find out more about the characteristics that animals have. Next, tell them that each group will be looking at different animals and trying to find similarities and differences between the animals in their books.

Lesson Steps:

1. Put the children in small groups. Give books that focus on a different animal types to each group.
2. Based on the cover of the book, have the groups formulate questions about the animals they will be observing. Let a few children ask out loud. Tell the others that they will have to look in their books to find the answers.
3. Give them 10 minutes to look through their books and observe all of the pictures.

4. Go through each group and ask for their observations and questions about why certain animals look the way they do.
5. After each group has talked about what they have observed, ask them why they think that type of animal possesses those physical features. How do these traits help them to survive? Record their answers on a poster board without separating findings. Draw or place a picture of each animal's characteristics next to the word you wrote. You may have to do this after the group time.

Closing: Talk about all of the different traits that each animal has and how it helps them survive. Go over all of the observations. Tell them that we have found many different animals with all different sorts of characteristics. Observe that there are a lot of different types of animals and that it would be difficult to remember them all. Tell the children that one way people organize animals is by classifying them based on the things we observed today. Tell them that next time we will be figuring out a way to classify or sort some animals.

Assessment: Record suggestions, questions, and observations for assessment of understanding.

LESSON TWO:

Angelica Bigelow

Grade Level: K-1

Subject: Science

Title: The Classification of Animals

Lesson Objectives:

1. For the children to discover a way to classify animals based on physical characteristics.

Benchmarks: Develop solutions to problems through reasoning, observation, and investigation.

- Strand III.2 The Organization of Living Things: All students will use classification systems to describe groups of living things; compare and contrast differences in the life cycles of living things; investigate and explain how living things obtain and use energy; and analyze how parts of living things are adapted to carry out specific functions.
- Elementary Benchmark Content Standard 2: 1. Compare and classify familiar organisms on the basis of physical characteristics.

Key Concepts:

- There are many ways that animals can be classified.
- Animals are often classified by physical characteristics.

Materials:

1. 3-5 medium sized pictures of animals from each classifiable group.

Introduction to lesson:

Review previous lesson. Tell them that we observed that many animals have different sorts of characteristics. Say that people have many different characteristics as well. Tell them that sometimes, we sort animals into groups based on these characteristics. Our job will be to find ways to sort these animals.

Steps to lesson:

1. Have them review the list of characteristics that were recorded from the last lesson.
2. Have them suggest ways that we could sort the animals and record.
3. As a class, go through each card and sort it into the suggested group.
4. Talk about if the groups they sorted the animals into make sense and how they could fix any problems that came up.

Closing: Discuss what we have done over the past two days.

Assessment: Evaluate if the students were able to develop solutions when asked where certain animals should be sorted. Use a participation chart.

LESSON THREE: www.ofcn.org

Carly Lehman

Grade: K-1

Subject: Science

Title: Classification of Animals

PURPOSE OF LESSON: Students will be classifying animals into categories in order to learn about scientific reasons for classifying animals.

TRANSITION INTO LESSON: Discuss with the students the process of separating animals into groups or categories so that they are more easily studied and discussed by scientists/others. Explain that the activity will help them learn about the categories of animals.

MATERIALS NEEDED:

Teacher: Film, filmstrips, or slides about animals (all five categories).

Students: Magazines with pictures of animals and scissors.

PROCEDURES:

- 1.) Divide the students into groups of 3-5 children.
- 2.) Give them the materials and instruct them to cut out pictures of animals.
- 3.) Have them sort the animals into 5-7 categories.

CLOSURE: Ask each group to present/explain their reasoning for sorting the animals they way they did. Then watch movie/filmstrips about how animals are really classified and why.

SIMPLIFICATIONS: Reduce the number of categories to sort by.

EXTENTIONS: Have them sort the animals in more than one way.

ASSESSMENT: What characteristics did the children notice about the animals and how did they sort them.

LESSON FOUR: teachers.net

Carly Lehman

Grade: K-1

Subject: Science

Title: Classification of Animals

PURPOSE OF LESSON: For the students to organize their data on categorizing animals.

TRANSITION INTO LESSON: Read a book about animals and discuss the different types of classification of animals.

MATERIALS NEEDED:

Teacher: Book about animals

Students: T-Charts, pictures of animals, and tape.

PROCEDURES:

- 1.) Hold up an animal and have the children take turns decided where it belongs on the T-Chart (i.e. Bird or Fish)
- 2.) Have them place the picture of the animal on under the category.

CLOSURE: Talk about the categories and characteristics of each.

SIMPLIFICATIONS: Only focus on two animals per day (fish and birds T-chart one day and then a reptiles and amphibians another day)

EXTENTIONS: Using what they have learned, have the students make flip books about the categories of animals (i.e. Who am I? with a description of the animal/category and then a picture of the animal/category described on the second page).

ASSESSMENT: What did the students say to indicate they understood the reasons for categorizing.

Organization of Living Things

By: Kate Bera, Eric Closson, & Kyle Martin

Activity # 1 – Grade Level 2: Benchmark #1

Ideas and Context:

When exploring different types of animals with dissimilar characteristics, young inquiring minds often ask, “How are different animals classified”? Considering the 2nd grade audience being taught, it’s best to organize and classify animals according to their distinct physical attributes. In general, most animals are categorized in five separate groups: Mammals, Fish, Birds, Reptiles, and Amphibians. This science idea exhibits relevance in several organizational contexts. At best, it reflects how we can organize by many characteristics and physical attributes are simply one form of classifying.

Practices:

In the activity, students will observe different kinds of animals to ultimately discover how animals with dissimilarities can be grouped. Their grouping will be based upon physical characteristics, leading to how science best categorizes animals on earth. The combination of their observations and inquiry will teach students to classify animals scientifically.

www.lessonplanet.com/science/animalclassification

Within the activity, students will be asked to view different photos representing animals on earth. Once reviewed, students will then begin to categorize the pictures of animals according to distinct physical characteristics (feathers, fur, scales, etc.). Once groups are situated the instructor will review each classification, being sure to draw connections between the names of each group and how they are classified. As a group, students will review the names of all animals to assist students in recall and better familiarize themselves with the animals that surround us.

Activity # 2 – Grade Level 5: Benchmark #2

Ideas and Context:

When classifying living things, it is often times problematic when mutations of animals and other living organisms arise, ultimately causing a new species. Not only can organizing them according to attributes be difficult, but also one may not be sure of how and where to place specific living thing accordance to others, alluding to possibly starting an entire new classification. This scientific dilemma has relevance for a number of reasons, mainly pertaining to how parts of living things are adapted and used in relation to comparable living organisms.

Practices:

In this activity, students will compare and contrast mutations of animals and their originators to compile a list of similarities and differences. Their findings will be supportive of external physical characteristics as well as internal physical characteristics, paying close attention to number of limbs, color of skin, and any other additions or subtractions of major organs. These detailed observations will help formulate a solution to the problem of how to best categorize mutated living organisms.

www.scienceinschools.com/lessonplans/grade5/animals

Within the activity, students in groups of two will observe one standard frog and compare it to another frog with considerable mutations. While investigating through dissecting, the recorder will write the similarities and differences amongst the two frogs, mostly noticing physical attributes. Once a considerable list has been comprised, students will determine whether or not it would be significant to classify the frog among its amphibious counterparts or distinctively classify it as its own.

Activity # 3 – Grade Level 5: Benchmark #3

Ideas and Context:

There are four organs that are found on plants, roots, stems, leaves and flowers. The primary function of the roots is to absorb and store water and anchor the plant in place. The primary function of the stem is to move water and minerals up from the roots and support the plant above ground. The main purposes for the leaves are to make food for the plants. Finally, the main function of the flower is to help make new plants by producing pollen to fertilize other flowers.

Practices:

In this activity the students will manipulate simple devices that aid observation and investigation. The students will use a magnifying glass to observe the different plant parts up close. The magnifying glass will help the students to make observations about each plant part and their functions.

<http://school.discovery.com/lessonplans/programs/plantparts/>

In this lesson, the students will be working with and observing various market-fresh vegetables. The students will identify the structure and function of roots, stems and leaves. The students will identify the parts of a plant by looking at an entire plant or a part of a plant. The students will ultimately discuss with hopes to understand the importance of plants for animals' (humans') existence.

Activity # 4 – Grade Level 3: Benchmark #4

Ideas and Context:

Humans are a species that have variation. We all come in different shapes, sizes and colors. There are many ways to classify human beings. For example, humans can be categorized by height, weight, skin and eye and many other ways. In this activity we will focus on categorizing people by height and weight using tape measures and scales.

Practices:

In this activity, the students will use simple measurement devices to make measurements in scientific investigations. The students will use tape measures and scales to measure their height and weight. They will use these measurements to classify themselves and prove variation in the human species.

<http://www.scienceonline.co.uk/lessonplans/7d.html>

In this activity, the students will measure their height and weight and that of their classmates. They will gather their information and create organized charts to classify themselves. In this activity, the students will learn that living things show variation within a species. They will also be practicing practical measuring and recording skills.

Activity #5 - Grade level four: Benchmark #5

Ideas and Context:

Animals can be very specifically categorized by the food they eat. Animals can be organized as herbivores (plant eating), or carnivores (meat eating). This lesson looks very closely at the eating habits of an owl's and attempts to classify the types of food owls eat by dissecting its waist. In this process will allow the student to investigate and explain how living things obtain energy through the foods that they eat. This lesson will also promote thinking about how parts of living things are adapted to carry out specific functions.

Practices:

In order for students to understand what an owl eats and how an owl uses this food as a source of energy, they will have to ask questions. The activity itself will reveal what an owl eats, but more importantly the students must learn to understand why an owl eats this type of food and how they use it as energy for their own good. To accomplish this goal of understanding the students will have to use their skills for information gathering. They will have to problem solve and realize that they can find this information in reference books, science magazines, other people or the world wide web.

<http://www.lessonplanspage.com/scienceowlpelletsSkeletalSystem58.htm>

Students will also learn why an owl eats the type of food it does and how it has adapted to do so. Each student will dissect an owl pellet and take out bones of animals that they have eaten. They will use alternate sources to classify these bones and the types of animals that they belong to. They will then diagram a food chain based upon findings.

Activity # 6 - Grade level five: Benchmark #6

Ideas and Context:

There is a very large variety of ways in which animals can be grouped or classified. The most common classifications are mammals, birds, amphibians, fish and reptiles. These five most common classifications are based mostly upon physical characteristics of animals. However, animals can also be categorized in relation to their habitat, food, sleep patterns, etc. The focus of this lesson is on the predator/prey relationships of animals within the same ecosystem. It is important to understand these specific relationships and how they affect one another to fully understand *the organization of living things* (Standard III.2). This standard promotes learning to understand the similarities and differences in the life cycles of animals and the classification systems of these animals, ideas that are addressed in this lesson.

Practices:

In this activity lesson the students will be exploring how hawks (predator) and mice (prey) interact and affect each other's health and existence in an ecosystem. This concept will be understood by carrying out the activity lesson, which is a game. The game requires the students to keep track of the generations of hawks and mice in an ecosystem. The construction and use of a table will be required to keep track of this information in an organized fashion. This table concept serves as a visual representation of the activity findings and allows students a reference for graphing their findings. The graph will then show how the size of the mouse and hawk populations changed over time, thus creating a summary of student observations.

<http://www.tec.iup.edu/spiral/11t8.htm>

In this activity the children will randomly throw 5 cards into a 60 centimeter square region that will be taped out onto the floor. At this point one hawk card will be thrown in. Then pick up the hawk card and also remove any mice cards that the hawk card is touching. For each generation, add a mouse card for each remaining mouse card in the square. Throw hawk card again and apply the same rule for removal. For every four mouse cards that are taken away, add a hawk card to the next generation. Put results in table for further use.

Physical Science

Changes in Matter

By: Amber Austin & Lisa Casari

Benchmark: Describe common physical changes in matter- size, shape, melting, freezing.

Ideas and Context

The lessons focus on students at about a second grade level. Small changes can be made to use the lesson with older or younger children.

A physical change is any change in the matter's appearance, but not in the make up of the matter. When you are finished with the physical change the matter is the same type of matter as when you began the physical change. Some types of physical changes are a change in the size, the color, the volume, the texture, the shape, and the hardness of the matter. When matter changes state, dissolves, or becomes part of a mixture the matter has undergone a physical change.

Amber Austin
Practices Lesson #1

The balloon activity relates to the constructing benchmark, "Use simple measurement devices to make measurements in scientific investigations." This lesson is for a younger elementary classroom. As is planned for second grade it seems appropriate to lead the students and direct them to the appropriate measurement devices for the circumferences of the balloons after the cool and warm conditions. Talking about ways to measure the balloons would be a good start to a discussion before beginning the actual activity. Ask them questions such as, how can we measure something that is round, would a ruler be appropriate, why and why not. Have them think about using something else, like the string, to use first on the balloon, and then they could use the ruler to measure the string. The main focus of the discussion is to get the students thinking about different measuring devices and what their best uses are for, and these could be of the non standard devices as well. Students should realize that using a straight ruler to measure an inflated balloon would not be the best way to go about the task.

Amber Austin
Practices Lesson # 2

The gobstoppers activity relates to the constructing activity, "Construct charts and graphs and prepare summaries of observations." In this activity the students are instructed to keep track of their finding and status of the gobstoppers during the activity in the charts that would

be provided. They are encouraged to be detailed and accurate through pictures and notes of the different stages. Also, after the activity the students are to write in their journals about their findings during the activity. This writing serves as a way to summarize their observations. They are also asked to write about the predictions in the beginning of the activity and compare what actually did happen. This activity would work better with students who were not beginning writers. I think it would be appropriate for third or fourth graders. It could be done with second or first, but the teacher could do the summaries in this case, meaning have the teachers recap what the results were at the end, and have the students focus more on the graphing.

Lisa Casari

Practices Lesson # 3

The Crayon lesson relates to the benchmark about generating questions. “Generate reasonable questions about the world based on observation.” This lesson focuses on the children making observations throughout the activity and forming questions from these observations. The children observe and create questions at the beginning of the lesson, while the crayons are warming, after the crayons have melted, and after the crayons are hard again. The children are asked to answer their own questions through their observations and to formulate new questions from the answers. This lesson looks at the physical change that the crayons go through when they change from the solid state to the liquid state back to the solid state. After the lesson the students are encouraged to think about how these changes are similar to other physical changes that go on around them on a daily basis. Also how other forms of matter would change if it took the place of the crayons in this activity. As the students are creating questions help them word their questions so they are able to be answered through observations.

Lisa Casari

Practices Lesson # 4

The matter and heat lesson relates to the benchmark about using simple devices. “Manipulate simple devices that aid observation and data collection.” During two parts of the activity the students are using devices to help collect data. In the first section each student is using a magnifying glass as well as a microscope. This allows for the student to look closer at everyday materials and make observations about what makes up those materials. In the second part of the lesson the class is using a thermometer to take the water temperature. This helps the students make observations about how air acts in different temperatures. This lesson also uses the benchmark about creating questions through observations. Throughout the lesson students are encouraged to think of questions that they have after making observations.

Lesson #1

Amber Austin

Title: Cooling and Heating Air

Benchmark: Matter-Describe common physical changes in matter size, shape, melting and freezing.

Objectives:

1. Demonstrate an understanding of air and the space it occupies
2. Determine measurements of a balloons volume at different temperatures.
3. Observe and journal what happens when the air in the balloon becomes cold
4. Measure the diameter of the balloon at different temperatures

Materials: Each group of 4 will need:

1. 1 balloon
2. string
3. cooler
4. ice

Teacher Knowledge: * Gases have volume
* The volume of gases changes when the temperature does

Helpful Hints: * Have cooler full of ice and ready to go
* Measure balloons in the cooler for a more accurate measure

Procedure:

1. Inflate a balloon and measure its circumference with the string. Mark and cut the string.
2. Put inflated balloon into cooler for 15 minutes.
3. While they wait the children should glue the string to the graph and document the temperature at which this measurement was taken.
4. Re-measure the balloon inside the cooler. Mark and cut the string. Glue string underneath the first string and document the temperature at which this measurement was taken.
5. Find the difference between the circumference of the balloon at room temperature and when it was cooled.
6. Review your results.

Questions: (To ask the students to think about)

1. How can you explain the difference in circumferences?
2. What does this suggest about air?
3. Can you think of places in the world where it would be harder to breathe than others?

Assessment: Were the students able to see the difference in the circumferences of the balloons? Did he or she generate possible explanations? Did they have an

understanding of air, and that it does take up space? Were they able to relate that to the different balloons? Did the students make predictions in the beginning, and were they able to justify why what happened after the experiment. (At this age level, it would be ok for the students to verbally express their understanding of science ideas, instead of in a journal.)

Lesson #2

Amber Austin

Title: Dissolving Gobstoppers

Benchmark: Matter-Describe common physical changes in matter size, shape, melting and freezing.

Objectives: Concept Objective- The student will:
1. Analyze and record changes in color as the GOBSTOPPER dissolves.
2. Make charts to discuss any similarities between each groups experiment.

Description: Each group will have four students and jobs will alternate with each activity. The jobs are as follows:

* Principal Investigator- Reads instructions, leads group discussions, asks questions of the teacher and ensures participation of all group members.

* Materials Manager- Collects and returns equipment, manages operation of equipment, ensures safe use of equipment and manages fair use of equipment.

* Time Keeper- Monitors time, keeps group on task and encourages group members to participate.

* Record Reporter- Records data and group work, writes activity results on class charts, reports findings to the class and reports all results fairly.

Adjustments and changes will be made according to the students needs.

Materials: Each **group** of 4 will need:

1. 4 different colored gobstoppers
2. 100 ml room temperature water
3. 1 pint clear plastic food storage container

Each **student** will need:

1. Observing gobstoppers student handout
2. Color crayons or markers
3. Handout (can be made by reading through lesson, though not attached)

Teacher Knowledge:

- * Water is a liquid
- * At the beginning of the lab the GOBSTOPPER is a solid.
- * Matter can change
- * A mixture is two or more kinds of matter mixed together but not chemically combined
- * Mixtures can be separated by physical means

Helpful Hints: #4- GOBSTOPPER packet

* Make sure to remind the kids to record their observations after each change occurs.

* Caution students to be careful not to spill the container of water.

At the end of the activity, do not pour the GOBSTOPPER down the drain.

Carefully remove them from the container before pouring the liquid down the drain. Also a time limit may be a good idea, such as have two minutes to note observations and draw them on the papers. Make sure to announce this to the students beforehand.

Procedure: Before the activity begins do a KWL chart as a group.

1. Divide students into groups of four. Hand out a different colored GOBSTOPPERS to each group member.
2. Have the materials manager of each group go to the materials center to pick up a plastic container with 100 ml of water.
3. Instruct the materials manager to give each group member a different GOBSTOPPER and to place the container of water so that all members of the group can observe it. Tell students to choose this placement for the container carefully because once the GOBSTOPPERS are put in the water, the container must not be disturbed.
4. Tell students that it is very important that the container be kept perfectly still after the GOBSTOPPERS are placed in the water. Instruct each student to place his GOBSTOPPER into the container of water as shown on the student handout.
5. Ask students to use crayons or colored pencils to show the original color of the GOBSTOPPERS on the first diagram.
6. Then ask students to color diagram 1 to show these changes in the water. When the GOBSTOPPERS change to a new color, have students go to diagram 2 and show the new color of the GOBSTOPPERS. Continue to ask questions as students observe.
7. Ask students what changes they are observing in the GOBSTOPPERS and the water. Be sure to point out the clear area around each GOBSTOPPERS after the first color is dispersed if students don't mention it when describing what they see. Continue to ask questions to stimulate students to describe their observations.
8. Point out the triangular pattern of color that fills in the middle of the container. Then have students show these changes in the water on Diagram 2. When the GOBSTOPPERS change to a new color, ask students to show the new color of the GOBSTOPPERS on diagram 3. Continue to elicit observations about how the GOBSTOPPERS and water are changing.
9. Finally, the GOBSTOPPERS will become light pink/purple. At this point have the students show the change in the water in diagram 3 and this new color of the GOBSTOPPERS in diagram 4.
10. Use a large sheet of paper to draw circles to represent each color of the GOBSTOPPERS. Invite students to come up to the paper and show the

sequence of colors for each GOBSTOPPER.

11. Ask students to identify any patterns they observe.

12. Ask students what the GOBSTOPPER would look like if you cut it in half. Explain that this is called a cross section. Challenge students to draw and label a cross section to show what they think the inside of a GOBSTOPPER looks like. Remind students that they observed a clear area around each GOBSTOPPER after a color was dispersed. Tell them to include what they think made this clear area in their cross sections of a GOBSTOPPER.

Key Questions: * What is happening to the solids?
* What is happening to the liquid?

Assessment: The student handout can be assessed according to the following scoring rubric:

4- Full Accomplishment- Student correctly performs activity. Student is able to observe and record every change in the GOBSTOPPERS. Student is able to observe and record every change in the water.

3- Substantial Accomplishment- Student correctly performs the activity. Student is able to observe and record most of the changes in the GOBSTOPPERS. Student is able to observe and record most of the changes in the water.

2- Partial Accomplishment- Student correctly performs the activity but needs help to do it. Student is able to observe and record some of the changes in the GOBSTOPPERS. Student is able to observe and record some of the changes in the water.

1- Little of Not Progress Toward Accomplishment- Student misunderstands the task or makes little of no effort to perform the activity.

(For the assessment of the activity, it is important that the students make use of the graphs. Depending on the age level, you may want to talk as a group about different groups findings instead of having them journal about it. This is because it may be hard for younger students to analyze data and make interpretations, etc.)

Lesson #3

Lisa Casari

Title: Crayons as a solid and a liquid

Objective: The students will:

1. Observe a physical change in the crayons, melting.

2. create questions based on their observations.

Advance preparation: Remove the paper from used crayons. You will need to decide whether or not you want to mix colors as the crayons melt or do you want to "end up" with the same color of crayon as at the beginning of the lesson. You will also need to remember that you will need ice for this investigation:

Materials:

1. Several broken crayons (Preferably the same color)
2. One 1-quart canning jar and one 3-quart canning jar
3. One hot plate and oven mitt
4. Ice cubes
5. Twelve-inch x nine inch shallow pan
6. One small Dixie cup per child
7. One 11" x 9" Manila paper per child (Optional)
8. Thermometer

Procedure:

1. Begin heating water in 3 quart pot.
2. Distribute crayon pieces to each child. Have them examine and describe their pieces. What do they notice about the crayons, what questions do they have from these observations? (Elicit that it is a solid, has a shape that does not change) Have each child put his/her crayons into the canning jar.
3. Teacher should: Put the jar into the pan of hot water and continue heating it until the crayons melt. Use oven mitt to remove the jar from the hot water. Use a thermometer and have children read it several times while the crayons melt.
4. During this time, discuss and predict what will happen, then observe. Ask the children questions, but also have the students create questions. Have them think about their observations and how they are different from their original observations.
5. As children watch, pour liquid crayon into each small paper cup. Observe and discuss what happened to the shape of the crayon. Elicit that a liquid has no shape of its own. What questions are the children thinking about now?
6. Place the paper cups in the shallow pan filled with ice cubes for about 10 minutes. Have the children peel the paper cups off, observe, describe, and compare. Have the children answer the questions that they posed before. How has their thinking changed from after the activity then before the activity? What new questions do they have after the activity? How would other forms of matter react to being heated? Who is this activity similar to physical changes that occur everyday? If time allows, the children will use their "new" crayons to draw a picture on manila paper.

Key Questions:

- * What kind of a change are the crayons going through?
- * Do other forms of matter go through these changes? What are some examples?
- * What is happening to the crayons?
- * What causes this change in the crayons?
- * How has the crayons changed from how they looked at beginning to the end?
- * What other observations did you make during the activity?

Lesson #4

Lisa Casari

TITLE: Matter and Heat

GRADE LEVEL/SUBJECT: GRADES 1-3

BENCHMARK: Matter-Describe common physical changes in matter size, shape, melting and freezing.

OVERVIEW: Young students have a difficult time conceptualizing many science concepts. They have a need to actively participate in learning, and even then may not comprehend why an event occurs. One such concept is the motion of molecules and the relationship of heat to states of matter.

PURPOSE: To involve students in demonstrating the relationship between molecules and states of matter.

OBJECTIVES: As a result of this activity, the students will:

1. Predict that heating a substance will cause it to expand (get big), and cooling it will cause it to contract (shrink).
2. Demonstrate an understanding of solids, liquids, and gases by their activity level as they act like molecules.
3. List examples of solids, liquids, and gases in their world.

RESOURCES/MATERIALS:

An additional adult or two is very helpful for the small group experiment. Another management technique could be to allow students to make mosaic pictures of their own while the teacher works with one small group at a time.

1. "Mosaic" picture made from paper punches, various items to observe such as cloth, workbooks, leaves, etc.
2. Microscopes (30X) and magnifying glasses
3. Materials for the experiment as listed.
4. String for a circle.
5. No materials needed.

ACTIVITIES AND PROCEDURES:

1. Introduction

-Discuss the concept that everything is made up of molecules. Show them a "mosaic picture" made up ahead of time from paper punches. This is a simplified exaggeration of something being made up of little things.

-Encourage them to look at several items with hand-held microscopes (30x) and magnifying glasses. Cloth, colors on covers of workbooks, and leaves are good for viewing small parts that are invisible to the eye. Emphasize that they are still not seeing molecules, which are even tinier than each dot they see on the book cover. Have them

write down the observations that they made by taking a closer look at the everyday materials. What questions do they have after making observations of these materials?

2. Small group experiment

Materials: needed (for each group)-

small flask or bottle

two bowls, balloon

ice

Thermometer

hot water(from a coffee pot is best, but you need to supervise this as it will burn)

Procedure-

-Put the balloon on the bottle. Have students establish that the bottle has air in it and that the air molecules inside cannot get out of the bottle when the balloon is on it. During the activity encourage the students to think of questions from the observations they are making.

-Ask students if they think the balloon will change if we put the bottle in hot water. Encourage idea exchange.

-Get 3 cups of hot water. Put it in a bowl and put the bottle in the bowl also. Let each student feel the bottle as it warms up. Have them observe the balloon. Take the temperature of the water with the thermometer. Allow for the students to "read" the temperature.

-Ask students if they think the balloon will change if we move the bottle to cold water. Encourage idea exchange.

-Get 2 cups of cold water and 4-6 ice cubes to put in the other bowl. Put the bottle in the bowl, and again let the students feel the bottle as it cools off. Have them observe the balloon. Take the temperature of the water with the thermometer. Allow for the students to "read" the temperature.

-Let the students move the bottle back and forth as time allows, and encourage predicting what will happen when they do.

-Ask for possible explanations and accept them all as something to consider.

3. Whole class activity

Procedure-

-Put a string circle on the floor, in the middle of an open area (This should be large enough for all students to stand in without crowding.)

-Have the whole class stand up and explain that they are now going to "become" molecules. Explain that warm molecules are very active and spread out away from other molecules. Have them spread out and "bounce." Explain that molecules which bounce all over are a gas.

-Ask if they've ever seen children "huddle" on the playground on a very cold day. Molecules do the same thing. They slow down and move closer together when they are cold. Ask the students to come into the circle and to huddle close together. They should then "freeze". When molecules get cold enough they freeze, although that does

not mean they are totally without motion, even as the children will not be totally without motion. Ask if they can think of an example of something "frozen" (ice). Explain that this is a solid.

-Molecules are sometimes in between. We call this state liquid. They spread out a little bit, but they stay inside their container. Have the students bounce slightly and push apart but stay inside the circle. Ask for an example of a liquid (water).

-Have them get back in their huddle, very still and "cold." Then have them "warm up" gradually, staying in the circle. Then have them warm up more, and explain that they can now float up over the string because they are a "gas." Ask what would happen if they were even "hotter" (they would spread out even more).

-Now you are ready for some exercise. Using the cues Hot, Warm, Cold, etc, or Solid, Liquid, Gas, have them show by their actions what the molecules would do in that state.

4. Discussion

-Now discuss the experiment from earlier in the lesson. Ask for ideas on what the molecules were doing inside the balloon. Have the students think about the questions they posed during the lesson. Can they answer them now? If not, what needs to be done to answer the questions?

TYING IT ALL TOGETHER

This provides a good basis of understanding for further studies of matter. Part/whole relationships in many areas can be related back to this. Students could be asked to begin a chart of solids, liquids, and gases using words or pictures.

Assessment: Use the small group and large group activity as a form of assessment. Record what ideas the students have about the small group activity. Listen for ideas that link all three parts of the lesson together. During the large group activity allow for students to comment about the states of matter that they are becoming. At the end of the activity use the last part as a form of assessment.

Changes in Matter

By: Katie Dama & Kristin McGlone

Unit Overview-Matter

This unit on matter is meant for fourth grade students. The following activities correlate with the MCF Using benchmark, standard IV.2: Changes in Matter: “All students will investigate, describe, and analyze ways in which matter changes; describe how living things and human technology change matter and transform energy; explain how visible changes in matter are related to atoms and molecules; and how changes in matter are related to changes in energy.”

Lesson 1: Introduction to Matter: For the first lesson on matter the students will understand that everything is made up of matter and there are three states of matter: solids, liquids, and gases. By using a K-W-L chart, the lesson will correlate with the MCF constructing benchmark, standard 1.1: Students should “generate reasonable questions about the world based on observation.” Through what students have observed and what they already know about matter, they will have to think of relevant questions about matter that they are interested in investigating further.

Lesson 2: Solids, Liquids, and Gases with Balloons: For the second lesson on matter the students will again understand that matter includes three different states: solids, liquids, and gases through the student’s direct experiences with the three different forms of matter. The students will also understand that matter is anything that takes up space and has weight. In addition, the students will realize that water, for example, can be changed into a solid, liquid, or gas. By the students creating a chart to record their observations of the three states of matter, the lesson will correlate with the MCF constructing benchmark, standard 1.6: Students will “construct charts and graphs and prepare summaries of observations.” Therefore, the students will use words, phrases, and illustrations to complete their chart to visually represent their observations of the three states of matter.

Lesson 3: Matter Scavenger Hunt: For the third lesson on matter, the students will begin to understand the properties of each of the three states of matter. They will also build on their prior learning of what makes a solid a solid, a gas a gas, and a liquid a liquid. The students will begin to have an understanding about the smaller, molecular level that makes up each state of matter. By going on a scavenger hunt and using various methods of gathering information, the students will be achieving the constructing benchmark, number 5: “Developing strategies and skills for information gathering and problem solving.” Students will be using many methods of gathering information in order to answer the questions that they are given by the teacher.

Lesson 4: Human Model: For the fourth lesson on matter, the students will get an even deeper understanding of the molecular level of matter. They will understand what happens to the molecules in matter when the matter undergoes a phase change. By working together in a group setting, the students will be able to achieve the constructing benchmark number 2 which states “Develop solutions to problems through reasoning, observation, and investigation.” The students will find solutions to the problems the teacher is presenting to them as she asks them to change molecular structure and change from one state of matter to another. The students will take an organized approach to the problem given by the teacher that promotes a reasonable solution.

Activity #1: Introduction to Matter

Katie Dama

Purpose of Lesson: The purpose of this lesson is to introduce matter by having the students use their prior knowledge to relay what they already know about matter. The students will also think of reasonable questions, or ideas about matter that they want to learn about. This will be done through the use of a K-W-L chart.

Transition Into Lesson: The teacher will begin the lesson by making sure that all of the students are in their seats and paying attention. The chart for the K-W-L chart will already be posted and the teacher will be ready to begin filling out the columns.

Materials Needed:

Teacher: The teacher will need a large piece of butcher paper and a marker.

Students: The students will need their science journals and a pencil.

Procedures: After the students are ready to begin the lesson the teacher will briefly explain that everything makes up matter and it can exist in three different states: solids, liquids, and gases. Next, the teacher will have the students make a K-W-L chart in their science journal by making three columns and labeling them, "What I **K**now about matter," "What I **W**ant to know about matter," and "What I **L**earned about matter." Individually, each student will first fill out what they know and what they want to know about matter. The teacher will explain that after they learn about matter each day for the next few weeks, the students will be given time at the end of each lesson to fill out things they learned about matter in the "What I **L**earned about matter" column. Finally, the teacher will ask the students to first share what they know about matter and will fill in their thoughts under the column, "What we **K**now about matter" on the class K-W-L chart. The teacher will finish the lesson by having the students share what they are interested in learning about matter, and will fill out the "What we **W**ant to learn column" based on all of the student's questions and interests.

Assessment: The teacher will pay particularly close attention to what the students say they know about matter to try and understand what misconceptions they may have about matter. Therefore, the teacher will be able to address these misconceptions in future lessons. The teacher will also pay close attention to any questions or interests the students have about matter so that he/she can plan lessons around what the students are interested in learning about. The teacher will also be walking around the classroom while the students are filling out their own K-W-L chart to make sure they are completing it correctly.

Closure: The teacher will explain that in the next lesson they will start exploring the different states of matter by completing an activity involving balloons. The teacher will remind the students that as they learn different ideas about matter, they should be filling out their, "What I learned about matter" column on their individual K-W-L chart.

Katie Dama

Activity #2: Solids, Liquids, and Gases with Balloons

Purpose of Lesson: The purpose of this lesson is to understand the meaning of the words solid, liquid and gas by providing concrete experiences with solids, liquids and gases. The students will understand that solids, liquids and gases are all forms of matter, and that matter is anything that takes up space and has weight. In groups, the students will construct a chart of their observations of the three states of matter.

Transition Into Lesson: The teacher will make sure that the students are sitting in groups of four students. Three different balloons, a piece of butcher paper, and a marker will be passed out to each group. The teacher will tell the students to leave the balloons alone until they are given directions on what to do. The teacher will explain that each group needs to choose a recorder to write on the butcher paper. When all of these steps are accomplished and the students are paying attention, the teacher will begin the lesson.

Materials Needed:

Teacher: The teacher will need a piece of butcher paper and a marker.

Students: Each group of four students will receive 3 balloons: one filled with frozen water, one with water, and one with air. The groups will also need a pair of scissors, an empty bowl, and a piece of butcher paper with a marker.

Procedures: The teacher will begin the lesson by telling the students that they will be exploring the three states of matter: solids, liquids, and gases. The teacher will explain that they have three balloons in front of them, one filled with frozen water, one filled with water, and one filled with air. Next, the teacher will have the chosen recorder (along with suggestions and help from the group) create a chart on their butcher paper. The recorder will draw three columns labeled "solid," "liquid," and "gas." The students will be told that they are going to investigate the contents of the three balloons and write and illustrate their observations on the butcher paper. The teacher will first tell the students to feel the frozen balloon and then cut the rubber off with their pair of scissors. The students will then discuss what they saw and felt, followed by writing their observations under the "solid" column of their states of matter chart. Next, the students will follow the same procedure with the water balloon. The students will feel the balloon, pour the contents into an empty bowl, discuss what they saw and felt, and then record their observations under the "liquid" column of their chart. The students will then feel the balloon with air. The teacher will tell the students to let the air out. The students will discuss what they saw and felt when they let the air out of the balloon and then record their observations under the "gas" column of their chart. While the students are recording their observations the teacher may want to encourage the use of descriptive words such as "hard, invisible, wet, splashy," etc. Finally, the teacher will bring the class back together as a whole to discuss each group's observations. The teacher will combine all of the shared observations onto a larger piece of butcher paper with the three headings of solid, liquid, and gas.

Assessment: The teacher will assess the student's performances by observing what is happening in each group. The teacher will make sure that each group member is participating. The teacher will also pay attention to what is being discussed, written, and illustrated on the group's matter chart. The teacher will make sure that each group is including descriptive words based on their observations as well as illustrations.

Closure: As a closure for this lesson, the teacher will have each student get their science journals out and write down anything they learned in their "What I Learned about matter" column of their K-W-L chart. Finally, each group will be asked to clean up their materials.

Krystin McGlone

Activity #3: Matter Scavenger Hunt

Purpose of Lesson: The purpose of this lesson is to help the students become more familiar with the properties of the three states of matter. The students will become more familiar with the properties of matter by engaging in various forms of information gathering strategies in order to create posters for the classroom. The posters will be used as a visual aid in the students further understanding of the properties of the three states of matter.

Transition into Lesson: The teacher will make sure that the students are sitting in groups of four students. The teacher will remind the students of proper behavior in a group setting. When the students are all clear on how they are to work together in a group, and are paying attention to the teacher, the teacher will then begin the lesson.

Materials Needed: To complete this activity, the teacher will have needed to prepare stations in the classroom that have the various resources that the students will be using to complete their assignment. At one station the teacher needs to have various magazines of all genres for the students to use as a resource. At another station the teacher needs to have a collection of reference books, including old text books, informational books on matter from the library, dictionaries, and encyclopedias. At another station, the teacher needs to have prepared a collection of trade books for the students to use for the assignment. The students will also need to have computers with Internet access available to them. Each group will also need three large pieces of butcher paper on which they will complete their posters.

Procedures: To begin this lesson, the teacher will explain to the students that they are going to be going on a matter scavenger hunt and creating a poster of their findings. The teacher will further explain that the poster will not be just about matter but about the properties of each of the three states of matter. The teacher will explain to the students that, in order to complete this assignment, they will be using various resources to complete a poster for each of the three states of matter. Using resources such as magazines, trade books, reference books, other people, and objects both in the classroom and in the school, the students will find examples of each of the three states of matter. In their findings, the students must find depictions of matter that represent some of their properties. The teacher will explain that the properties that must be represented are, for a solid: a solid maintains its size, shape and visibility. For a liquid, the property that must be represented is ability to change shape based on its container, and for a gas the properties that must be represented are invisibility, and the ability to change shape easily. The students will be instructed to use the resources available to them to represent these objects in any form they think is the most beneficial to their learning. The teacher will suggest that each of the posters contain words, pictures, drawings, and symbols. When the students have finished their scavenger hunts, they will prepare their posters and give a presentation to the class on why they chose what they did for each of the categories.

Assessment: The teacher will assess the students learning of this topic based on the variety of objects they have chosen to put on their posters. The teacher will also assess the students

based on whether or not the students were able to depict the properties of each of the three states of matter in their posters. During the scavenger hunt, which may take place over several days, the teacher will also pay attention to the groups and how well they are working together. The teacher will also pay close attention to the ideas being shared between the group members and if each of the group member's ideas are being represented in the final posters.

Closure: To complete this lesson, the students will be asked to write down in their science journals anything new they learned during this activity. They will record this information in the "What I learned" part of their K-W-L chart. The teacher will also inform the students that in the next lesson they will be taking a closer look at the properties of matter and why each of the states of matter has the properties that it does.

Krystin McGlone

Activity #4: Human Models

Purpose of the Lesson: The purpose of this lesson is for students to understand how the molecular structure of matter changes as matter goes through state changes. The students will work in groups to form human models of the molecular structure of the matter as it changes states.

Transition into Lesson: The lesson will begin when the students are sitting in groups, quiet and paying attention to the teacher.

Materials Needed: The only materials that will be needed for this activity are the students' science journals and the students themselves.

Procedure: The lesson will begin with the teacher explaining the terms freezing, melting, evaporation, and condensation to the students. With the explanation of the terms will also come a real world example to help further the students understanding. During the explanation the teacher will explain how the molecular structure changes when a state of matter goes through a phase change. After the students have learned about the different phase changes matter can experience, they will then experience the changes for themselves. The class will go somewhere where there is a lot of room to move, like outside or to the gym. The teacher will then instruct each group to form a solid. They will arrange themselves so as to represent the molecular structure of a solid. The teacher will then shout out a phase change, such as melting, that solid could experience and then each group will have to depict what happens when a solid goes through the phase change of melting. The teacher will do this so that each group experiences melting, freezing, evaporation, and condensation. After each group has experienced the phase changes, the class will return to the classroom and finish the activity.

Assessment: The students will be assessed on their ability to quickly go from one form of matter, experience a phase change and then end up as the proper state of matter. While the students are working together, the teacher will also be paying close attention to how they interact in a group setting. Because the students will, at times, be required to be in close contact with one another it will be important that each of the group members is behaving like young adults and keeping their hands to themselves.

Closure: To conclude this lesson, the students will be asked to write in their science journals. They will record any new information that they learned in the "What I Learned" section of their K-W-L chart. After the commotion of moving around has ended, the students will be asked to explain how the molecules in matter change as they go from one state to another.

Matter and Energy – Electricity

By: Melissa Brown & Heather Duncan

Melissa Brown

Lesson 1: What is Electricity?/Safety

Activity Description/Objectives/Assessment: See attached lesson plan.

Ideas: II-4 Identify forms of energy associated with common phenomena.

This lesson will give an overview of various aspects of electricity that will be important for students to understand throughout the Unit on Electricity. The goal is that the ideas they already have be challenged and that they will make the connection to common phenomena during the lesson.

Practices: I-6 Construct charts and graphs and prepare summaries of observations.

The students' construction of posters that state what they have learned throughout the lesson will ensure that teachers are able to assess what the students learned in this lesson.

Lesson 2: Magnetic Fields

Activity Description: <http://www.galaxy.net/~k12/electric/fields.shtml>

Objectives:

1. To observe the interaction of magnetic materials with other magnetic materials.
2. Interpret this interaction and make predictions as to how it exists in the real world.

Ideas: IV-5 Describe the interaction of magnetic materials with other magnetic and non-magnetic materials.

A key part of students understanding electricity is students understanding magnetic fields. This activity focuses on the interaction of magnetic materials with other magnetic materials. The goal is that after this lesson students will understand this idea of a magnetic field.

Practices: I-6 Construct charts and graphs and prepare summaries of observations.

In this activity, students will do a hands-on experiment with a compass and a magnet. It is simple and easy to execute, but the data that the students record will create a picture that shows where the magnetic field is around a certain magnet (given that there are no complications with polarization).

Assessment: Students will write down hypotheses and observations on a chart. They will also participate in a discussion about magnetic fields.

Lesson 3: Is Electricity Safe?

Activity: <http://www.galaxy.net/~k12/electric/safe.shtml>

Objectives:

1. Students will learn possible electrical hazards specifically concerning batteries.
2. Students will understand why it is important for the positive and negative ends of batteries to be lined up properly.

Ideas: IV-6 Describe possible electrical hazards to be avoided at home and at school.

The idea in this lesson is fundamental to students' success in future experiments involving electricity as well as with electricity at home.

Practices: II-1 Develop an awareness of the need for evidence in making decisions scientifically.

This lesson will give students knowledge and awareness that is very practical. The practice of this lesson involves manipulating a circuit, but more importantly becoming aware of the way electricity flows and how to use batteries safely. In this case, knowledge means little if students are unable to apply it practically, so developing awareness is key.

Assessment: Teacher will observe students making circuits. Students will be asked to construct a circuit in a safe way and will be asked why it is safe.

The following activities fall under Strand IV of the Michigan Curriculum Framework. They are related to the ideas in this section because there is a focus of understanding the real, physical world in which students interact with while living every day. In understanding our physical world, the framework outlines that students need to understand “phenomena, such as motion and electromagnetic interactions.” Students also accumulate certain practices by working on the following activities.

Activity 1: Objectives: Students notice that there are 2 opposite fields with the magnetic force, in which they may/ may not note on their papers. Introduction: Students are asked to think about when they have used magnets before. Class discussion. Lesson: Two magnets and one compass are materials needed for the activity that involves magnet exploration. Students use the materials to investigate what happens when they experiment with them. They are encouraged to ask questions, then think of ways of answering them as they investigate with the magnets and battery. Assessment: Students are to investigate the potentially mechanical devices (magnets and compass) and write at least five observations that they make. Conclusion: Teacher writes a compilation of what students observed, and what they realized. Teacher scaffolds students in direction of pointing out that two opposites make the magnets stick together.

(<http://www.galaxy.net/~k12/electric/poles.shtml>)

The following is a description of Standard IV.1 from the Michigan Curriculum Framework: “All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter. Matter and energy are the fundamental entities of the physical universe.” Students use ideas from this strand with Activity 1 because they are making sense of how the world works in relation to opposing charges being attracted. The ideas learned in this activity will carry into another lesson that involves how the world works, like circuits. For example, students need to understand that the light bulb will only light up if the wires connect to the opposite sides, because the opposites attract to make the circuit work. The students also learn the idea of how magnetism is interacting with matter (the battery and the surrounding environment) to create an attraction so that the magnets may be attracted, or repelled from each other. This concept connects to other ideas in the electricity unit because the students will experience that electricity can only occur when matter connects.

Practices that students learn in Activity 1 are to trust their own thoughts when investigating, and then writing down what they think about the investigations. They write down interesting observations that they noticed, so they are also working on filtering out the irrelevant to what matters most in understanding something.

According to Strand I of the MCF, students are to “Construct New scientific and personal knowledge.” In developing knowledge, students accomplish goals of Strand I, Part 3: they are manipulating materials and are drawing conclusions through an investigation. Magnets can be related to a “mechanical device,” as Part 3 mentions, but the investigation

about what is happening with the two opposite poles of the magnet are important in constructing personal knowledge. Through such an investigation, students learn why the magnets and compass are related to one another. By learning about how magnets work, students create an understanding in which they will carry with them when they work with more magnets and materials that are related to two opposing forces. For example, when the students learn about batteries, they learn that a positive and a negative charge—two opposites—are involved in connecting the battery to a circuit and making electricity. By understanding the magnets, the students manipulate such a device to understand about the two opposites are being attracted to each other. They learn about how the construction of scientific knowledge, and how that knowledge is carried to more investigations. In the end, students form connections of understanding how an investigation works and how practices from one lesson can be carried to other investigations or newly learned knowledge.

Activity 2: My static electricity lesson (File is attached.)

The following is a description of Standard IV.3: “All students will describe how things around us move and explain why things move as they do; demonstrate and explain how we control the motions of objects; and relate motion to energy and energy conversions. Motion of objects is accounted for by gravitational, electromagnetic, and nuclear forces.” In Activity 2, students learn the idea of how static electricity points to electricity that is stable, and how this idea compares to circuit electricity. Students will explain how things move as they do when the things are involved in an electric charge or electric circuit. I think this strand should provoke inquiry with students when they think of how lightning works, or how their toilet is able to flush. With Activity 2, students are able to understand the idea that humans can control the motion of objects. They experiment with this with a “jumping Jacks” experiment, in which they rub the balloon, and the balloon picks up paper people on the ground. The students control the motion to rub the balloon, and this will hopefully encourage thought about why the students shock themselves when stepping out of a car, or why they shock a friend after riding down a slide.

In Activity 2, students are involved in many practices. They work on their listening skills because they have to listen to the teacher describe the experiments in order for them to generate their own hypotheses. Students also learn about becoming involved in observing, hypothesizing, and theorizing why something happened on their assessment sheets. This is important because they learn what scientists do, and what they need to do when trying to figure out problems. Students also learn to think about what other students say about a science idea, and, in turn, learn to value their classmate’s voice when the teacher welcomes the comment.

Students also develop practices with this lesson. Strand 1, Part 1 states that the children need to “generate reasonable questions about the world based on observation.” In the static lessons, students listen to what the experiments are about, and they use their own judgments to state what they think will happen with the static and the materials involved. The whole process of using the data sheets is so that students are recording their thoughts into a tangible form. By thinking about ideas of what may happen, the students develop thoughts and are involved in a constructing sort of way so that everything is more constructive to the students’ learning. The questions on the sheet help to scaffold the students’ thoughts into reason. For example, the practice of developing reasoning is scaffolded by data that students write: “Hypothesis: What do you think will happen?” “Observations: What actually happened?” Then the group talks about what happened, and they record their information then, as well: “Why did it happen?” Students’ observational and questioning skills in science are generated with the practices of this lesson.

Outline for a Daily Lesson Plan

Date Lesson Will be Taught: April 13

Grade: 5th

Objectives: Students will understand what static electricity is, why it happens, and how it is different from regular electricity.

Materials & supplies needed: 2-3 balloons, paper cut-outs, book *The Science Book of Electricity*, book *Experiments With Electricity*, student data sheets

Procedures and approximate time allocated for each event

• **Introduction to the lesson** (What will you say to help children understand the purpose of the lesson? How will you help them make connections to prior lessons or experiences? How will you motivate them to become engaged in the lesson?) (10 minutes)

1. Explain we will be learning about static electricity and give oral outline of lesson. 2. Ask students if they have ever seen static with their hair or with a balloon. 3. Students record events on data sheets: “Jumping Jacks” (from pg. 12/13, *The Science Book of Electricity*): “Place paper people on bare table top, rub balloon on wool, hold balloon above paper people, explain what is happening when they “jump.”

• **OUTLINE of key events during the lesson** (Include specific details about how you will begin and end activities; what discussion questions you will use; how you will help children understand behavior expectations during the lesson; when/how you will distribute supplies and materials) (15 minutes)

Throughout events, record key facts as a sort of note-taking procedure on piece of paper as we go along. 1. Define “static electricity” with help from students and from what we did with intro lesson. 1A. Explain how static is different from regular electricity.

2. Activity: “Magic Wand” (pg. 14/15 in *The Science Book of Electricity*.) 6. We talk about key concepts of what happened in this activity. Steps: Rub handkerchief on record, place metallic covered balls on the charged area, and observe what happens. Place a pencil next to balls and observe what happens.

• **Closing summary for the lesson** (How will you bring closure to the lesson and help children reflect on their experiences? How will you help them make connections to prior lessons or prepare for future experiences? What kind of feedback do you want from them at this time?) (5 minutes)

1. Ask students to define in own words what “static electricity” means as we refer to sheet of notes in which we made.
2. Offer that students may pay more attention to static in their every day world since they hopefully learned why it happened.

Academic, Social and Linguistic Support during each event

Help student responses with cuing to specific questions; keep students on track throughout lesson. Students can work with other students while working on data sheets. Students participate with experiments, but teacher guides.

Remind students what we are doing next and explain the procedure.

Is there really enough time to talk about lightning?

Students can work with other students while working on data sheets. Students participate with experiments, but teacher guides.

Let as many students as possible talk about what “static” means to them.

<p>Assessment: Students will have data charts in which they will fill out for both activities (sheet attached below). They will record what happened in the experiment and what they learned about static from the experiment, as written assessment. Teacher asks questions throughout lesson, as well as for conclusion, and students provide answers for a verbal assessment.</p>	<p>Academic, Social, and Linguistic Support during assessment</p> <p>Help student responses with cuing; keep students on track</p>

name/date _____

STATIC ELECTRICITY DATA SHEET

	Balloon Experiment	Record and "Magic Wand"
Hypothesis (What do you think will happen?)		
Observations (What actually did happen?)		
Why did it happen?		

Did you notice anything interesting about what happened with the static electricity data you observed? What are your reactions?

Earth Science

Solar System, Galaxy, & Universe

By: Christy Wiley & Erica Zielinski

Phases of the Moon Write Up

Christy Wiley

The Unit we are preparing with this lesson is one on outer space. This unit was planned for students in the second and third grades with an emphasis towards third grade. The strand in the Michigan Curriculum Framework that helped us prepare and pull out science ideas was Strand V.4. This strand says “All students will compare and contrast our planet and sun to other planets and star systems, describe and explain how objects in the solar system move; explain scientific theories as to the origin of the solar system; and explain how we learn about the universe.” (MCF pg 5). This simply states the basis for any solar system unit should include these scientific ideas.

The specific scientific idea for this lesson is motions of the moon around the earth. This directly correlates with the line “describe and explain how objects in the solar system move.” This lesson is based on the strand from the MCF.

Practices

This lesson also connects to strand 1 in many ways. The benchmark is to generate reasonable questions about the world based on observations. The students will be told to observe the moon on each page of the book and to notice how it changes shape. After the book, the teacher will ask leading questions about the shape of the moon. This facilitates the benchmark. Students can make observations that lead to the questions that can be answered through scientific investigations. The question the students need to answer is, why does the moon appear to change shape? The students will investigate this through use of computers, (the teacher can print out lunar calendars or students can find them by using given web sites), listening to Good Night Moon, (observing how the moon appears to change shape throughout the book), making their own lunar calendars. The students should also be encouraged to notice the moon when outside.

This lesson should be used as an introduction to the solar system unit. All of the students should have noticed the moon appears to change shape by the second and third grades. This lesson does not require the students to know too much but, as you can see, there are many scientific ideas and practices as outlined by the MCF for this lesson.

Phases of the Moon

An Educator's Reference Desk Lesson Plan

Submitted by: Amy Miller

Email: amyelizabethmiller@yahoo.com

School/University/Affiliation: University of Pittsburgh at Johnstown (Johnstown, PA)

Date: September 17, 2001

Grade Level: 3

Subject(s):

- Science/Astronomy

Duration: 25-30 minutes

Description: After listening to Goodnight Moon, students use construction paper and coat hangers to construct lunar calendars. This lesson could serve as a starting point for a unit on space or space exploration.

Goal: Students will learn about different phases of the moon.

Objectives:

1. Students will be able to identify four phases of the moon (new moon, first quarter, full moon, and last quarter).
2. Using hangers and construction paper, students will be able to construct a lunar calendar for the current month.

Materials:

- a copy of Margaret Wise Brown's Goodnight Moon (preferably a big book)
- computer(s) with Internet access
- coat hangers (one for each student)
- white or yellow construction paper
- pre-made calendars
- scissors
- lined paper
- string or yarn
- glue or paste
- hole punch
- pencils

Procedure:

Lesson Introduction:

Read Goodnight Moon to the class. Ask students, "What did you notice about the moon on each page?" Prompt students if necessary to get them to respond that the moon is full in each picture, except the pictures featuring the cow jumping over the moon. "What do you think the word *lunar* means? What is a *calendar*? What do you think a *lunar calendar* is?"

Lesson Focus:

Divide students into small groups (depending on the number of computers available). Students will access web sites provided by the teacher (see **Internet Resources** below). Students will research the names of each phase of the moon along with what the phases look like and what a lunar calendar looks like. Monitor students' progress, and answer questions as they are asked. After students have finished their research, have them sit in a circle to share what they discovered.

Inform students that they will be constructing a lunar calendar for the current month. Each student will receive a hanger and construction paper. Students will take a piece of construction paper and cut it in the shape of a rectangle to make the calendar. (The teacher can have pre-made calendars ready that can be glued onto the rectangular piece of construction paper.) On the calendar, students label the days that each phase falls on for the current month. The completed calendar can be tied to the center of the coat hanger with string or yarn. Students can also draw the phases of the moon on smaller pieces of construction paper and cut them out. The phases can be tied to each side of the lunar calendar on the coat hanger.

Closure:

Students will have the opportunity to review what they learned. If students have science journals, they can write about what they learned and their feelings about the topic or activity.

Assessment: Students will be evaluated on their class participation during discussion opportunities. Review students' lunar calendars to check for accuracy. As an extension, students can develop additional lunar calendars for the rest of the year.

Useful Internet Resources:

* [US Naval Observatory - Phases of the Moon and Percent of the Moon Illuminated](http://aa.usno.navy.mil/faq/docs/moon_phases.html)
http://aa.usno.navy.mil/faq/docs/moon_phases.html

* [Virtual Reality Moon Phase Pictures](http://tycho.usno.navy.mil/vphase.html)
<http://tycho.usno.navy.mil/vphase.html>

* [The Moon for Southern Hemisphere Beginners](http://homepages.win.co.nz/creation/moon.html)
<http://homepages.win.co.nz/creation/moon.html>

* [Blank Calendar -- from a webquest called "Lunar Learning" by Nancy Farrell](http://www.warren.k12.in.us/webquest/farrell/webquest/calendar.htm)
<http://www.warren.k12.in.us/webquest/farrell/webquest/calendar.htm>

Bringing the Solar System to Life Write Up

Christy Wiley

This should be the second lesson in our unit about the solar system when teaching 2nd to 3rd graders. The guidelines used to decide whether or not this lesson was useful were the Michigan Curriculum Frameworks. Strand V.4 tells us, “All students will compare and contrast out planet and sun to other planets and star systems, describe and explain how objects in the solar system move; explain scientific theories as to the origin of the solar system; explain how we learn about the universe. (MCF pg 5) The specific scientific idea that comes form this lesson is to explain how objects in the solar systems move. More specifically, the motions of the earth and moon around the sun. This teaches the students the earth and moon go around the sun and not the other way around. Students may have a hard time grasping the concept of the motions of the planets so this lesson should bring the events to life while teaching the vocabulary.

Practices

The benchmark that connects with this lesson is to develop solutions to problems through reasoning, observations and investigations. To clarify this benchmark, students will develop and organized approach to a problem that promotes a reasonable solution. Students will develop an approach to a problem using reasoning, observations, data collection, and investigations to arrive at a solution. This lesson is an example of this benchmark because the students will use investigation and observations to learn about the terms of the solar system and learning about the motion of the sun, moon, and earth. The problem the students have is what does the terms rotate, revolution, and orbit means? They will learn about this through actually doing it. They will become the planets and sun and turn in the direction the teacher tells them according to the term given. (revolution, rotate, and orbit). The students will also be observing the investigation. Not all of the students can be the planets so they will be able to do the experiment and watch it as will.

This lesson has many connections to the MCF, as described above, to help the students met their benchmarks and guidelines. This lesson should be the 2nd lesson in our unit because it talks about the motions of the planets and the sun and moon. In our first lesson we taught the students why the moon appears to change shape. It makes sense to teach the students how the planets move next.

Bringing the Solar System to Life

An Educator's Reference Desk Lesson Plan

Author: Sally Spooner

School or Affiliation: Sunset Elementary School, Cody, Wyoming

Endorsed by: These lesson plans are the result of the work of the teachers who have attended the Columbia Education Center's Summer Workshop. CEC is a consortium of teacher from 14 western states dedicated to improving the quality of education in the rural, western, United States, and particularly the quality of math and science Education. CEC uses Big Sky Telegraph as the hub of their telecommunications network that allows the participating teachers to stay in contact with their trainers and peers that they have met at the Workshops.

Date: May 1994

Grade Level(s): 2, 3

Subject(s):

- Science/Astronomy

Overview: The Solar System is a very abstract concept for primary age children. This activity was designed to show children the ideas of "revolution" and "rotation".

Purpose: This Science activity, part of a unit on the Solar System, uses role playing to demonstrate the universe and its connection to the sun.

Objectives:

As a result of this activity, students will be able to:

1. Make models to represent the planets in comparative size.
2. Use their models to demonstrate revolution and rotation of the planets around the sun.
3. Give definitions of "revolution", "rotation", and "orbit".

Materials:

1. one yellow punch ball
2. nine balloons of different colors
3. chalk or string to mark orbits

4. resource material to check orbits of the nine planets

Activities and Procedures:

1. Children will blow up a yellow punch ball to its fullest and balloons of nine different colors to sizes representing the nine planets.
2. Take the class outside or go into the gym inside. Have nine paths marked on ground or floor with string or chalk.
3. Have one student hold each balloon. Another student will hold the yellow punch ball which represents the sun.
4. The "sun" stands in the middle of a circle. The other children take their places on the marked paths. Teacher will need to give each child the name of his/her planet and direct him/her to the correct place.
5. Begin the experiment by having children walk in their path or "orbit" around the sun. Stress that the planets never leave their own orbits. This travel around the sun is called "revolution". This term should now be introduced.
6. After the children have orbited the sun once, bring in the added concept of "rotation". While moving around the sun, the children should also start to spin around like tops. (Caution them against becoming dizzy.) This demonstrates "rotation". Tell children that it takes one year for the earth to revolve around the sun, and it takes one day for the earth to rotate on its own axis.
7. Point out that "rotation" or spinning on one's own axis takes much less time than going all the way around the sun, "revolution."
8. Give all children in the class a chance to try the experiment.

Tying it all Together:

After returning to the classroom, demonstrate the principle just learned with the globe. Let someone spin the globe and walk around a "sun" to show "rotation" and "revolution". For children who have trouble keeping "rotation" and "revolution" straight, here is a tip: the middle sound of "rotation" has the same vowel sound as "day" and it takes the earth one day to rotate. This same type of activity can be used to show the relationship between the moon and the earth. Role play is an excellent way to teach primary children and makes these abstract concepts come to life.

Though space is still a very abstract and often difficult idea for students, third graders should have a basic knowledge of space. As with all subjects, a unit on space should not only reinforce what the students already know, but should build onto their prior knowledge. Important to a unit on space is to build onto very the basic knowledge that the students already have about space. The first, one of the most basic, and most important ideas to be introduced to students is about planets. According to Standard V.4 of the MCF Using Benchmarks, it is important for students to be introduced to basic ideas as to how planets compare and contrast to each other, the sun, and Earth. Important to the understanding of planets is also where each planet is in relation to the others. In addition, this lesson correlates with both MCF Constructing Benchmarks and National Teacher Education Standards. Using outside sources such as the internet, students are allowed to research planets, the sun and Earth. Charts and graphs are also used throughout the lesson to compare and contrast each of the planets.

Made up of a ball of extremely hot gases, the sun is a star at the center of our solar system. Orbiting around, or moving around, the sun are nine planets that are very different from the sun and from each other. These nine planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn Uranus, Neptune, and Pluto. Each planet has very different characteristics from any of the other planets. Closest to the sun is the second smallest planet, Mercury. Mercury has a very thin atmosphere that cannot hold life and is the fastest planet in our solar system. The next closest planet to the Sun is Venus. Because Venus is covered with thick clouds that trap in heat, Venus is the hottest planet in the solar system. Venus is also the closest planet to Earth. The third planet from the sun is

Earth. Earth has an atmosphere that is made up of many different gases and is the only planet that has life. Mars is the fourth planet from the earth. Because Mars is farther from the sun, it is a much colder planet than Earth. Mars is known as the red planet because when it is seen up close in pictures, the rocks on Mars make it look red because of the iron in them. The next planet from the Sun is Jupiter, the biggest planet in the solar system. Jupiter is a gas planet, meaning that it is made up of mostly gases that swirl around. Saturn, the next planet from the Sun, is a very large planet that is surrounded by rings that are made of ice, dust, and other particles. Like Jupiter, Saturn is a gas planet. The seventh planet from the Sun is Uranus, a smaller gas planet. Because Uranus is so far from the sun, it is very cold on the planet making the planet look blue-green when looking at it in pictures. Neptune is the eighth and second farthest planet from the Sun. Very similar to Uranus, Neptune is a very cold planet that appears blue-green when looked at in pictures and has rings that surround it. The farthest planet from the sun and smallest is Pluto. Once every 248 years, Pluto orbits inside of Neptune and is actually closer to the Sun than Neptune for about 20 years.

Each planet is very different from one another and is very special. Some planets are close to the Sun while others are farther away. Depending upon the distance from the Sun some planets are hotter or colder than other planets and have features on their surfaces that are specific to that planet.

Those Whirling, Twirling Planets

<http://spacelink.nasa.gov/Instructional.Materials/On-line.Educational.Activities/Planets/>

Erica Zielinski

Central to this lesson is the hands on activities that the students are involved in throughout the lesson. These activities help students to revisit prior ideas that they have been introduced to while continuing to gain new skills on their given topic. Broken down into three parts, this lesson is meant to help students gain knowledge about the planets and the solar system. As explained throughout this write-up, this lesson follows very closely with the Michigan Curriculum Framework benchmarks for space, as well as with the National Science Education Standards and the National Educational Technology Standards.

The first part of the lesson deals directly with the names of the planets and their relation to each other and the Sun. Using a very simple chart numbered one through nine, the students will be asked to research the names of the planets and their order. The second part of the lesson deals with the sizes of the planets and how they compare to each other. Each student will be given a chart at the beginning of the lesson that lists each of the planets and the sizes of the planets. Using the chart the students will create a new chart that represents the sizes of the planets from the smallest planet to the largest. The third part of the lesson matches each of the planets with a description of its characteristics. The students will be given a sheet with a list of facts in groups and the students are to research the planets and match the correct planet with the correct characteristics. Once the students have completed the task of matching then they are to create a chart themselves that represents each of the planets and its characteristics in an organized way.

Though textbooks should be available for the students to use, the main focus of the lesson is for students to research using outside resources. Listed in the lesson plan are internet resources that would be of assistance to the students in their research. Other resources might include reference books, magazines and other internet sites. Having students research using outside sources does many things. As a scientist, one is responsible for asking questions and then using many different methods to help answer their own questions. During their research, the students will be able to form their own questions about the topic or questions on how to research the topic. Once questions have been formed, giving students the tools to help answer their questions will help them to develop solutions and strategies to answer future questions.

The use of charts throughout the lesson is very important because it helps students to visually represent their findings in a way that makes sense. A well organized chart can be used by students in the future as a reference, a reminder, or a study guide. Oftentimes, very important information is contained within a chart and it is essential that students acquire the skills to be able to use charts. Being able to use a chart is essential to being able to interpret the information that is contained within a chart.

Planets Lesson

Purpose of Lesson:

This lesson will teach the students about the nine planets in relation to the Sun by using measurement tools to explore distance. In this lesson the students will be measuring the distances between each of the planets and the Sun (Smaller scale units will be used. Ex: every million miles equals one centimeter.).

Transition to Lesson:

The students will begin the lesson in their seats. There will be three parts to the lesson. During the first part of the lesson the students will be in their seats doing a whole class activity. Then the class will break off into small groups to do another activity. The last part of the lesson will be a whole class activity.

Materials:

Entire wall of classroom

Large Cut out Sun

Cut outs to represent each of the nine planets

Measurement tools (rulers, meter sticks, yard sticks)

Calculator

Planet information sheet (gives facts about planets)

Paper and pencil

Other classroom information materials

Procedures:

Before:

Entire side of classroom wall should be cleared and Sun cutout should be Placed to the left side. Students will begin the lesson in their desks. Using the wall as a visual aid the students will talk as a group about their knowledge of the solar system. The lesson will start with questions for the students to answer.

- Does anyone recognize what is on the board?
- What is it?
- What is missing?
- What do you think we should do about that? Should we put the planets on the board?
- *Obviously and incorrectly place the planets on the wall.* Does this look right?
- Why? Why not?
- If this isn't right, how do we know where to correctly put the planets?

Continue to ask the students questions leading towards correct spacing of the planets. This portion of the lesson is to introduce the students to the concept of where planets are in the solar system in relation to the sun.

Explain to the students what they will be doing during the lesson.

Together, as a group work through an example problem. Before breaking

students into small groups explain to the students what they will be doing, assign jobs, set expectations, and tell them what they will need to take with them. Release them into small groups.

During (2 days):

In their small groups students will begin to research their specific planet and begin to calculate how far the planet is from the sun. Multiple sources should be available for the students to reference if they need to, including the teacher. Because the numbers in the activity are very large anticipate difficulties. As students arrive at the right answers have them measure and correctly place their planet on the wall.

After: Students will come back together as a whole group to wrap up the lesson. Using the completed visual on the wall talk with the students about what they found. Ask each group to share with the class how they arrived at their answer. It is a good idea to have students demonstrate how they arrived at the answer.

Simplifications:

Make the numbers the students are working with less intimidating. Instead of converting from numbers in the millions make the conversion from the thousands or hundreds and round them to easy to work with numbers. If further simplification is needed have the numbers converted before the beginning of the lesson.

Extensions:

If the students have little trouble calculating and measuring have the students do a quick write about what they found. Have them explain in words how they calculated and measured the distance from the sun that their planet is.

Assessment:

Assessment will be done by watching what the students are doing and asking them questions. This will help to show their level of understanding they have for the material.

Constellations Lesson

Once students have acquired a basic working knowledge of space, constellations are an interesting topic to introduce to them. In addition to helping to reinforce what students have previously learned about space, constellations are a great way to introduce history into the unit. Broken down into three parts, the lesson is meant to introduce students to the idea of constellations, how stars play an important role in constellations, Greek Mythology and how constellations have been important for thousands of years. As explained throughout this writ-up, this lesson follows very closely with the Michigan Curriculum Framework benchmarks for space.

The first part of the lesson is to introduce the students to the concept of constellations. This concept can be introduced using any book that talked about what constellations are. After the book has been read, students can be asked what they already know about constellations and stars. The second part of the lesson is to talk to the students about what constellations are, where are they from, and how they are important. Specific examples of constellations can be used to aid in the discussion. The third part of the lesson is to have students invent their own constellations and write a story that explains where the constellations is from and why it is important.

This lesson is very interesting and useful because it incorporates many things into it. Important to the lesson is the opportunity for students to use outside sources to research and learn about the topic. While textbooks should be available for students to use, it is essential that students have access to outside sources such as reference books, reading books, internet, and magazines. To research an idea, scientists use many different sources and methods for gaining information to answer questions that they have.

Through the activities in this lesson students will be required to ask questions about the material and then be able to answer those questions using the various sources available.

Also important to this lesson is how it crosses the curriculum. In addition to the history that students learn during the lesson students will be asked to create, or invent, their own constellations. In their creation process students will be asked to use the skills and knowledge they have gained to apply in a very different manner.

In addition to learning the facts about space and our solar system it is important to include history into a unit on space. One of the easiest, and most exciting ways that history can be incorporated into the unit is with constellations. According to Standard V.4 of the MCF Using Benchmarks, it is important that students be introduced to basic ideas as to how the solar system works and ideas that we have, or have had in the past, about the universe. Important to the understanding of the universe is how ideas about space have developed, how they have changed, and how these ideas are still used today.

Constellations have been around for thousands of years and have been very important throughout time. A constellation is a large grouping of stars that are connected together in a pattern to form figures. Only by connecting the stars in the night-sky can a constellation be seen. While some constellations can be seen throughout the year, there are many constellations that cannot be seen all year long. Some are best seen during the winter while others are best seen during the summer. In ancient times, constellations were thought to be pictures of an important stories of gods, goddesses or animals.

Throughout time, most constellations have been named after these people and animals as a reminder of how they were important to the world. The stars in the sky are divided into

eighty eight different constellations. Of the most popular constellations are: *Ursa Major*, *Ursa Minor*, *Orion*, and *Taurus*.

1. *Ursa Major*- This constellation is also known as the “Great Bear.” It is seen in the Northern Hemisphere it is formed with fifteen stars, including all seven of the Big Dipper.
2. *Ursa Minor* – This constellation is also known as the “Little Bear” or the Little Dipper. This constellation starts at Polaris (North Star) and has seven stars in it.
3. *Orion* – This constellation is also known as “The Hunter.” *Orion* was named thousands of years ago for a Greek god. *Orion* can be seen in the skies from late fall to early spring.
4. *Taurus* – This constellation is also known as and represents the “Bull.” *Taurus* represents a sign of the zodiac and is over one million years old.

These are only a few of the many constellations that can be seen in the night sky.

With a constellation guide it is relatively easy to discover all eighty eight constellations that are in the sky.

Purpose of Lesson:

This lesson will introduce students to stars and constellations. Students will learn about constellations and then create their own.

Transition into Lesson:

Students will begin the lesson in their seats. There will be three parts to the lesson. During the first part of the lesson the students will be seated in a group to listen to a story read by the teacher. Next, the students will be doing a whole class activity. The last part of the lesson will be a small group/partner activity.

Materials:

Book about stars and constellations

Visual aids of constellations
Vocabulary
Black construction paper
Glow in the dark stars
Glue (if stars are not stickers)

Procedure:

Before:

Students will begin the lesson either in their seats or as a group on the floor. Read a book about stars and constellations to the class. Using the book, talk with the students about their prior knowledge of stars and constellations. The lesson will start with questions for the students to answer.

- Can someone tell me what a constellation is?
- What are they made of?
- Where can we find constellations?
- Does anyone know of any constellations?

Continue asking the students questions about their knowledge of the constellations. This portion of the lesson is to introduce the students to the ideas that they will be presented with during the lesson. Before sending students to their desks tell them what to expect during the lesson and set expectations for the lesson.

During (2 days):

Day1:

As a whole group, introduce students to the ideas of constellations. Talk to them about what they are formed from and where they can be found. The history of constellations is important to the understanding of constellations. Using either an over head or a flashlight star projector, show the students a few of the most famous/popular constellations (*Ursa Major, Ursa Minor, Orion, Taurus*). Describe in detail each of the chosen constellations. Pair students up and assign them a constellation to research and report on. Give guidelines for their research (what they are expected to find out and what sources they can use to do their research). Before sending pairs off to research set expectations for the lesson.

Day 2:

Let students complete their research before continuation with the lesson. Once students have completed their research move onto the next part of the lesson.

After:

Have students continue to work in their groups/pairs to complete the next part of the lesson. In each group students will use what they have learned about constellations over the past few days to create, or invent, their own constellations. Each group should receive one piece of black construction, a bag of glow in the dark stars, a piece of chalk and glue. Each group will

construct and name their own constellations. Allow enough time for each group to be able to present their constellation to the entire class. Ask students to explain their constellation.

- Can you explain your constellation to the class?
- Do you have a name for your constellation?
- What is the significance of the name?
- What shapes did you choose for you constellation?
- Why?
- Where would we be able to find your constellation?

Simplifications:

During the research of constellations, give specific directions to the students as to where they will be able to find information. Possible copy articles so they are simply required to read the materials.

Extensions:

After researching a constellation have each student do a quick write about that constellation. After groups create their own constellations have each students do a quick write describing their constellation and information about it.

Assessment:

Review the ideas of the lesson and pay particular attention to students responses. Ask questions of students throughout the lesson.

Stars and Constellations:

<http://www.eduref.org/Virtual/Lessons/Science/Astronomy/AST0202.html>

Weather(Clouds)

By: Zoa Bonofiglio & Jessica Criner

Mini Unit on Clouds Outline: This mini unit will take one month to complete.

The goal of this unit:

Students will “learn science practices in contexts while developing knowledge about phenomena” by:

- Engaging in the process of inquiry and observation
- Generate questions
- Observe phenomena and log observations
- Maintain a “Cloud Journal” focusing on ideas, questions, and observations
- Encourage learning to go beyond simple answers towards critical thinking skills that connect big ideas like states of matter.
- Create “expert” peer groups
- Do research and note taking
- Integrate other curriculums specifically math and art.
- Using different types of charts to present data
- Generate a final summary or scientific journal: “Our Classroom Almanac”

Benchmark Overview:

MCF Benchmarks used: MI CLiMB Program Used via CD

Strand I/ Content Standard 1/ Elementary

Benchmark 1: Generate reasonable questions about the world based on observation.

Benchmark 2: Develop solutions to problems through reasoning, observation, and investigation.

Benchmark 5: Develop strategies and skills for information gathering and problem solving.

Benchmark 6: Construct charts and graphs and prepare summaries of observations.

Strand II/ Content Standard 1/ Elementary

Benchmark 2: Show how science concepts can be illustrated through creative expression such as language arts and fine arts.

Strand V/ Content Standard 2/ Elementary

Benchmark 1: Describe how water exists on Earth in three states.

- *for this unit specifically will be discussed water as a liquid (water droplets) and solid (ice crystals)*
- *Note misconception as stated on MI CLiMB about clouds and steam.*

Lessons and Activities Outlined: *all activities will be attached as lesson plans*

- Lesson One: What is a Cloud? (1 day)
 - **Activity:** Cloud in a Jar
 - MCF:
 - Strand I/ Content Standard 1/ Elementary/ Benchmark 1
 - Strand V/ Content standard 2/ Elementary/ Benchmark 1

- Lesson Two: Cloud Expert (1 week)
 - **Activity:** Expert Groups (Group size will vary) with each group using at least 2 different resources including one from the internet to compile facts, pictures, and data about their expert topic:
 - Group 1: High Clouds: Cirrus, Cirrocumulus etc.
 - Group 2: Medium Clouds: Altocumulus
 - Group 3: Low Clouds: Cumulus, Stratocumulus, Stratus etc.
 - Group 4: Multilayer Clouds: Nimbostratus, Cumulonimbus
 - MCF:
 - Strand I/ Content Standard 1/ Elementary/ Benchmark 5

- Lesson Three: Cloud Art (1 day)
 - **Activity:** Each person in their expert group will use watercolors, crayons, cotton balls, markers to create a cloud scene for the classroom art gallery.

 - MCF: Strand II/ Content Standard 1/ Elementary/ Benchmark 2

- Lesson Four: A Cloud A Day! (2 week unit)
 - **Activity:** Daily Data Collection/ Math connection: Averaging **Chart:**
 - Cloud Type
 - Barometer reading (each student will make a barometer)
 - Precipitation reading (outside of classroom window)
 - Outside Temperature reading (thermometer outside of classroom window)
 - Inside Temperature reading (thermometer inside classroom)

 - MCF: Strand I/ Content Standard 1/ Elementary/ Benchmark 2,3,6

CLOSURE: (3 days)

Final project will be to create a “Class Cloud Almanac” which will include all of our data, volunteer journal entries, charts, artwork, etc.

Lesson 1: Cloud in a Jar

Zoa Bonofiglio

Introduction:

This lesson will involve one activity in a larger unit dealing with investigating and describing what makes up weather. Over the course of the unit, students will have the opportunity to:

1. Observe a cloud in a jar (Lesson 1)
2. Research 3 types of clouds (Lesson 2),
3. Observe how weather affects cloud types (Lesson 3)
4. Complete an art project and essay using their research about the characteristics of the three cloud types for this unit (stratus, cumulus, and cirrus) (Lesson 4).

Everything will be compiled in a portfolio

In this lesson students, students will observe how water, air temperature and air pressure creates a cloud. Students will be asked to think about how scientist uses descriptive language to describe their observations. For example, if one says they saw a cloud formed versus describing the color of the cloud and the movement of the cloud a lot of information is lost. The more descriptive and detailed an observation is documented the better. Students will use their science journals to document their observations, using descriptive language.

MCF: Strand V/ Content standard 2/ Elementary/ Benchmark 1 (2 & 4)

- *Strand I/ Content Standard 1/ Elementary/ Benchmark 1*

For this lesson, I used the MiCLiMB CD to research benchmarks and content standards. As has been stated, students will observe phenomena, like scientist do. Students will then complete a data page in their science journals making sure to use descriptive, detailed language to support their observations. Each student should generate at least 4 questions from their observation for further research.

Students will also use science tools for measuring and supporting their activity (Jar, thermometer, various components for “pollution/particles in air”, and measuring devices). In the lesson presented on the website below it is vague as to how scientific the approach to the activity would be. However, I would have students document temperatures of ice and “warm” water as well as measuring particles.

This lesson will authentically engage students in generating questions like scientists do in their search for answers to the why of their observations. A scientist starts with a question or problem, a curiosity perhaps, and works at finding answers through observation and usually generating more detailed and focused/specific questions.

Students will come to understand the value of asking “Why” or “What is making this phenomena happen” in order to solve problems and develop solutions.

This lesson will lead students to ask why temperature and air pressure activate a cloud. Students will be given a scaffold by asking them questions that will engage their critical thinking skills to use prior knowledge about clouds, states of matter, and personal observations. For example, are all clouds the same in structure, size, and color? Do different weather patterns create different types of clouds? How can we alter this activity to consider the effects of pollution?

Resources: This link will take you to the lesson plan:

Yamnitz, K. “#14. Home-Made Clouds.” Teachers.Net Lesson Exchange. 1997.
<http://www.teachers.net/lessons/posts/14.html>. 4/19/2004

This link is a rubric maker online:

“Teach-nology.” Rubric, rubrics, Teacher Rubric Makers. Teachnology, Inc. 2003.
http://www.teach-nology.com/web_tools/rubrics/ April 25, 2003.

Cloud in a Jar Observation



Name _____

Date _____

Doing the Activity	Above Average - Average			Fair - Needs Improvement		
Followed steps accurately	6	5	4	3	2	1
Used measuring tools to collect data	6	5	4	3	2	1
Collaborated with peers using scientific reasoning	6	5	4	3	2	1
Data Collection/ Recording	Above Average - Average			Fair - Needs Improvement		
Organization of data	6	5	4	3	2	1
Explanation of steps followed was concise	6	5	4	3	2	1
Organization of journal entry is easy to follow	6	5	4	3	2	1
Generated questions appropriate to activity	6	5	4	3	2	1
Uses detailed, descriptive language	6	5	4	3	2	1
Scientific Content	Above Average - Average			Fair - Needs Improvement		
Adequate time spent on activity	6	5	4	3	2	1
Hypothesis correlates with activity appropriately	6	5	4	3	2	1
Demonstrates comprehension of content material	6	5	4	3	2	1
Evidence of scientific language	6	5	4	3	2	1
Measurements/Observations are accurate	6	5	4	3	2	1
Study is thorough	6	5	4	3	2	1
Overall Grade for Science Project---->	6	5	4	3	2	1

Comments:

Lesson 2:

This lesson will be part of a unit covering Standard V.3, The Atmosphere and Weather. The students will have already been introduced to clouds and how they generally form and will now be studying the different types of clouds.

In this lesson, the students will be learning about three different types of clouds. They will be studying the various types of clouds through research-based activities. They will be instructed to focus on these three specific cloud types: cirrus, stratus, and cumulus. They will be asked to describe the defining characteristics of these cloud types, such as, what they look like and where they are found in the sky, in a small group and present their findings to the class using a poster. The objective of this lesson is for students to create a presentation of the three different cloud types after their research.

The benchmarks this lesson addresses are that students will develop strategies and skills for information gathering and problem solving, MCF: I1.5. In the same way that scientists use many methods of gathering information, students will be using different sources such as books, pictures and various web sites to research cloud characteristics. Students will also be preparing a chart, in the form of a poster, to represent the data they found, MCF: I1.6. The results will likely be similar across the groups but they will be able to compare their findings to generate an agreed upon description of each cloud type. The purpose of this kind of activity in science is for the students to work with their peers on a science activity, to present their findings with others and discuss their results in an open-forum type discussion. These are similar to scientific practices which are very important for students to partake in so that they understand how scientists work and so that they can also participate in the different roles of scientists.

Cloud Types Research Lesson:

Grade Level-5

Objectives:

1. Students will research three cloud types.
2. Students will then make and present posters of their findings that distinguish the characteristics of the three cloud types. For example, what characterizes a cirrus cloud? What does it look like?

Materials:

We will need computers with internet access, weather books (*Weather Mania*, *How the Weather Works*, etc.), posters, markers, and paper to jot down research notes.

Procedures:

1. Begin by discussing the weather outside. Hopefully, it's cloudy and you can ask questions like, "What is the weather like today?", "What do you think clouds could tell you about the weather?", "Do the clouds outside look the similar to other clouds you have seen...have you seen clouds that look different from those today?", "What might make one cloud different from another?"

2. Next, show students selected pictures of the three types of clouds. Introduce the cloud names to them, cirrus, stratus and cumulus, and write them out on the board or overhead.
3. Explain to the students what they will be doing. "Today you will be researching these cloud types in small groups. You will look at books and web sites to be able to describe these clouds. Your group will list the sources you used and the description you came up with for each cloud and you will end up presenting this information on a poster. You need to use at least two different sources and if you find contrasting information in those two sources, you will need to use more sources to find the most accurate description. Your group will then present the poster at the end." There should be books or journals already set out at a table or two for students to use. I found three good books at the library and I know there are likely many more. Students may or may not know how to search the internet so you may have to steer them in the right direction if needed. I used google to search and found quite a bit of information.
4. Let the students' research for about 45 minutes before starting their poster. If they get done earlier, they could get started on their poster.
5. Have them make their cloud type posters.
6. Present posters and facilitate large group discussion about the cloud findings.

Assessment:

Students will be assessed on their participation in the group work and on their posters. Students should be able to explain and describe their posters to their classmates. I expect them to understand how the three types of clouds are different from each other and also to be able to communicate those differences to their peers. I think it would be beneficial to ask each student in the group to contribute some bit of information about the cloud types they researched. Overall, students should gain the knowledge that allows them to differentiate between the three cloud types so that later on, if they were given a test on clouds, they could describe each cloud and give characteristics of it. This activity is just a more meaningful way for the students to gain this knowledge.

Extension:

Have students learn about another type of cloud that they would like to include on their poster. Have them write a quick write about the clouds they have seen and when they saw them.

Support:

Choose groups that will be able to work effectively together. Assign tasks each group member should focus on. Make sure to monitor groups for inclusion of all members and look for possible conflicts.

Other Resources:

<http://www.lessonplanspage.com/printables/PScienceCICloudTypes6.htm> 4-11-04

Weather Mania by Michael DiSpezio

Reader's Digest, *How the Weather Works* by Michael Allaby

Lesson 3:

This lesson will be part of a unit covering Standard V.3, The Atmosphere and Weather. The students will have already been working with the three different cloud types: cirrus, stratus and cumulus and should be able to classify them by their defining characteristics. Now they will be studying how clouds directly relate to weather. They will specifically learn when the different cloud types are observed in weather by taking a close look at specific weather conditions and the clouds present in those conditions.

In this lesson, students will observe pictures of different types of clouds with the data listed for the weather conditions of those days. For example, the students may see a picture of small, scattered cumulus clouds with data from that day given including high temperatures and sunny. Students will be given various pictures of these cloud types with weather data to analyze so that students can see the correlation between the weather conditions and the clouds that form in them.

The benchmark that this lesson addresses is MCF:11.2 which states that students will develop solutions to problems through reasoning, observation, and investigation. The students will be investigating when the cloud types form based on their observations of different pictures and their analysis of the data presented. They will record their thoughts in their science journal and the whole class will discuss the results after the investigation.

Weather and Clouds Lesson:

Grade Level-5

Objectives:

1. Students will examine cloud pictures and weather data to analyze what weather conditions are necessary to form the cloud types; cirrus, cumulus, and stratus.
2. Students will see patterns in weather conditions and cloud formation.
3. Students will use this new understanding to hypothesize the cloud types for future weather forecasts.

Materials:

Students will need paper and a pencil.

Teacher will need future weather forecasts, cloud pictures, and data sets including temperature, air pressure, wind direction, and humidity.

Procedures:

1. Begin with a small discussion on weather. Use this short discussion to try and get students to generate ideas about how weather might relate to the clouds they see. Ask questions like, "What is the weather like today?", "What type of clouds do you see in the sky today?", "Have you seen this same type of cloud on other days where the weather was similar to/different from today's?", "Could anybody explain why they think this happens?"

2. Next, tell students that there are many different patterns that we can observe in the weather that can help us predict what types of clouds we will see. Tell them that today, we will be learning how to do this by looking at some cloud pictures and weather data to try and find patterns.
3. Let the students work in small groups and give each group a cloud picture to discuss. Have them record what type of cloud they see and the data set for each picture. Then, after the pictures have rotated through the groups, have students discuss and come up with a pattern or reason why they think any certain cloud type may form.
4. Ask each group to discuss what pattern they found between the data set and the clouds. Facilitate a discussion around their findings. Also, you may need to do some further explanation of the science ideas behind these patterns and why they occur here. This can be a complicated task, so stick to general patterns and simplified explanations for the first day.
5. Give the students a forecast for the week and ask them each to individually predict what type of clouds they will see on that day and why. After they do so, allow them time to talk to their group about what the others decided.

Assessment:

For this lesson, assessment can take place in a couple ways. First, the group work can be collected to make sure each group did their work. This can also be assessed during the discussion where each group presents their findings. Another assessment could be to collect student's predictions on the forecast. Although students may not fully understand this concept in such a small amount of time, they should be able to make observations and generate questions which allow the teacher to see that they are thinking about the topic and trying to understand it better. The effort put into these activities is important and should help lead to understanding.

Support:

Choose the groups wisely to help meet the needs of all students to the best of your knowledge. Assign jobs to each group member in order to keep them on task and involved in the activity. Monitor the students while they are working.

Resources:

May need to use weather websites for full data sets.

Strand V.3: The Atmosphere and Weather

Lesson 4: Cloud Art

Introduction:

This lesson continues our cloud unit in a fun and engaging way. Students will be asked to use their observations and data collections to develop a solution to how they can portray their chosen cloud type artistically. They will need to demonstrate the characteristics of their cloud, they will need to consider scale (horizon), and they will need to consider weather conditions.

Again, over the course of the unit, students will have the opportunity to:

5. Observe a cloud in a jar (Lesson 1)
6. Research 3 types of clouds (Lesson 2),
7. Observe how weather affects cloud types (Lesson 3)
8. Complete an art project and essay using their research about the characteristics of the three cloud types for this unit (stratus, cumulus, and cirrus) (Lesson 4).

Everything will be compiled in a portfolio

MCF: Science/ Strand V/ Content standard 3/ Elementary/ Benchmark 2

- *English Language Arts/ Strand I/ Content Standard 8/Benchmark 3*
- *English Language Arts/Strand 1/ Content Standard 2/Benchmark 1*

For this lesson, I used the MiCLiM CD to research benchmarks and content standards. Students will need to use their observations to reason through their planning of an essay, and art project reflecting their observations and research about cirrus, nimbus, or stratus clouds.

Scientists often draft their ideas visually, and include art in their renditions of their observations. This is one-way students can see, authentically, how science includes other areas of study. This will help them connect ways to integrate prior knowledge and other resources as possible solutions for problems or expectations.

This lesson will engage students in planning, and strategic reasoning about how to incorporate their observations and data into an essay and cloudscape. Students will have to decide what information should be included and in what order for their essay. They will also need to determine what aspects of their specific cloud formation is visually more proactive. This will help students organize thoughts and hone in on their knowledge about clouds that they have been learning. Scientist often think and rethink about their observations in creative ways to help them arrive at solutions.

Resources: This link will take you to the lesson plan:

McNicholas, I. "Clouds." Academy Curricular Exchange: Columbia Education Center/ Science. <http://www.ofcn.org/cyber.serv/academy/ace/sci/cecsci/cecsci043.html>.

Name: _____

Date: _____

Cloud Type: _____

Teacher(s): Mrs. B

Cloudscape



Process	Below Avg.	Satisfactory	Excellent
1. Has clear vision of final product	1, 2, 3	4, 5, 6	7, 8, 9
2. Properly organized to complete project	1, 2, 3	4, 5, 6	7, 8, 9
3. Managed time wisely	1, 2, 3	4, 5, 6	7, 8, 9
4. Acquired needed knowledge base	1, 2, 3	4, 5, 6	7, 8, 9
5. Communicated efforts with teacher	1, 2, 3	4, 5, 6	7, 8, 9
Product (Project)	Below Avg.	Satisfactory	Excellent
1. Essay structure is organized/makes sense	1, 2, 3	4, 5, 6	7, 8, 9
2. Mechanics of writing	1, 2, 3	4, 5, 6	7, 8, 9
3. Organization of art component	1, 2, 3	4, 5, 6	7, 8, 9
4. Uses creative license	1, 2, 3	4, 5, 6	7, 8, 9
5. Demonstrates cloud type knowledge	1, 2, 3	4, 5, 6	7, 8, 9, 10
6. Accurately depicts cloud type	1, 2, 3	4, 5, 6	7, 8, 9

Total Score: _____

Teacher(s) Comments:

Geosphere - Erosion & Weathering

By: Marie Allen, Theresa Bey, & Kristin Overfield

Science Mini Unit on Geology

Overview

- 1. Ideas and Context/Practice- Benchmark 1 & 2**
- 2. Lesson Plan 1**
- 3. Lesson Plan 2**
- 4. Ideas and Context/Practice- Benchmark 3 & 4**
- 5. Lesson Plan 3**
- 6. Lesson Plan 4**
- 7. Ideas and Context/Practice- Benchmark 5 & 6**
- 8. Lesson Plan 5**
- 9. Lesson Plan 6**

** Each lesson correlates with the benchmark of the same number.*

Ideas and Contexts

Benchmark 1 - Identifying and describing major features of the earth's surface.

The earth's surface is made up of many different landforms. A landform is a natural physical feature of the earth's surface such as mountains, hills, plains, valleys, and bodies of water such as rivers, oceans and lakes. (Also deserts.) In order to satisfy the requirements for this benchmark, an understanding of what landforms look like, as well as where they are formed and found is required.

Real world context- Concepts of landforms will be explored through examples of Michigan surface features such as The Great Lakes, Grand River, or the Porcupine Mountains. A more local real world context would have students looking at the landforms in their school community or neighborhood community.

Benchmark 2- Recognize and describe different types of Earth Materials

The Earth is made up of a variety of different materials, some are related (such as gravel, rocks, and large boulders.) Some materials are very distinct and different, (clay, and soil.) Noticing and comparing similarities and differences of these materials will give clear and concise understandings of what our Earth is comprised of.

Real World Context- In lesson 3 (Geology Walk) rocks, soils, sand etc. can be observed in their environment. Samples of materials will be provided in this lesson for hands on experience and manipulation.

Practices

Lesson 1- Students will look through magazines, brochures, internet sources, maps, Polaroid pictures, as well as text, and ask themselves "What is this feature?" They will use these sources to interpret the characteristics of each landform. Students will be using members of their small groups as an interchange of information. Students will have a compilation of landforms with main characteristics to clear misconceptions and create basic understandings of given landforms. Student will use their knowledge to determine similarities and difference concerning landforms.

Lesson 2- Students will be reading text, manipulating earth materials, observing characteristics, and writing down observations. Students will ask themselves and group members questions regarding materials and what they are observing, comparing, and recording. Students will be using their group members and their own prior knowledge to develop solutions. Students will use the physical materials provided, and similarity/difference tables to help interpret information for themselves and to each other. Students will be able to use these experiences with different earth material in the future but remembering key differences and characteristics of each material.

Lesson Plan for: Making a landform collage

Purpose of Lesson: Students will be describing and exploring landforms on the Earth's surface

Objectives:

1. Students will become familiar with the earth's major landforms such as mountains, rivers, valleys, plains, oceans, lakes, and deserts.
2. Students will work in small groups to explore the landforms, place them on a group poster board.
3. Students will use an abundance of resources, (books, magazines, internet, and travel brochures) to find major landforms.

Transitions through lesson:

1. Students will be given the assignment in large group, (individual seats.) At this time expectations will be discussed, as will resources and any questions student might have.
2. Students will then break into small groups, (of four or five,) to work on their presentation. Each group can take their materials to a different part of the classroom to complete the project.
3. Students will complete the assignment and then return in their individual desks for their brief closing and assessment

Procedures:

1. Students will be given directions, expectations, and group members.
2. Students will collect the materials that they will need for this project, personal scissors, markers, glue stick.
3. Students will break into groups and each group will find a place in the classroom to work at. One member from each group will then come up to the teacher who will distribute materials, (magazines, internet materials, travel brochures, etc.)
4. The group will look through materials to find the landforms that the teacher has asked for. (Each group should have a typed list of the landforms that they need to find.)
5. Group members will work to cut out three pictures of each landforms and then glue them to the poster board and label each. All group members should be cutting and gluing. One member can be the recorder, (the person keeping track of the glued landforms.) One member might also choose to be the labeler.
6. After each group has completed their poster, the children should clean up materials and return to their desks. Each poster needs to be deposited at the teacher's desk.

7. After clean up students will return to their seats and take a clean piece of paper and a pencil from their desks.
8. The students will then take a “quiz” on the learned landforms. The teacher will hold up a picture of a landform and the students will write the name of the landform on their paper.
9. After the quiz the teacher will collect them and then the class will go over the landform questions together.
10. The teacher should announce tomorrow's science lesson and close the lesson out.

Simplifications:

- students can stick to the basic landforms such as lake, river and mountain

Extensions:

- students can explore more difficult landforms such as deltas, plateaus, basins,

Assessment:

After the assignment has been completed, students will engage in a quiz type closing assessing what they may have retained from the activity. Each student will take out a piece of paper and a pencil. I will have previously collected pictures of certain landforms that I think they should have learned or explored. I will hold up the picture of the landform and they will each write down the answer on their paper. (After collecting the papers I will be able to tell if there are any landforms that are misunderstood or unknown.)

Closure:

After we take the quizzes and collect them, the groups will hang their collages around the room. We will brief together about the next day's lesson, (exploring different earth materials.)

Lesson Plan for: Identifying types of Earth Materials

Purpose of Lesson: Students will work in groups to identify and discuss different earth materials.

Objectives:

1. Students will work collaboratively in a small group discussing rocks, sand, clay, boulders, and gravel
2. Students will fill in table regarding materials attributes and characteristics
3. Students will use their observations and the table they create to engage in a large discussion about materials and their similarities and differences.

Transition into lesson:

1. Students will be given instructions, expectations, and rules about the activity in their individual seats prior to beginning the activity. Students will be given group colors and will be dismissed by group.
2. Students will form groups of six children and sit in an area separate from other groups. When all students in a group are quiet and situated, one student will raise his/her hand indicating that their group is ready to receive materials from the teacher.
3. After the activity is complete students will return to the large group to discuss their findings with the rest of the class.

Materials Needed:

Teacher:

- six sets of materials (each set has one rock, large rock or boulder, sample of clay, sand, soil, and gravel,) 6 magnifying lens's, worksheets/tables for all students in the class,

Students:

- pencils

Procedures:

1. Students will receive the assignment, instructions, expectations, and groupings
2. Students will assemble in their small groups and retain the materials
3. Students will work as a "team" to observe and record characteristics of materials.
4. Students will use their senses and the magnifying glass to notice material characteristics
5. After charts are complete, students will put materials away and move back to their original seats.
6. Students will designate one student to bring materials up to the teacher's desk.
7. Students will use the chart to engage in a large group discussion about what they noticed about the materials.

8. The teacher will lead students in a discussion about materials' similarities and differences.

Simplifications:

- provide a list of questions that students can use as a guide for making inferences and observations about materials
- if there are many deficient writers in the class, have one advanced writer assigned to each group and the can do the writing, other can offer thoughts and ideas about materials
- Have students predict where they might see some of these materials in their communities.

Assessment: The student worksheets of observations and characteristics, and the generation of discussion on similarities and differences concerning earth materials.

Ideas and Context:

Benchmark 3: Describe natural changes in the earth's surface

There are many factors that contribute to physical and chemical weathering. Physical weathering is the breakdown of rocks and sediments into smaller pieces of the same material through physical means such as animals, plants, water, and wind. Chemical weathering is the breaking down of rocks and sediments into smaller pieces of a new material through chemical reactions aka: the rock is not the same material as before. While weathering involves the breakdown of materials into smaller pieces, erosion is the transport of these smaller pieces to new locations.

Real World Context- concepts of weathering and erosion will be explored through observation in locations such as the school parking lot, the playground, or the grounds of the school. Changes to be observed may include; slopes, vegetation growth, cracks in the asphalt, water accumulation, etc. (These would depend on the location of the school).

Benchmark 4: Explain how rocks and fossils are used to understand the history of the earth

Fossils are formed when plants or animals' remains leaves imprints in rocks that are preserved over great periods of time. The imprints that are preserved are usually a hard part of the animal or plant. Fossils occur in sedimentary rocks because these rocks form at the surface of the earth where living organisms generally exist.

Real World Context: Fossils can be found in many areas of the world. Some of these areas include: gravel, mines beaches or can also be seen in museums. Fossils can be used as a "visual history" for extinct organisms such as dinosaurs.

Practices

Lesson 3: The students will ask questions concerning natural processes such as weathering and erosion of the earth's surface. The students will develop solutions to their questions through direct observation of what they experience in the natural world outside of their school. The students will interpret what they have observed through an accurate labeled map which they will create based on the types of weathering and erosion that they see. The information that is depicted on their maps will help clear up any misconceptions that the students may have possessed prior to the lesson. The maps will serve as a resource to assess the new material that they have learned.

Lesson 4: The students will create their own fossils and make predictions on what they think will occur once the plaster has hardened. The students will ask questions about fossils; where they come from, how they are made, and develop solutions to their questions after their fossils have been formed. The students will share their experiences about what they have done and compare their knowledge. The students will interpret fossilization through their own representation of a fossil. The students' misconceptions will be cleared up after their fossil has been created.

Lesson Plan For Describing Natural Changes in the Earth's Surface

Purpose of Lesson: At the completion of this lesson the students will be able to identify examples of physical and chemical weathering, and erosion. The students will be able to recognize natural changes in the earth's surface through familiar locations such as the playground, parking lot, and grounds of their school.

Objectives of Lesson: The students will be given a brief introduction of the concepts of physical weathering, chemical weathering, and erosion. The students will walk around the campus of the school and will make a labeled map depicting examples of weathering and erosion that they observe. The students will make individual maps and will then present them to the class. The lesson will end by an open discussion of similarities and differences in the student's maps.

Transition Into Lesson: The students will line up at the door in an orderly fashion and we will exit the classroom into the yard of the school. I will know that the students are ready to exit the building when they are quietly lined up. The lesson will involve a walk around the campus of the school in a group like way, which includes individual time to draw their maps, and in conclusion the opportunity to discuss similar and different attributes that had been recorded.

Materials Needed: Teacher: Nothing

Students: They will need a pencil, piece of paper and perhaps a clipboard that they can attach their paper onto a hard surface.

Procedures: I will tell the students to make sure they do not leave the grounds of the school. Students that may be prone to wander I would want to keep in close reach. I would encourage the students to try and do the assignment individually so that all of the students would not have the same examples of weathering. I will allow about 45 minutes for drawing their map. If the students are working in a productive manner and need more time that is a possibility, I will remain flexible in this area. After the students appear to be finished with the activity back into the classroom. I will then gather the student together in a large circle and allow the students to share their ideas with one another. I want the students to pay close attention to the examples that the other children use.

Simplifications: If the students appear to have difficulty with the lesson I will lead the class as a whole around the grounds of the school giving hints to different examples of weathering and erosion.

Extensions: If the class finds all of the examples that can be observed on the school grounds I would bring the students back into the class and give them another piece of

paper. On this piece of paper I would tell them to draw examples of weathering and erosion that appear either at home, a vacation spot, a park, etc.

Assessment: I will gauge the students understanding through whether they can accurately depict the specific example to the proper type of weathering or erosion. At the end of the activity, probably the next day, I will have prepared a written assessment. I will give examples in words and depicted by picture and have the students write in the blank next to the example if chemical weathering, physical weathering, or erosion is being shown. (I would have based the examples from the examples that the students shared in class the day before.)

Closure: I will wrap up the lesson by giving the students examples of chemical weathering, physical weathering, and erosion in the world. I would ask the students if they had any questions and I would give the students an introduction of lesson number four, which involves the making of fossils.

Lesson Plan For: The Introduction of How Rocks and Fossils are Used to Understand the History of the Earth.

Purpose of Lesson: At the completion of this lesson the students will be able to understand how rocks and fossils are studied to learn about the history of the earth. The students will have a brief lecture on how fossils are formed, where they can be found, and how they are used learn about the earth.

Objectives of Lesson: The students will work in a hands on manner creating their own fossil. The students will also improve their note taking skills by listening to a small lecture for background knowledge on fossils and their importance. The students will also get the opportunity during the wrap-up of the lesson to ask and answer questions that are brought into discussion.

Transition Into Lesson: The students will sit in their desks while making their fossils. I will have paper plates prepared with the needed plaster on the plates. The students will have a few objects on their desk in a cup. These objects may include leaves, shells, twigs, grass, flowers, stones, etc. I will know the students are ready to begin by waiting until the students are quietly sitting in their desks. I will explain the definition of fossilization to the students and explain to them that they are going to make their own fossils.

Materials Needed: The materials that will be used include; plaster of paris, paper plates, objects to make impressions of (leaves, shells, twigs, grass, flowers, stones, etc.)

Procedures: I will explain to the students the definition of fossilization. I will then pass out the paper plates that have the plaster of paris already on them. I will then model to the students that they are to press the objects into the plaster and then lift them right away to make impressions. I would also explain to the students that “real” fossils are created when the object decomposes. Then I will let the plaster dry and allow the students to look at them. After the students have put many impressions into the plaster I will gather them back up and lay them on the back table to dry, out of reach of the students.

Simplifications: The lesson is quite simple, however if the students are having a great deal of difficulty I will give them a less number of objects to impress into the plaster.

Extensions: If the students find this lesson to be quite easy I will then go into a more depth discussion of fossils that they have observed in various museums, etc.

Assessment: I will gauge how this lesson went by how the students discuss fossilization in a large group discussion. (This lesson is quite easy, yet the children enjoy doing art activities and this lesson incorporates both science and art.)

Closure: I will end the lesson by bringing the class back together to get their feedback on the lesson. I will then ask the students how the fossils they made are both similar and different from fossils such as dinosaur bones. Then I will brief the students for lesson number five.

Ideas and Concepts:

Benchmark 5- Describing uses and materials taken from the earth

The weathering of rocks on the earth's surface, and the build up of landforms from internal forces bring natural resources within our reach. Example of these natural resources may include certain rocks and minerals. Some of the natural resources that come from the earth are: gypsum, limestone, mica, coal, slate, salt, iron, sand and fluorite.

Real-world context- These minerals can be processed into products that we use in our everyday lives. (Ex: gypsum is the mineral used to make wallboard, which is used to make the homes we live in. Many of these resources come from our own state, Michigan. Salt is heavily mined in the Detroit area. Gypsum mines are abundant in the Grand Rapids State. Sand is mined along the western coast of Lake Michigan; it is then used to make glass products and parts of cars, (a prosperous industry in our state.)

Benchmark 6- Demonstrate ways to conserve natural resources and reduce pollution through reduction, reuse, and recycling of manufactured materials.

In order to preserve natural resources for future generations, recycling manufactured materials is necessary. Recycling is to process (as paper, glass, or cans,) in order to regain materials for human use. For example, aluminum is a highly recycled mineral based product. Using recycling aluminum requires 10% of the energy in comparison to using pure aluminum.

Real-world context- Students are gaining experience and knowledge of how to separate and recycle materials found in their schools. Students can take what they have learned about conserving and recycling and use it in their homes and communities to create a better, cleaner environment.

Practices:

Lesson 5: Students will ask questions regarding materials and what they are composed of. They will inquire about where these materials can be found and made. Students will develop solutions to their questions using the text provided to them to better understand natural resources and where they are located. Students will use the pictures depicted on the map to understand how they are used in everyday life. Students will reconstruct their understandings of the material by creating location maps of their homes and state and natural resources in designated spots.

Lesson 6: The students will ask questions regarding their own behavior in regard to protecting the environment. The students will develop solutions by viewing the amounts of recyclable materials that are being disposed of that could be reused or recycled. The students will use the sorted materials to understand the concept being conveyed, they will create graphs in order to interpret their findings and visualize how many resources could be recycled. The students will reconstruct their understanding of how important recycling is to the environment by showing that one small example, such as a full garbage can, and applying it to a larger scale such as the environment as a whole.

Natural Resources

Benchmark: Describing uses and materials taken from the earth

Purpose of Lesson:

- Discuss how natural resources are used in a household.
- Learn about where natural resources are found and made.
- Students will use the picture of the house and the map of Michigan to show where natural resources can be found and made.

Materials:

Map of Michigan
Drawing of house
Natural Resource Cards
Pencil
Journal
Glue
Scissors

Procedure:

1. Students will be sitting at their desks. They should have a pencil and their journal out for note taking.
2. Present some familiar natural resources such as Fluorite, Salt, Iron, etc.
3. Ask them where these minerals can be found and what is made from them.
4. Have about a 15 minute conversation with the students. This will help the teacher to learn how much the students already know about the topic.
5. Record their ideas on the chalkboard.
6. Tell them that most every object is made from at least one natural resource. Give examples around the room. (Ex. Gypsum is used to make wallboard.)
7. Tell the students that they will be learning about other natural resources that can be found around their house and also, where some of these natural resources can be found throughout Michigan.
8. Give student the resource cards, map of Michigan, and drawing of house.
9. Students will then cut out resource cards and glue them to their correct spot.
10. Provide them with glue and scissors if they do not have their own.
11. Give them about 30 minutes to complete the assignment.
12. While students are working, walk around the room and answer questions.
13. After all the students have finished bring them together for another group discussion.
14. Have the students share with the class what they found interesting while doing this assignment.

Simplifications:

Give the students a couple more minutes to complete their work. Assist them with all questions they may have. Allow them to work with others. Provide them with resources, such as books on natural resources, and the internet. (Make sure to have a website handy.) Make sure dictionaries are available for the students to use. Provide a detailed map of Michigan.

Extensions:

Give students the opportunity to explore other natural resources that are not mentioned in the lesson. Have them draw their own picture that includes other household items that are made from natural resources. Also, have them research where other natural resources are found outside of Michigan. Have them discuss way to conserve natural resources.

Assessment:

Compare the discussion in the beginning of the lesson and the notes they took in their journals with the discussion at the end of the lesson and the placement of their natural resource cards on the map and house. Also, while student are working, question them about the placement of their natural resource cards.

Closure:

To wrap up the lesson, have a final discussion with the students. Answer any questions or concerns that they may have about the lesson. Tell the students that next time they will be learning about ways in which they can conserve natural resources.

Acknowledgements: This lesson was taken from NSC 301, taught by Jane Rice. Marie Allen has modified it.

Natural Resource Cards

Directions: Cut out the minerals and rocks below and glue them to the picture of the house provided. They should be glued next to an object in which they can be found.

GYPSUM	SLATE	IRON	COPPER
This mineral is used to make wallboard. There are underground mines below the city of Grand Rapids.	This rock is sometimes mixed with tar to make shingles. It's mined in Pennsylvania.	This mineral is used to make steel for cars and buildings. It's mined in the Upper Peninsula.	This mineral is used to make electrical wire. Copper used to be mined in the Upper Peninsula.
SALT	QUARTZ	GRAPHITE	COAL
This mineral is added to food, used to make chemicals, and to melt ice. It's mined under the streets of Detroit.	This mineral is the main component of one type of sand that we see on the Great Lakes beaches. It's used to make glass.	This mineral is used as a lubricant and, when mixed with clay, forms the "lead" of pencils. It's mined around the world and can be made in laboratories.	This rock is burned to produce steam for heating and generating electricity. It used to be mined in the Lower Peninsula.
CLAY	FELDSPAR	MICA	PHOSPATE
This rock particle is used to make bricks. It's mined along rivers in central Michigan.	This mineral is used to make a porcelain coating on top of metal.	This mineral is added to paint to give it strength.	This rock is used to make fertilizer. It's mined in Florida.
LIMESTONE	GRAVEL	SAND	FLUORITE
This rock is crushed and added to sand and gravel to make concrete. It's mined in Rogers City on the shore of Lake Huron.	This crushed rock is added to sand and limestone to make concrete. It's mined at gravel pits around the state.	This crushed rock is added to gravel and limestone to make concrete. It's mined in gravel pits along the lake shores.	This mineral is added to toothpaste and drinking water to help prevent dental cavities. It's mined in Kentucky and Illinois.

Directions: Cut out the natural resources below and glue them to the map of Michigan. They should be glued near the area where they can be found.

<p style="text-align: center;">COPPER</p> <p>This mineral (made up of one element) was deposited by volcanoes in the Keeweenaw Peninsula a billion years ago. Mines in the UP produced most of the copper for the country between 1880-1920. It's used to make electrical wire and plumbing pipe.</p>	<p style="text-align: center;">IRON ORE</p> <p>The iron minerals in this rock were deposited in the western half of the UP 2 billion years ago by volcanoes. Iron is used to make steel. Michigan Mines were the top iron producers in the first half of the 20th century, which gave rise to the steel and auto industries in the state.</p>	<p style="text-align: center;">LIMESTONE</p> <p>This rock was formed from layers of shells left behind from marine animals in the seas that covered Michigan. It's used in the production of steel and cement, to soften water, and to neutralize acid soils. The largest limestone quarry in the world is in Rogers City.</p>
<p style="text-align: center;">OIL</p> <p>Oil deposits formed in the Lower Peninsula hundreds of millions of years ago from marine plants and animals living in the sea that covered Michigan. As these organisms died and fell to the bottom of the sea, they were covered by sediments. The pressure of the sediments changed the remains into oil.</p>	<p style="text-align: center;">COAL</p> <p>This rock was formed millions of years ago from plants. The chemical energy of the plants was preserved, not consumed by decomposers, thus making coal a "fossil fuel". MI's coal was previously used for heating, but it's not economically feasible to do so now. Coal is found under the central part of the state.</p>	<p style="text-align: center;">SAND</p> <p>These rock fragments were deposited by glaciers 10,000 years ago. Sand and gravel cover the Lower Peninsula and are mined extensively. Sand is used to make glass. Both sand and gravel are used to make concrete.</p>
<p style="text-align: center;">GRAVEL</p> <p>These rock fragments were deposited by glaciers 10,000 years ago. Sand and gravel cover the Lower Peninsula and are mined extensively. Both sand and gravel are used to make concrete.</p>	<p style="text-align: center;">GYPSUM</p> <p>This mineral was formed hundred of millions of years ago when seas evaporated in Michigan, leaving behind mineral deposits. A hug gypsum mine is under the city of Grand Rapids. Gypsum is used to make wallboard for new houses.</p>	<p style="text-align: center;">SALT</p> <p>The mineral was deposited millions of years ago when salty seas evaporated. It's used in the chemical industry, as a road deicer, and in cooking. A hug mine exists under the city of Detroit.</p>

* The picture of house and Map of Michigan are hand drawn and will not be included in the lesson.

Conserving Natural Resources

Benchmark: Demonstrate ways to conserve natural resources and reduce pollution through reduction, reuse, and recycling of manufactured materials.

Purpose of Lesson:

- To educate students on becoming responsible users and protectors of their environment.
- Students will learn about environmental dilemmas, thereby understanding the global implications of their actions.
- Student will demonstrate a way in which they can improve their environment, such as, recycling, reduction, and reuse of natural resources.

Materials:

- Shel Silverstein's poem, "Sara Jane Amanda Stout Wouldn't Take the Garbage Out"
- Full garbage cans from other classrooms
- Graphing paper
- Pencil
- Calculators

Procedure:

Introduction: Teacher will read the poem by Shel Silverstein, "Sara Jane Amanda Stout Wouldn't Take the Garbage Out". The class will then discuss the implications of the poem, the mounting garbage, and move the discussion toward the concept of disposal of the garbage. The class will then discuss the idea of all people in the world's garbage and its' size and volume.

1. Collect the garbage cans from different classrooms.
2. Categorize the garbage into different piles: paper, waste, plastic, metal, etc.
3. Graph how much material that was disposed of could have been recycled.
4. The class will then calculate the weekly, monthly and yearly volume of each type of material.
5. Have the student's research other ways in which they can conserve natural resources. They can research on the internet and in the school library.
6. Have them present their findings to the class.
7. Have them create recycling bins for their classroom.

Simplifications:

Help the students think about the topic by asking them questions. Have extra help available for the students, including, teacher aids, parents, and special education teachers. Have resources on hand for the students to use. Help the students set up their graph before they graph the garbage. Or, have a ready made graph for students to use.

Extensions:

Have the students help explain to other students the importance of conserving natural resources. Have the students make recycling bins for their house, also have them write a letter to their parent's way it is important for their family to recycle.

Assessment:

Observe the students while they are separating the garbage cans. Record observations made. Use the graphs that the student created as an assessment tool. Record important ideas during all class discussions.

Closure:

Discuss the importance of conserving natural resources. Have the student continue thinking about this topic throughout the school year.

Acknowledgements: This lesson was taken from the web page:
<http://www.col-ed.org/cur/sci/sci86.txt> . It has been modified by Marie Allen.

Atmosphere and Weather

By: Sara Gold, Jackie Horn, & Leeland Jennings

Small Group Science Project

Weather and Atmosphere

Jackie Horn Sara Gold Leeland Jennings

The science topic of weather and atmosphere is a broad topic to be approached in elementary school. There are so many facets of the topic that approaching all concepts associated with the two would take various lessons. The age groups for the lessons that we tried to find were upper elementary grades. Our main focus was the fourth grade. However, there was a lesson that was listed for fifth grade that we felt fourth graders could manage just as well as the fifth graders could so we included it.

For the students to get the most out of each of these lessons, one must also plan in a manner that the children's knowledge can be built upon during each lesson. It would not make sense to start a topic that the important background information had not been covered; therefore, a sequential order for the topics is both desired and required. Of the lessons and activities that we found on the Internet the most logical order for the lessons is the following (This is not to say that there would not be helpful lessons that one could do between some of these lessons or that there would be lessons in different subject areas that would help these science lessons.):

Heat Is Neat Lesson

Jackie Horn

Ideas and Context: The atmosphere is a blanket of air around the earth. This air is a substance, and so it has properties. One of these properties is temperature. The temperature of air can be hot, warm, cool or cold. The temperature of air can change depending on environmental factors like humidity and altitude. The temperature of air can also change depending on the weather and season. The tool used to measure air temperature is a thermometer. (MCF Benchmark: Describe weather conditions).

Practices: In this activity, students will measure the air temperature using a thermometer. As stated in Benchmark #4, students will, “Use simple measurement devices to make measurements in scientific investigations.” They will also be using a stopwatch to keep track of time. They will use their measurements to compare different temperatures in different locations and environments.

Activity Description:

HEAT IS NEAT

GET READY TO PUT YOUR THERMOMETER TO WORK!

RULES:

Always stand the thermometer up. It is easier to read. Read the thermometer without picking it up. Have your eyes level with the thermometer when you read it.

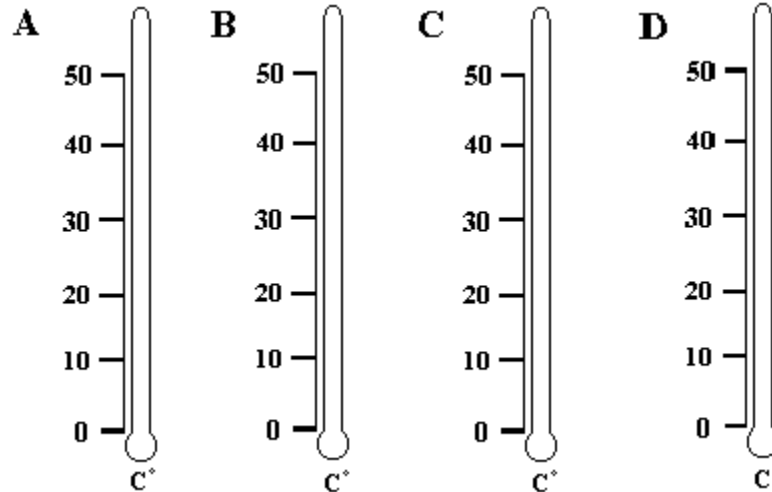
Try not to touch the bulb of the thermometer with your hands. Your hands are warm and will raise the temperature of the thermometer.

DIRECTIONS:

1. Take the temperature in each location on the list. Leave the thermometer "stand" in each location for the amount of time listed. Use the stopwatch to time yourselves.

2. Write the temperature of each location below the correct thermometer and color in the correct number of degrees on each thermometer.

1. Inside air--Place the thermometer on the chalkboard tray for 5 minutes.
2. Outside air--Place the thermometer against the shady side of the building for 5 minutes.
3. Hot air--Hold the thermometer in front of your mouth and breathe on the bulb of the thermometer slowly for 2 minutes.
4. Icy air--Stand the thermometer in the bowl of ice cubes for 5 minutes.



QUESTIONS:

1. Location _____ is the warmest.
2. Location _____ is the coldest.
3. Why did you measure the outside air in the shade instead of in the sun?

Our Town Temperature Lesson

Sara Gold

Ideas and Context: This activity is for a fourth grade class, although I think it could probably be used from 3rd grade up. It corresponds to the Atmosphere and Weather Benchmark #2: Describe Weather Conditions. There can be several different temperatures in different parts of the same town at the same time. Landforms such as hills, mountains, and high or low elevations can cause temperature variations in small areas. Bodies of water can also produce this effect as well as an area that has both urban and more rural areas close to one another. (This would be perfect for a school like Gunnisonville in the LSD because some kids live downtown in the city and some live in the cornfields to the north.)

Practices: This activity corresponds to constructing benchmark # 6: Construct charts and graphs and prepare summaries of observations. Students will collect their data and then come together as a class to make the charts and graphs. Students will use thermometers to take readings of the temperature at their own house and then use graphing and charting methods to organize and summarize that data in order to make observations about temperature variation in their town.

Activity Description:

Taken From: <http://faldo.atmos.uiuc.edu/WEATHER/LESSONS/urban.heating.html>

Lesson: Our Town

Prerequisites:

Thermometer Reading
North, South, East, West
Map Reading
Reflectivity and Absorption

Objectives:

This lesson uses and/or introduces new tools in geography, math, and science to make observations and draw conclusions on the local temperature variations in your area.

Materials:

A large map of your town which covers an area large enough to include all of the student's addresses.

One thermometer for each student or as many as possible (see Resources for possible sources of thermometers)

Graph Paper

A large sheet of paper or poster board

Assorted colored stick-on stars

Red, White, and Blue construction paper

Introduction:

Explain to the students that they will be taking thermometers home this evening to record the temperature of the air in their backyard. "You will all be taking the temperature at your home at exactly 7 PM tonight." Some questions to stimulate thought:

Any guesses as to what the temperature will be tonight?

Do you think you will all record the same temperature or different temperatures? Why?

If there are different temperatures recorded, will the warmer ones be on one side of town and the colder ones be on another or will they be mixed up? Why?

Are there any reasons why the temperature where I live will be different than where you live?

Body: Hang the map of your town in a place in the classroom where it can remain relatively undisturbed for a week or so, yet is accessible by the students. On the large sheet of paper(s) or poster board list the student's names down the left side with room for an address column and a temperature observation column. Place a colored star next to each name on the list using as many different colors as possible.

* Mrs. Floyd	105 South State Street	59
* Sally Fields	620 Elm Street	58
* Bobby Reynolds	511 Maple Street	59
* Sue Blue	100 Magnolia Lane	61

etc...

Start the lesson by asking the students to print their address with marker in the address column next to their name on the poster board. Next, have the student find the location of their home on the large map one student at a time, with the help of the class. The teacher may help or may feel it is necessary to have this part of the lesson prepared beforehand if no map skills have been taught. This section may be difficult and tedious so it can be done in several smaller sessions spanning several days if desired. Once a student has found his/her location, he/she should put a colored star on the map matching the color of the star on the name board. It may be a good idea to have the student put his/her initials next to the star to make it easier to locate each address later.

Before the rest of the lesson can be done, the students must record the air temperature at their home. Pick a day, preferably when the evening promises to be clear, to send a thermometer and instructions home with each student. The following day when the students return with their temperature observations, they can each record their temperature next to their name and address on the poster board. Explain that the students are making a table of the temperature observations. A table is another name for a list of items, such as temperatures, names, and addresses.

Max/Min/Range:

Ask the students: "Did everyone have the same air temperature at home last night?" Tell the students that you are interested in finding the range of the temperatures in your town last night. To do this you need to know the maximum (highest) temperature and the minimum (lowest) temperature in town. The maximum temperature is the highest temperature on the list or table. No other temperatures will be greater than the maximum. Have the students find the maximum temperature on the list. Write the temperature on the chalkboard. The minimum temperature is the lowest temperature on the list. No other temperatures will be less than the minimum temperature. Have the students find the minimum temperature on the list. Write the temperature on the chalkboard. If this exercise proves difficult it may help to sort the list of air temperatures on the chalkboard from least to greatest with the help of the students.

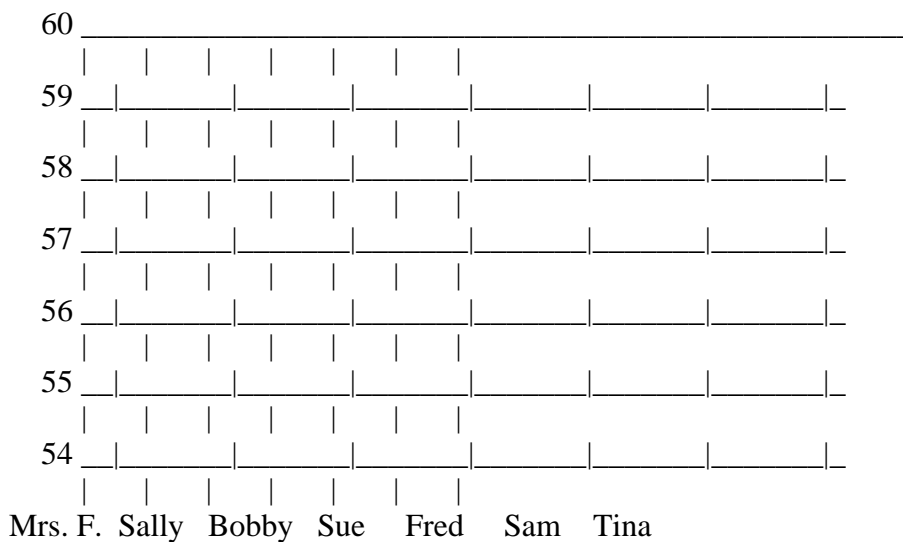
OPTIONAL: Explain to the students that "in our town the air temperatures changed from (maximum, e.g. 59) in one part of town to (minimum, e.g. 39) in another part of town." We call this change from one area to another the "range of air temperatures." We can make a measure of the range of air temperatures by taking the

difference between the maximum and the minimum air temperatures. As a class, subtract the minimum from the maximum in a conventional manner or by counting up from the minimum to the maximum while holding up fingers. The number of fingers up when the maximum is reached represents the range of the air temperatures. The larger the change or difference between the maximum and minimum, the larger the range in air temperatures. The smaller the change or difference between the maximum and minimum, the smaller the range in air temperatures.

Graphing:

Note: The following procedure can be time-consuming. It is advisable to have other activities available for the students to do while others are graphing their data.

Make a large graph template on the chalkboard or a large piece of poster board with air temperatures labeled on the vertical axis and student's names labeled on the horizontal axis:



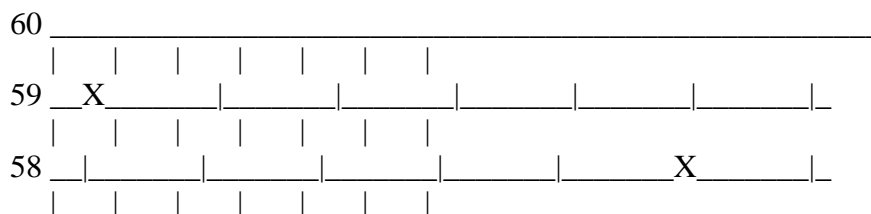
Model how temperatures are plotted on the graph by putting an X on the temperature that you observed. Read your temperature from off the observation poster board and count up from the bottom of the graph until you reach the value that

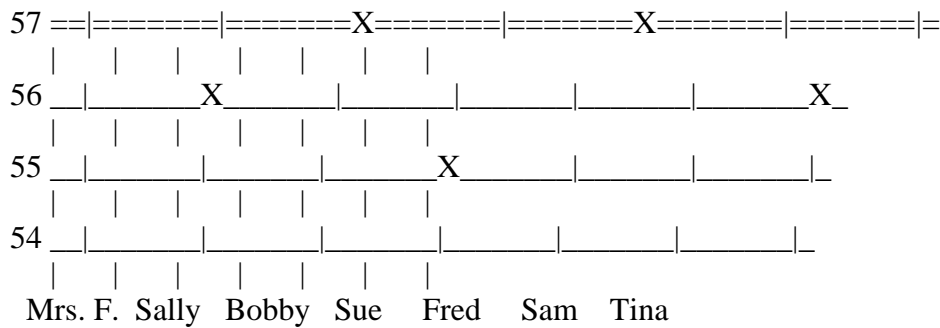
corresponds to your observation. Put a bold X at the intersection of the lines for your temperature observation and your name.

Have each student come to the graph, read his or her observation from the observation board, count up from the bottom of the graph and put a bold X over the correct temperature. When the graph is full, explain to the students that this is another way to represent the information on the observation board. To demonstrate this: turn the observation board so that the students cannot see it. Show the students that you can find your temperature from the graph by searching the horizontal axis for your name, follow the vertical axis up until you reach your bold X, follow the horizontal axis to the left to read the temperature. Have a few students come to the graph, find their names, follow up to the X, left to their temperature observation, and read their temperature to the class. Finally, have each student find the temperature observations for another student using the graph. Position the observation poster board so that the rest of the class can check that the process is working yet the student at the graph cannot see it.

Comparing Temperatures:

Sometime before the start of this part of the lesson, calculate the average of the temperature observations (round to the nearest degree). Explain to the students that you are going to draw a line through the middle of the temperatures on the graph. Draw a thick horizontal line across your graph through the average temperature. Your graph should look something like this now:





Explain that we are going to compare the temperatures to the middle line temperature. Some temperatures will be above this line, some temperatures will be below this line. Tell whether your temperature is above or below the middle line and by how many degrees. Count from the line up or down to your observation to get the number of degrees away from the line. Ask a number of students to do the same thing with their observations. Ask: "Whose air temperature is the farthest away from the line? How far away is it? Whose air temperature is the farthest away and warmer than the line? How far? Whose air temperature is the farthest away and colder than the line? How far? Are there any observations that are exactly line? Whose?"

Mapping and Data Visualization:

Explain to the students that you are going to try to determine which parts of town were warmer than the middle temperature line on our graph, and which parts were colder than the middle temperature line on our graph, on the night they took their observations. Ask each student to get some red construction paper if their observation was warmer than the line, blue construction paper if their observation was colder than the line, and white construction paper if their temperature was exactly on the line. Each student will cut a circle from their colored paper (2-6 inches, depending on the size of your town map). With a piece of tape, have the students place their colored circle on top of the star marking their address on the town map. The circles may overlap some.

When all the circles have been placed, ask the class to look at the map and try to determine if there are any areas which have more red than blue and any areas with more blue than red. Ask: "Was the area of our town with more red than blue warmer or colder than the surrounding area? Was the area of our town with more blue than red warmer or colder than the surrounding area? Can you think of any reason why one area of our town might be warmer than the other? Colder?"

Physical characteristics to watch for:

Elevation Changes: If you have hills or mountains in your area, the higher elevation areas may cool off faster in the evening.

Bodies of Water: If you have a decent size body of water near your town, the locations nearest the water may have their temperatures modified to be closer to the water temperature than surrounding areas.

Urban Heat Island Effect: Urban areas tend to be significantly warmer in the evening than rural areas because asphalt, bricks, concrete, etc. tend to absorb and retain heat more than surrounding areas.

Try to determine if any of the above may be relevant in your observed temperature pattern. If they are, propose the theory to the students and ask the students for their input as to any further experiments you might be able to perform to prove your theory. For example, if the central part of town has many red circles and the outskirts of town has many blue dots, you can explain the Urban Heat Island Effect to the students and review the lesson Reflectivity and Absorption. You may want to follow-up with an experiment in which you take temperature measurements over vegetation covered surfaces and over asphalt covered surfaces. If you have a body of water near you and you believe it may be influencing your evening temperatures in some way, you may suggest that the class

somehow obtain the water temperature to test your theory. Even if the initial theory is suspect, proceed with the follow-up experiments keeping in mind that fostering scientific inquiry rather than the search for correct answers is the ultimate goal.

Conclusion :

Review with the class the three ways you looked at the temperatures you observed: table of observations, graph, and map. Ask the students to name their favorite. Why? What can the graph show that the table couldn't? Is it easier to find the maximum and minimum temperature from the table or from the graph? Can you think of other numbers for which a graph might be useful? What can the map show that the graph couldn't? Was it easier to see what areas were warmer and what areas were colder than the middle line temperature from the map or from the graph? Can you think of other numbers that would be useful to put on a map?

Vocabulary Words:

- Maximum
- Minimum
- Range
- Table
- Graph

Evaluation:

- Make up a list of air temperatures or have the students take another reading on another evening. From this new list of temperatures have the students find the maximum, minimum and range (optional) of the air temperatures.

- Students can graph the observations in the list above on a prepared graph

template.

- Students can reconstruct the observed list of temperatures for each student using only the graph the class made.

Evaporation Activity

Jackie Horn

Ideas and Context: Water is made up of tiny molecules. The water molecules in the atmosphere move around in a cycle. This cycle consists of several processes. Water falls to the earth, as precipitation. Once the water is on the surface of the earth, the air molecules began to warm the water molecules. Once the air molecules warm the water enough, the water molecules begin to rise into the air. This process is called evaporation. Once the water evaporates into the air, it begins to cool again. The water condenses to form clouds. Then, the water falls back to earth as precipitation once again. This is the water cycle. (MCF Benchmark: Explain the behavior of water in the atmosphere.)

Practices: In this activity, students will focus on one part of the water cycle: evaporation. The students will observe water evaporate throughout a school day. As they observe this phenomenon, they will explore where the water goes by measuring the humidity in the air. By using the hygrometers to record humidity levels, the students will be “manipulating simple devices that aid observation and data collection,” as stated in Benchmark #3.

Activity Description:

Objective: To demonstrate the concept of evaporation.

Materials: Plates- Styrofoam or plastic, not paper (enough for partners)
One purple, orange and black crayon fro each group
Water
Measuring Cup
Humidity Detector (hygrometer)

Introductory Activity: Teacher wipes a damp sponge across a chalkboard. The class should watch and make observations as to what happens. They should notice the streak slowly disappear. Ask: “Where does the water on the board go? What happens to puddles after it rains? Where does the water go?”

Body:

1. Do this lesson on a dry day, not a rainy or foggy day. Divide the class into partners. Each pair needs a plate and three different colored crayons. Each pair should make a shallow puddle of water on their plate. Then they use the purple crayon to make a circle around their puddle of water. Have each pair pick a different place to set their plate (such as in the sun, in the shade, near a heat register) and have the plates sit for about an hour. During this time, make predictions about what will happen to the water. Ask: “If we leave our puddles of water in the same places in the room, what will happen to the water in an hour? What will happen to the water? Will the puddles be larger or smaller?”
2. After about an hour has passed, have each pair check their puddles. Each pair should make a new circle around their puddle if it has changed at all. The groups can then compare puddles. Have them leave the plates where they were for another hour. During this time discuss their predictions and what actually happened. Make predictions for the next hour. Ask: “What will have happened to the puddles in another hour? Will there even be a puddle left? Why?”
3. After one hour, recheck the puddles. Have the students draw a black circle around their new puddle. Have them compare their puddles to other groups’ puddles. Have a discussion about what happened to the water. Ask: “Who’s puddle shrunk, or evaporated faster? Why? (Relate this the location in the classroom) Where did the water go? What types of places helped the water

evaporate faster?” If necessary, direct the students towards the concept of evaporation. Have the students leave the plates overnight and check them in the morning.

4. Introduce that weather people can measure the amount of water in the air, or the “humidity” using humidity detectors. Pass around the humidity detector for students to examine. Ask the students; “ Have any of you ever watched the news and saw the weather person give a value for the humidity?” Explain that the humidity is the amount of water in the air. Have the students use the humidity detector to measure the humidity in the class each day. Have them record it in their weather journals. The humidity values should be taken at the same time everyday--- afternoon works best.

Cloud Formation Lesson

Sara Gold

Ideas and Context:

This lesson is for a fourth grade class. The lesson corresponds with MCF Benchmark Content Standard 3, numbers one and two. These are: Describe the atmosphere and Describe weather conditions and climate. Clouds form because water evaporates into the atmosphere. The heated air containing water vapor rises and cools causing the water vapor to condense. The condensed water vapor clings to particles of dust as and smoke to form clouds.

Practices:

This activity corresponds to benchmark # 1: Generate reasonable questions about the world based on observation. Students will both take part in and observe the cloud formation simulation in order to answer and generate more questions about cloud formation. This is a teacher directed activity which allows students to pay attention to the outcome of the experiment itself rather than following the steps needed to simulate cloud formation. Students will observe the formation of a cloud in order to answer questions or form questions (depending on the amount of prior knowledge about clouds.) about the role of hot and cold air in the formation of clouds.

Activity Description:

Topic: Cloud Formation

Grade Level: Fourth

Concept: Cloud formation results when warm, humid air rises and cools, causing the water vapor in the air to condense and form clouds.

Teacher Materials:

- --a large jar
- a plastic bag of ice that will fit over the jar opening
- a pitcher of warm water
- 1 sheet of black paper
- flashlight
- matches

Student Materials:

- pen and paper to record observations

Management Strategies:

This activity would be most appropriately done with small groups so that all students can view the cloud formation in the jar. Other class members could be working on researching the different types of clouds, drawing and labeling these clouds, researching and drawing the water cycle, working on a forecast for the rest of the day based on the clouds in the sky, etc. The activity itself should not take more than 10 to 15 minutes. For safety reasons, students should not be allowed to handle the matches. Also, students need to be careful around the glass jars. Much of the following procedure will vary, depending on students' reactions, comments, and levels of understanding.

Procedure:

1. Ask students what some of the different types of clouds are, what they are made of, and ask the focus question, how do you think

clouds form? The responses to this question could be written on the board to return to later.

2. Tell the students that we are going to perform a simulation of the forming of a cloud. Take out the jar and have one of the students tape the black piece of paper onto one side of the jar. Ask another student to pour the warm water into the jar until it is one third full.

3. Light a match and hold it in the jar for a few seconds and then drop it in. At this point, have a student quickly cover the jar with the bag of ice.

4. Have another student (or teacher) shine the flashlight on the jar while they record their observations.

5. Now the students will explore what happened. The following questions can be used to help the class learn about what was happening:

- What did you see in the jar? (a cloud)
- Where did the cloud come from? (the water in the bottom of the jar)
- How did the warm water effect the cloud formation? (caused the water to evaporate and warmed the air, causing it to rise)
- What did the ice cubes do to help the clouds form? (cooled the air [made the water vapor condense]).

- What role did the match and its smoke play in the cloud formation?
(gave the water something to condense or grab on to)
- Now what would you tell me a cloud is made of? (small water droplets)
- Ask someone to describe the process of cloud formation from what they just learned.

Assessment/Evaluation:

As a learning activity in itself, assessment is not really needed, but an option for assessment would be to have students draw a picture of how the cloud formed in the jar. In addition, the products of the following extension activities could be assessed.

Extension/Integration:

As an application of what they learned, each student could draw a picture of how a real cloud would form, and what effects the warm earth and the cool air in the mountains would have. The process could be repeated by students without using the match or with dust, flour, sand, cedar shavings, or other particulate materials to see if the cloud would still form. As an art activity, students could construct different types of clouds by cutting two sheets of construction paper simultaneously and stapling them part of the way together. Then they can be filled with newspaper and decorated.

For a math activity, students could record the clouds they see for a couple of weeks and graph how many days they saw each type of cloud. A language arts activity that could be used is to have students write weather reports and then present them to the class. Students could also write poems about clouds or stories from a cloud's point of view, discussing what type of cloud it is and what kind of weather it would bring.

Source:

Bugenig, D. (1996). How does a cloud form? [On-line]. Available: <ftp://ftp.unr.edu/pub/archive/mailling-lists/galileo/clouds>.

Weather Around the World Lesson

Leland Jennings

Ideas and Context: Throughout this lesson the students will approach many science ideas regarding Weather and the Atmosphere. The students will deal with and learn about many properties that air has as a substance. The students will be discussing and observing the properties of air known as humidity, temperature, visibility and air pressure. These concepts are part of Strand V: Atmosphere and Weather. MCF Benchmark: Describe weather conditions.

Practices: In this lesson, the students will be participating in many practices that are laid out by the Michigan Curriculum Framework. The major practices that the students will be participating in is that the throughout the lesson the students will be developing skills and strategies for the gathering of information. The students' will engage in researching the weather conditions of cities around the world. After much date has been compiled from various resources, the activity will require critical thinking because the

students will then analyze data and come up with reasons for why the weather conditions were what they were in the observations. These practices are consistent with Benchmark 5 because the children will be developing strategies and skills for collecting data as well as developing problem solving skills to find out why there observations were the way they were.

Activity Descriptions:

Weather Around the World

Suggested: Grade \approx 5

Objective: Students will learn a few key weather terminologies and a variety of climates through examining and recording weather characteristics in a variety of communities around the world.

Materials:

- newspapers with daily weather forecasts of cities all over the world OR weather internet sites (see below)
- graph paper
- markers

Method: Have each student pick a city that they would like to do their weather project on.

- Explain to students the following weather terms:
 - **Humidity**- a measure of the water vapor content of the air, also known as relative humidity.
 - **Temperature**- the degree of hotness or coldness measured by a thermometer.

- **Pressure**- the force of the atmosphere, also known as barometric pressure and is measured in kilopascals.
- **Visibility**- the distance one can see horizontally.
- Every day (best to do it at the same time of day) students check the newspaper or the internet and record their city's weather, looking specifically for the terms listed above.
- After two weeks of recording, have students graph their results for each weather term.
- Compare them with others in the class. What are some reasons for differences?

Variation: Pick only a few cities to examine and graph the results on big class graphs (one for each term that you would like to be covered). Pick a different color for each city and then compare them with each other.

Source: **Online:** <http://atozteacherstuff.com/go/jump2.cgi?ID=2916>

Survival Experts Lesson

Leland Jennings

Ideas and Context: Students will approach many benchmarks of Weather and Atmosphere while taking part in this assignment. The students will have to have an understanding of various properties of weather and the atmosphere such as temperature, precipitation, humidity, and pressure. The students will also discuss natural disasters that can occur due to these properties of the atmosphere. They also will have the opportunity to discuss the impact that natural disasters may have on weather or the atmosphere. (i.e.

volcanic eruption) These ideas that are to be discussed are appropriate according to the Michigan Curriculum Framework Strand V: Elementary Level Benchmarks 1 and 3. The students will be discussing weather conditions as well as explaining severe weather safety precautions, respectively.

Practices:

In this lesson, the students will be participating in many practices that are laid out by the Michigan Curriculum Framework. The major practices that the students will be participating in is that the throughout the lesson the students will be developing skills in observation and investigation while they use reasoning to develop solutions to dangers posed by natural disasters. The children will be observing and investigating weather conditions that help to cause certain natural disasters. They then will analyze the data to help them find out what types of actions would or should be taken to help people survive or lower the negative impact that the natural disaster has on people. This use of observation and investigation as well as the analyses to find out what actions should be taken by people to prevent damage from the natural disasters is in accordance with Benchmark 2.

Activity Descriptions:

Survival Experts

Grades: 3-5, 6-8

Brief Description: Students take on the role of survival experts as they research and produce brochures or guides to educate others about what to do in the event of a natural disaster.

Objectives:

Students:

- learn how to survive natural disasters.

- use print and/or electronic resources as they research information and safety precautions and tips related to a specific natural disaster.
- use technology to create an informative survival guide about one type of natural disaster (optional).
- share their research with their classmates and families.

Keywords:

disaster, earthquake, flood, hurricane, natural, safety, survival, tornado, volcano, weather

Materials Needed

- computers with Internet access (optional: lesson can be adapted if computers are unavailable)
- computer programs for drawing, writing, and creating brochures (optional: lesson can be adapted if computers are unavailable)
- books, magazines, and newspapers with articles and information on natural disasters
- sample brochures or survival guides from community or disaster agencies

Lesson Plan:

Introduce students to this project by creating a letter that announces the lesson idea; the letter should invite students to share their survival skills and expertise by creating a guide for surviving a natural disaster. You might create a simple **[Your Name or Your School Name]**

Advertising Agency logo for your letterhead so it looks like the letter is coming from an actual advertising agency. Print copies of the letter, and distribute to students at the start of class.

Review with students other safety and educational brochures from local social and community service agencies; discuss what makes those brochures valuable, readable, and appealing. Talk about some of the elements the brochures include.

If students have computer access, demonstrate how to create a three-column, two-sided brochure with available software. Many programs have assistants or wizards that will help you accomplish this with ease. The demonstration should include inserting graphics into the document. Discuss the project's grading method or rubric with students.

At this time, teachers will need to assign students a disaster to research, or students will need to decide which disaster they would like to research. See the list of Suggested Survival Guide Topics below.

Make a class list of the elements students might include in their brochures. The list of Brochure Requirements and Options below might serve as a guide.

Next, provide time for students to research their assigned disasters. Students will use print and library resources and, if computer access is available, Web sites. See the list of Suggested Web Sites below.

Talk with students about how they might also include an "in-person" or "first-hand" survivor resource. Allow time for additional research outside of class for this. Students might contact in person, by

phone, or by email or letter a person who has had a first-hand experience dealing with disaster. They might get in touch with an expert in the topic who works for a community agency. If computer access is available, provide students with two hours of computer time to create their brochures and to spell check and print them.

Allow time for students to share their work. Students will hand in their work for a grade; they should turn in with their brochures a bibliography of resources they used. Display brochures on a bulletin board.

Suggested Survival Guide Topics:

Surviving

- an avalanche.
- being stranded in a desert.
- a flood.
- a tornado.
- a hurricane.
- a volcanic eruption.
- being capsized in a boat or ship due to weather.

Brochure Requirements and Options:

Requirements

- brochure title
- basic information
- tips
- tools
- clothing
- equipment

- food
- frequently asked questions (FAQ)
- dangers or challenges

Options:

- map
- handy phrases -- if in a foreign country
- unusual terms -- relevant to the topic
- other helpful resources related to the type of disaster
- common geographic features related to the topic (rock formations, etc.)
- customs or traditions that might aid understanding

Suggested Web Sites:

The following sites offer a starting point. Students might do an Internet search to locate additional sites related to their specific topics.

- [Greater Outdoor Recreation Pages](#)
- [Flood Facts](#)
- [Flood Survival](#)
- [Disaster Preparedness Guide](#)
- [American Rescue Team International](#) Select Lifesaving Tips
- [Desert Survival](#)
- [CNN Storm Center](#)
- [Hurricane Survival](#)
- [Emergency Survival](#)
- [Tsunami Hazards and Disasters](#)

Assessment:

Assess students:

- through observation during research periods.
- on how many required elements they include in their brochures.
- on how many optional elements they include.
- on the variety of resources (bibliography) used.
- on following proper citation format.
- on originality and format of brochure -- including correct spelling and grammar.

Submitted By:

VaReane Heese, Springfield Elementary School, Omaha, Nebraska 9/12/2002

Source:

Heese, Vारेane. (2002). Survival Experts [Online]. Available:

http://www.education-world.com/a_tsl/archives/02-1/lesson032.shtml

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