DOCUMENT RESUME

ED 237 444 SP 022 504

TITLE Basics. [A Compilation of Learning Activities Pages from Seven Issues of Instructor Magazine, September 1982 through March 1983 and May 1983.]
INSTITUTION ERIC Clearinghouse on Teacher Education, Washington, D.C.
PUB DATE 83
NOTE 20p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Journal Articles (080)
JOURNAL CIT Instructor; v92 n2-7,9 Sept 1982-Mar, May 1983

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Education; *Elementary School Mathematics; *Elementary School Science; *Language Arts; Learning Activities; *Social Studies; Teaching Methods
IDENTIFIERS PF Project

ABSTRACT

This collection of 18 learning activities pages focuses on the subject areas of science, language arts, mathematics, and social studies. The science activities pages concern the study of earthquakes, sound, environmental changes, snails and slugs, and friction. Many of the activities are in the form of experiments for the students to perform. Language arts activities cover folktales (specifically "The Blue Jackal" by Marcia Brown), the study of words, writing with an outer-space theme, reading comprehension, and the use of comics as motivators. The three mathematics pages contain activities on metrics, division, and the use of mathematics in the outdoors. Map study skills and a study of Alexander the Great are the two social studies topics provided. Two pages of multidisciplinary activities cover teaching the concept of time and teaching about transportation and travel. The final page in this compilation contains music activities designed to give students a break when they are restless. (EM)

BASICS. [A Compilation of Learning Activities Pages from Seven Issues of Instructor Magazine, September 1982 through March 1983 and May 1983.]

Compiled by the ERIC Clearinghouse on Teacher Education, Washington, DC.

Why does the earth quake?

SCIENCE

Sandra Markle

Throughout history, different cultures have held their own beliefs about why the earth quakes. For instance, the ancient Greeks thought earthquakes resulted from spirits fighting among themselves. The Japanese once believed that the earth was carried on the back of a giant spider—when the spider moved, the earth shook. Today, of course, geologists understand the reasons why earthquakes occur. And while it's still difficult to predict exactly when they'll strike, much has been learned about the causes of earthquakes and where they're most apt to happen.

In this article, you'll find several hands-on experiments that will help your students understand this earth-shaking and often disastrous phenomenon.

Why does the earth's crust move?

Materials needed One hard-boiled egg, a kitchen knife, paper towels, an electric skillet, food coloring, water, and five grains of uncooked rice.

Directions Place the egg on a paper towel and tap the shell several times until it cracks. Then, carefully slice the egg in half. Use this as a model of the earth.

Explain that geologists (people who study the earth) believe that the earth's crust (egg shell) is composed of 20 giant *plates*, each thousands of miles long, thousands of miles wide, and about 40 miles thick. These plates float, closely packed together, on top of a thick layer called the *mantle* (egg white). This mantle is believed to be about two thousand miles thick and is composed of *molten* (melted) and *semimolten* rock, which resembles the consistency of soft taffy. The molten rock is known as *magma*.

Deep within the earth there is a *core* (egg yolk) of very hot, heavy metals. Heat from these metals causes slow, circular currents, called *convection currents*, which flow through the mantle. These currents carry the magma upward, after it is heated near the core, to cool just below the earth's crust. When it cools, the magma sinks back toward the core again.

Fill the skillet with water and turn the heat on, making sure to follow all safety precautions. When the water begins to boil, add a few drops of red food coloring and let students observe the color spreading through the water on convection currents. Then add the rice and let kids watch the grains move in the boiling water. Explain that they are carried along by the convection currents. Like the magma in the earth's mantle, they move upward, then back down toward the bottom of the skillet. When magma moves this way, it causes the plates in the earth's crust to shift.

What happens when the plates shift?

Materials needed Two thin, hardcover books that are about the same size and small enough to be held comfortably in your hands.

Directions Start by reminding your students that the giant plates which form the earth's crust are constantly moving past one another. This motion squeezes and stretches rocks at the edges of the plates. If the pressure becomes too great, the rocks rupture and shift, and an earthquake results. The point at which the rock ruptures is called a *fault*. Earthquakes are most likely to occur along the boundaries of faults.

Stand in front of the class, holding one book in each hand, spines touching. Press the two books together as hard as you can. Then begin to slide one book forward and away from your body as you continue pressing the spines together. Students should notice that you're having trouble sliding the book forward. Explain that this is because pressure increases the amount of friction between the two surfaces. Keep sliding until one book suddenly pops up over the other. Students will notice that the book you were sliding now shows a sudden burst of movement. Explain that this is because the pressure decreased when one book slipped over the other and energy was released. This is what happens when two plates in the earth's crust meet. The rocks at the edges rupture under pressure, causing a fault. Energy is released, and an earthquake occurs.

What happens to released energy during an earthquake?

Materials needed Any long, flexible spring, such as the spring found in the binding of a spiral notebook. (Any size will do.)

Directions First explain that the energy released during an earthquake travels away from the fault in waves called *seismic waves*.

There are three types of seismic waves: *compressional waves*, *shear waves*, and *surface waves*. Compressional waves are actually sound waves and they travel at the speed of five miles per second. They cause rocks in their paths to vibrate and change in *volume* (the amount of space they occupy). Demonstrate compressional waves for your students by holding one end of the spring still and using your fingers to push the other end toward the fixed end. This movement will cause the spring to compress and change in volume.

Shear waves travel at approximately half the speed of compressional waves. They cause rocks and buildings to vibrate vertically from left to right. Your students can feel the effects of shear waves by taking turns holding one end of the spring still while snapping the other end from left to right. They'll see vertical vibrations in the spring in addition to feeling them.

Surface waves move a little more slowly than shear waves and roll along the surface of the ground in much the same way that ocean waves roll along the surface of the sea. Demonstrate the motion of surface waves by holding one end of the spring still while gently pushing the other end downward, then releasing it slowly.

The earth's crust appears to be sturdy but in reality, it is not much stronger than the shell of an egg. Convection currents below the crust and the pressure caused by one plate meeting another can result in sudden ruptures. When this happens, the earth no longer seems like such a solid home. But we needn't live in fear of earthquakes the way people once did. Geologists have made great strides in locating major fault zones and are not far from developing a method for predicting earthquakes. We've come a long way from spirits and giant spiders! □

Sandra Markle is a free-lance writer who has taught science in the classroom and on TV. She contributes to INSTRUCTOR regularly and is a Basics consultant.

Instructor v92 n2 p180 September 1982

BASICS

Getting to know folktales

LANGUAGE ARTS

Carol Fisher

If your students are like most kids today, they probably haven't had much exposure to folklore. Unfortunately, oral tradition has fallen by the wayside in our society—and we've lost a large part of our cultural heritage along with it.

You can restore this rich tradition in your classroom by planning a unit on folklore. In this article you'll find suggestions for expanding your students' general knowledge of folktales, along with specific activities to use in conjunction with one tale, *The Blue Jackal*, by Marcia Brown (Charles Scribner's Sons, 1977).

Introducing folklore

Begin by explaining to your class that folklore generally deals with either material culture, social folk customs, or the verbal arts. Material culture refers to skills and techniques that have been passed on from one person to another, such as how to plant corn or how to make a pie crust. Social folk customs have to do with group interactions and are usually passed down from one generation to the next. Some examples include holiday traditions, harvest celebrations, and so on. Finally, the verbal arts encompass folktales, chants, proverbs, and narratives. Almost anything can be considered a form of folklore—if it has been passed on *orally* from one person to another, or from one generation to the next. Now try some of the following general activities.

1. Ask your students to discuss how they celebrate holidays like Christmas, Hanukkah, or Thanksgiving. Which holiday traditions do they expect to pass on to their own children?
2. Ask your school librarian to help you choose examples of folktales, fairy tales, myths, and so on. Make it a point to read one of these stories to your students every day. Set up a folklore corner in your classroom and encourage students to read stories to their classmates during free time.
3. Ask each student to submit a favorite family recipe to be included in a class booklet, called "Folk Cookery."
4. Invite a senior citizen to visit your classroom and relate a folktale he or she remembers hearing as a child.

Teaching a specific tale: The Blue Jackal

This folktale provides for a wide variety of extending activities such as the ones that follow. The main character is a jackal, named Fierce-Howl. One day he runs into a dyer's house to escape a pack of dogs and accidentally jumps into a huge vat of indigo dye. The next morning, he climbs out of the vat and returns to the jungle. The other animals are terrified by his dark blue fur and, thinking he is some strange and magnificent beast, crown him ruler of the forest. He lives quite happily until, one day, he howls back at the other jackals and exposes his true identity. Read this story aloud to your students, then let them try some of the following activities.

1. Dramatize Fierce-Howl's trial for deceiving the other animals.
2. Write a diary entry Fierce-Howl might have made the night he was crowned ruler of the jungle.
3. Investigate unusual forest and jungle animals such as the jackal, iguana, and genet. Then share your information with classmates in a brief oral report.
4. List several different adjectives that might have been used to describe Fierce-Howl before and after he lost his crown.
5. Pretend to interview various jungle animals after they found out who Fierce-Howl really was.
6. Debate whether or not Fierce-Howl was justified in accepting the crown without explaining the real reason for his strange, blue fur.
7. Investigate the art of tie-dyeing, then try it yourself as an extra-credit art project.
8. Dramatize the story using animal sock puppets.
9. Write a poem entitled, "Ode to a Faded Jackal."
10. Write your own folktale about deception, then share it with classmates in oral or written form.
11. Write a newspaper report describing Fierce-Howl's return to the jungle as perceived by the other animals. Illustrate your story with an original drawing. □

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BASICS

Time-ly activities

MULTIDISCIPLINARY

Judith Enz

Time is an abstract concept that's difficult for elementary school students to understand. You can make it more concrete for your students with these time-ly activities that cut across all areas of the curriculum.

1. Have groups of students investigate how primitive peoples and ancient cultures measured time. Some cultures they might want to research include the Ancient Greeks, Romans, and Egyptians; Eskimo tribes; and native American Indians. Have kids display their findings on your bulletin board, using charts, expository paragraphs, and illustrations.

2. Instruct students to find out how we measure time today, then have them work in pairs to make models demonstrating the earth's revolutions and rotation around the sun.

3. Time has a different meaning for everyone. Have students collect from books of famous quotations things people have said about time that are particularly interesting. Instruct each child to print his or her favorite quote on a sheet of construction paper, then tack them all on your bulletin board. Next, have kids write their own thoughts on time by completing a sentence starting with "Time is . . ."

4. For older students, use these questions to prompt discussion or debate about time: Is time really relative? When did time begin? Will time ever end? Would time exist if there were no living persons to measure it?

5. Have each child create a personal time line, illustrating major events in his or her life. Or let kids construct bar graphs comparing the amount of time allotted during the school day for recess, lunch, P.E., math, reading, and so on.

6. Let your students learn to tell time the way people in the military do. Explain that for the P.M. hours, 1 o'clock = 1300 hours, 2 o'clock = 1400 hours, and so on until 12 midnight (2400 hours). For the A.M. hours, 1 o'clock = 0100 hours, 2 o'clock = 0200 hours, and so on until 12 noon (1200 hours).

7. Make a classroom sand timer, using a cone-shaped plastic drinking cup with a small hole in the pointed end. Supply a few cups of fine sand. Now let kids predict how long it will take for 1 cup of sand to flow through the timer; pour it in, and check the clock to see whose prediction was most accurate. Repeat the process using 2 cups of sand, ¾ cup, 3 cups, ¼ cup, and so on. Display the results in a classroom graph with "minutes" along the vertical axis and "cups of sand" along the horizontal axis.

8. Have your class make a time capsule and bury it somewhere on the school grounds, if possible. Some items your kids might want to put in their time capsule include a class photo, one important fact about each student in the class, baseball cards, current newspaper clippings, pictures from fashion magazines, lyrics to popular songs, and so on. When the capsule is assembled, let students compose a short note to next year's class, telling the students where the capsule is located and giving them the option to open it immediately or pass the legacy on to the next class.

9. Collect various time schedules for bus lines, railroads, and airlines. Let students take turns using these schedules to plan imaginary trips. How long will it take each child to travel from his or her starting point to the final destination?

10. For a language arts activity, have students pretend they've been granted the ability to travel forward or backward in time. What year would they most like to travel to? Have each child write a few brief paragraphs explaining why.

11. Encourage students to use encyclopedias to investigate the concept of time zones. Why are they necessary? Instruct each child to choose any five cities in the world and tell what time it is in each city when it is 9 A.M. in your hometown.

12. To improve students' skills in time estimation, try this game. First, cover your classroom clock with brown paper. Then instruct the children to be seated. When everyone is silent, have kids raise their hands when they think one minute has passed. Wait until every child has raised his or her hand before you identify the winner. Repeat the procedure for 2 minutes, 5 minutes, and so on. ☐

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Take math outdoors

MATHEMATICS

Joseph Baust

Now that it's autumn, why not take your math lessons outdoors? That's right—the area outside your classroom is a natural for bringing math activities to life! In this article, you'll find several ideas that will help kids learn to classify, measure, estimate, and solve problems—as they explore their environment.

Leaves along the path (early grades)
For this activity, you'll need to gather several types of leaves. Choose one variety, place all those leaves together, then divide them equally between two plastic bags. Mix the remaining leaves together and divide them among five or six other bags. Now divide your class into groups. Give two groups the bags filled with the same type of leaves, and distribute the rest of the bags among the remaining groups.

Next, plot a short path (such as the distance between two trees) along which children are to place their leaves. When the groups have finished, ask how many leaves each used to complete the course. Then ask students how they positioned their leaves. Did they place them end to end, or side by side? Did they leave space between each leaf or were sides or ends touching? Why do they suppose the two groups using the same-variety bags used approximately the same amount of leaves? Why was there such a difference between the amounts of leaves used by groups with the mixed bags?

Explain that in order for measurement of any kind to be accurate, a *standard unit of measure* is necessary. In this activity, the groups using the same-variety bags came closest to working with a standard unit of measure because all the leaves were approximately the same size.

Predicting (middle grades)
This activity will provide students with practice in addition and multiplication—and it's also a lot of fun! Have each child choose an area of your school yard (no larger than a square foot), then mark boundaries with chalk (if the area is asphalt) or string (if the area is grass). Next, have students count and list all the items found in their areas, such as pebbles, insects, trees, plants, and so on. Each child should then predict how many of those items would be found in a similar area that was 10 times as large, 50 times as large, 100 times as large, and so on.

Bean bug invasion (upper grades)
Rope off an area of your school grounds that measures 2 × 2 meters square, then scatter beans or peas within the boundaries of the square. (You might call these "bean bugs.") Next, construct a second square out of pipe cleaners or rigid drinking straws that measures 10 × 10 centimeters. Ask kids to guess how many bean bugs are inside the large square. Then ask how they might use the smaller square to estimate, without counting, the number of bean bugs in the larger square. If nobody knows how this might be done, instruct a student volunteer to place the small square on the ground, within the larger square, and count the number of bean bugs found within the smaller square. Choose other volunteers to repeat this process five times, then have kids determine the average number of bean bugs found within the smaller squares.

Now ask students to tell you how they might use that average to determine the number of bean bugs found in the larger square. Explain that the first step is to figure out how many times the 10 × 10 cm square will fit inside the 2 × 2 meter square. Have kids attempt to figure this out on paper until someone arrives at the correct answer (400 times). Ask students how they might use this number together with the average number of bean bugs from the five samplings to determine the approximate number of bean bugs in the larger square. If nobody knows, explain that the estimate can be found by multiplying the average number of bean bugs in the five samplings by 400. Have students complete the operation on paper.

This activity will give kids needed practice in sampling, adding, multiplying, and averaging.

Use the activities presented above to spark your own ideas for outdoor math.

Joseph Baust is an assistant professor at Murray State University in Murray, Kentucky.

Metric mania

MATHEMATICS

Barbara Bethel

Today's students need plenty of practice in using the metric system. One of the simplest and most entertaining ways to provide that practice is to have children measure familiar objects in and around your school building, using metersticks. The only materials you'll need are enough metersticks for every child in your class, and a ball of string.

You'll notice that the following activities do not ask students to measure items in standard units first, then convert those measurements to metrics. Current thinking about metrics education holds that conversion is an extra step which may confuse children unnecessarily. After all, in most areas of the country, a meterstick is just as easy to come by as a ruler is!

My measurements, myself What could be more familiar to a child than his or her own body? Children will enjoy finding their metric measurements with this simple activity. To start, divide your class into pairs and give each pair a meterstick and a piece of string, about one meter (39.37 inches) in length.

Instruct one member of each pair to measure the circumference of his or her partner's head, using the length of string. Then demonstrate how to hold the string against the ruler to obtain the measurement in centimeters. Students should record their measurements, to be compiled in a classroom graph later on. Next have students take turns measuring their partners' arms, wrists, and feet in centimeters.

What's a meter? This activity will give kids a chance to practice their skills in estimation, while they become more familiar with metric measurements. Have children brainstorm a list of objects, each of which they estimate to be about one meter (39.37 inches) in length. Next, instruct children to measure those items on the list, using a meterstick. Make sure they record each measurement. How close did students come to correctly estimating the length of the objects on their list?

Measuring shadows On a sunny day, take your class outdoors for a measurement activity that combines math and science. Divide the class into pairs and have students take turns using a meterstick to measure their partners' shadows. If possible, repeat this procedure two or three different times during the day. At what time during the day are the children's shadows longest? At which time are they shortest? Students should notice that their shadows are shortest around noon, and get longer thereafter. Explain that shadow length is related to the sun's position in the sky. Now instruct the children to use science texts or other reference books to find out exactly how the two relate. You might also have students measure the shadows cast by different structures on your school grounds such as a flagpole or your school building.

Estimating decimeters Here's another estimation activity that will introduce decimeters while helping children understand the concept of area. First, use sheets of construction paper to cut several (at least 30) 10 cm × 10 cm squares. Show one to the class and explain that the area of the sheet of paper is one square decimeter. (10 cm × 10 cm = 1 square decimeter.) Now ask each child to estimate how many square decimeters it will take to completely cover a desk in your classroom. To find the correct answer, give the supply of squares to one student volunteer and instruct the rest of the class to watch as he or she places them, one beside the other with sides touching, on the surface of the desk. Which estimate came closest to the actual measure?

Now instruct children to find the area of the desk in square decimeters. That's easy to figure out—just have them multiply the number of squares placed horizontally on the surface by the number of squares placed vertically.

Repeat this procedure, using five other square or rectangular objects found in your classroom, such as textbooks, a flannel board, a sheet of posterboard, and so on. Each time, have children record their estimates first, followed by the actual metric measurements. You may want to award a small prize to the student whose estimates come closest to the correct area of each object measured. □

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BASICS

Soundscapes

SCIENCE

William Neil

On October 27, PBS stations across the country will air "To Hear," a one-hour special "celebration of sound," that focuses on both the pleasures and the hazards of sounds around us. Before your students view this special presentation, use the activities that follow to explore sound in our environment.

Waves in the ocean of air Drop a book on your desk. Ask kids if they know how the sound of the book hitting the desk reached their ears. Explain that when the book hit the desk the two surfaces moved back and forth very quickly—that is, they *vibrated*. This vibration set air molecules around the book in motion. Those molecules jostled their neighboring air molecules, starting a chain reaction much like a tumbling row of dominoes. This chain reaction of moving air molecules is called a *sound wave*. The sound waves traveled from the vibrating book through the air to your students' ears. Without this movement of sound through air, we could hear no speech, no music, no thunder, no noise at all. Now try the activities that follow to further acquaint students with the concept of sound waves and how they travel through the air in our environment.

1. For this exercise, you'll need a tuning fork and a glass of water. Strike the tuning fork and place it in the water. The vibration will make the water splash. Explain that sound waves are invisible, but if they could be seen, they would look like the ripples a pebble makes when dropped into a calm pond.
2. Place the tuning fork used above beside a Ping Pong ball. Now strike the tuning fork and put it down again. What happens? (The ball jumps.) Explain that sound waves traveling from the tuning fork through the air made the ball jump.
3. You'll need a balloon and a radio for this exercise. Ask a student volunteer to hold the inflated balloon next to his or her cheek. Now hold the radio up to the other side of the balloon and turn it on. Can the student feel the balloon vibrating? Can he or she feel the movement of air molecules? What caused the molecules to move? (Sound waves from the radio.)

The ear: A perfect sound receiver Drop a book on your desk one more time. Explain that students heard a noise because the sound waves were caught by their ears. Ears are designed to *feel* sound waves. What happens inside our ears when we hear sounds?

Explain that the ear has three parts: the outer, middle, and inner ear. The outer ear catches the sound waves, acting like a funnel to direct them to the eardrum. Sound causes the eardrum to vibrate. These vibrations make the three small bones in the middle ear move mechanically. These bones—the *malleus, incus*, and *stapes*—send the mechanical vibrations to the inner ear, where they are picked up by tiny hair cells and transmitted as electrical impulses along the auditory nerve to the brain. That's how the ear feels sound. Now use the following activities to further investigate sounds.

1. Our ears can receive many different sounds simultaneously. Have students sit quietly and list the sounds they hear. Did some students hear things others did not? Explain that this is because we always choose to listen to some sounds and ignore others. Otherwise, we'd suffer from "sound overload!"
2. How well do we know the sounds around us? Have each child bring an object to school that makes an interesting sound. Students are to take turns sounding their items, while classmates close their eyes and attempt to guess what they hear. Award a small prize to the child who correctly identifies the most sounds.
3. The Voyager spacecraft carries a gold disk, etched with human voices and the sounds of our world. Someday, these sounds may be heard by extraterrestrial beings. Ask students what sounds they would include if they were making such a disk.
4. Take students on a walk around your school play area. Tell them to keep their ears wide open! What sounds do they hear? Which are most pleasant? Which are most unpleasant to hear? □

William Neil is executive producer of the PBS special, "To Hear." He holds a master's degree in educational technology.

BASICS

What's in a word?

LANGUAGE ARTS

Barbara Hunt Lazerson

Once upon a time, elementary school students diagrammed sentences, conjugated verbs, and declined pronouns. Such a regimented approach to language arts probably killed the interest of all but the most ardent linguists. Fortunately, times have changed; today, children are learning that language can be fun.

If you'd like to add to your students' enjoyment of language arts, try this idea for a learning center on etymology, called "What's in a word?" Not only will it promote interest in words, it will also help strengthen kids' dictionary skills at the same time.

You'll need to supply a dictionary for your center that includes explanations of word origins. A good example is *Childcraft Annual: The Magic of Words* (Field Enterprises Educational Corp., 510 Merchandise Mart Plaza, Chicago, IL 60654; 1975).

Following are some examples of activities you might want to include in your center. Just type or print them on duplicating masters, run off enough copies of each worksheet for every child in your class, and let kids take turns completing them at the center.

Etymology riddles

Student directions The "etymology" of a word refers to its original meaning, in addition to any changes in meaning that may have occurred over time. To answer the riddles on this worksheet, you'll need to know something about the etymology of each underlined word. For instance, to answer the riddle, "Why might you set a trap for the *muscle* in your arm?" you'd have to know that our word *muscle* was taken from the Latin word meaning "little mouse." Read each word on this worksheet and look up the underlined words in the dictionary. Can you answer these riddles after learning the etymologies of the underlined words?

1. Why would you take a *comet* to the barber?
2. Why would an *eavesdropper* get wet on a rainy day?
3. Why shouldn't a person on a salt-free diet eat *sausage?*
4. Why would you brush a *dandelion* with a toothbrush?
5. Why might a student go to *school* only during free time?

Answers

1. *Comet* comes from the Greek word meaning "long haired."
2. The literal French meaning of *eavesdropper* is "one standing under the drip from the eaves."
3. *Sausage* comes from the Latin word meaning "salted."
4. *Dandelion* comes from the French word meaning "lion's tooth."
5. *School* comes from the Greek word meaning "leisure."

Name that animal

Student directions Many animals were originally named for their identifying characteristics. For instance, the *greyhound* was named for its color, and the *hoot owl* was named for the sound it makes. However, some animal names don't have such obvious origins. On this worksheet, you'll find two columns of words. Column A contains the names of 10 common animals, listed in alphabetical order. Column B contains the original meanings of those names, listed in random order. Your task is to correctly match the animal names in column A with their original meanings in column B. Check your answers by referring to the dictionary.

Column A	Column B
1. caterpillar	a. cut into
2. crocodile	b. diver
3. duck	c. hairy cat
4. gorilla	d. having eight feet
5. hippopotamus	e. nose horn
6. insect	f. pebble worm
7. octopus	g. river horse
8. poodle	h. spinner
9. rhinoceros	i. splash dog
10. spider	j. hairy person

Answers 1)c 2)f 3)b 4)j 5)g 6)a 7)d 8)i 9)e 10)h

Days and months

Student directions The names of the days of the week and the months of the year come from a variety of sources. Some were named for stars and planets, others for gods in Roman and Norse mythology. The original meanings for the names of some days and months are found in quotation marks in the following sentences. Replace these words with the appropriate names. Check your answers by looking them up in the dictionary.

1. Christmas is celebrated on "Ten" 25.
2. Students like "Frigg's Day" best!
3. People in the United States celebrate the 4th of "Julius."
4. "Of Mars" comes in like a lion and goes out like a lamb.
5. There's a scary holiday in the month of "Eight."
6. "Moon's Day" always gets me down.
7. "Woden's Day" falls in the middle of the week.
8. Turkeys have reason to worry in the month of "Nine."

Answers 1)December 2)Friday 3)July 4)March 5)October 6)Monday 7)Wednesday 8)November

How's that again?

Student directions If we used the original meanings of common words in conversation, we'd certainly confuse our friends! This worksheet consists of sentences in which the original meanings of certain words appear in quotation marks. Substitute the proper words for these original definitions. Can you find the answers in the dictionary?

1. The "near farmers" got together for a block party.
2. The "moving from place to place" pulled the railroad cars over the plains and toward the mountains.
3. "Sweet root" is Sally's favorite candy.
4. Tom looked in the "forefinger" of the book to find the pages he wanted to read.
5. Lots of 14-year-olds have a 10 o'clock "cover-fire."
6. Alice's favorite "toy horse" is stamp collecting.

Answers 1)neighbors 2)locomotive 3)taffy 4)index 5)curfew 6)hobby

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BASICS

Alexander is great!

SOCIAL STUDIES

Mark Jewell

In 1977, an ancient tomb was discovered in Greece. It is believed to have been the burial chamber of Philip II of Macedon, a famous Greek general and father of Alexander the Great. Artifacts found inside the tomb, in addition to other treasures from ancient Greece, have been assembled into an exhibit called "The Search for Alexander."

This exhibit has been shown in museums in Chicago, Boston, San Francisco, and New Orleans, and will have its final showing in New York City from October 27, 1982 through January 3, 1983.

Even if your students won't be able to view the exhibit, they can begin their own search for Alexander with some of the simple activities presented below.

Background information

Alexander was one of history's greatest superstars. He lived in Greece from 356-323 B.C. As king of Macedonia and one of the most brilliant generals in history, he conquered much of what was then considered the civilized world. By the time he was 25 years old, he had carved an empire ranging from the Mediterranean Sea to the Indus River, including what is now Turkey, Lebanon, Israel, Jordan, Egypt, Libya, Cyprus, Syria, Iraq, Iran, Afghanistan, central Asia, Pakistan, and India. Through his conquests, the world came to know Greek ideas and culture.

Alexander died of malaria when he was at the height of his power. His generals held the empire together for a short while, but by 311 B.C. it had split into states with individual rulers.

Alexander's life and accomplishments impressed people all over the ancient world. Today, his leadership and valor remain a source of inspiration to artists and writers alike.

Supply your class with reference books and encyclopedias (see bibliography) and have them further research the life and times of Alexander the Great before trying the following activities.

1. Many words in the English language originated in Greece. Examples include *democracy, epic, omega, tunic,* and *oracle.* Use a dictionary to find and define 10 other words with Greek origins. Then illustrate each word and definition.
2. Pretend that you are one of Alexander's soldiers and are aware of his plan to conquer the world. Compose a letter to your family in Macedonia, telling them how you feel about the part you are expected to play in Alexander's grand plan.
3. During Alexander's reign, many coins and medals were made in his honor. Pretend you are in charge of designing a coin or medal for Alexander. What will it look like?
4. Alexander's father, Philip II, was the first Macedonian to participate in the Greek Olympic Games. Research the history of the Olympics in Greece and describe three symbols or ceremonies that are still part of the Olympics. Examples include the lighting of the Olympic torch, the symbol of five interlocking circles, the Olympic motto "Citius, Altius, Fortius" (Swifter, Higher, Stronger), and the oath taken by athletes before the games start.
5. A pictorial map is one with small illustrations marking important places and events. Create your own pictorial map of Alexander's empire. Start by tracing the outline of a map of the Eastern Hemisphere; then fill in the boundaries of those countries that were part of the Empire. Next, draw small pictures to mark capitals and other important cities, scenes of major battles, the places where Alexander was born and died, and so on.
6. As a boy, Alexander was taught to play the lyre, a string instrument used to accompany lyric verses. Write a lyric poem of your own that might be sung to the tune of a popular song.

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BASICS

Secrets of a changing schoolyard

SCIENCE

Kathleen Friesen

It's happening this very minute—right outside your classroom door. Slowly, almost imperceptibly, the environment is changing. The grass outside your school building is becoming drier. Leaves may be changing colors. And sidewalks are wearing away from constant use and exposure to the elements.

Change is constantly affecting our environment, yet often it passes unnoticed. By scheduling several class "field trips" throughout the year to a place no farther than your school grounds, you can help students become experts at detecting and understanding changes in their immediate environment. At the same time, children will sharpen their skills in observation, measurement, and descriptive writing.

Schedule your first trip for sometime before the end of November. But before you take the kids outside, hold a class brainstorming session in which you list examples of environmental changes students are likely to observe, such as falling leaves or flowers that have gone to seed. Encourage kids to think of less obvious changes as well, such as a rust spot increasing in size on an iron fence, an icicle forming at the bottom of a drainpipe, or moist ground becoming firm and dry in the sun.

Following this initial brainstorming session, you might want to take your students outdoors for a few minutes so they can locate additional examples.

The first field trip

Your goal for the first field trip is to choose several different "change stations," that is, small areas in which at least one of the changes on your list is already occurring. Select enough stations for groups of two or three students to "adopt" each one. Stations should be marked with wooden stakes, string, or surveyor's tape so they can be identified easily throughout the year. Following are a few examples of change stations you may find on your school grounds:

- a part of a sidewalk in which a crack is beginning to form
- the ground at the bottom of a drainpipe
- the bud of a flower
- one leafy tree branch
- a square meter of grassy ground
- one foot of iron fencing

After students have chosen their stations, have each group decide on one change it would like to observe throughout the year. For instance, the group that chooses the sidewalk station might focus on the changing size of the crack.

On this first field trip, instruct students to record as much data as possible regarding the current state of change in their stations. How large is the rust spot? What color are the leaves on the tree branch? What is the condition of the ground at the base of the drainpipe? Have kids draw pictures to illustrate their data; photograph their stations, or describe them on paper. This will lay the groundwork for comparisons later on.

Change stations revisited

Try to schedule one field trip each month for the rest of the year. Each time students visit their stations, have them record additional data regarding the changes they observe in the form of graphs, a series of pictures, or journal entries.

You'll also want to ask questions that will encourage students to think about the changes they observe. Why are the leaves on the tree branch changing color? What is causing the ground to become more firm at the base of the drainpipe?

Instruct students within each group to brainstorm possible answers to your questions, then use reference books to validate their guesses back in the classroom.

After your final field trip of the year, groups should compare their data from each visit and share their discoveries with classmates. Students may be surprised to learn that a rust spot has doubled in size or that one small crack in a sidewalk has led to several more! □

Kathleen Friesen is currently working toward a graduate degree in science and environmental education at Cornell University in Ithaca, New York, and is eagerly awaiting her return to the classroom.

BASICS

Get on the road to learning

MULTIDISCIPLINARY

Sandy Zjawin

Every day most of us use some form of transportation, whether we're making the daily jaunt to school or going much farther away. The different methods of transportation used, the kinds of information we need to know along the way, and the exciting experience of traveling itself can take your students into unknown areas, and almost any subject, as these activities show.

Modes and means

1. Research methods of transportation used by fantasy characters, such as Santa's sleigh and reindeer, Mary Poppins' umbrella, and flying carpets. Use the information to write short manuals such as "The Effect of Weather on Flying Carpets."

2. Collect train schedules and ticket stubs from trains, planes, and buses. Paste them on cardboard to create a transportation collage.

3. Find pictures of different kinds of ships such as clipper ships, aircraft carriers, towboats, houseboats, tankers, and fishing trawlers. How does their structure or the equipment they carry make them useful for their particular task? (Towboats, for example, have special "pushers" that look like knees built along the bow to help them push larger ships into harbor.) Cut out the shape of each ship from dark paper and paste it on cardboard; then identify each one by its silhouette. Read such seafaring adventures as Jack London's *Tales of the Fish Patrol* or *Tales of the Sea*.

4. Research the fascinating history of the railroads. For example, the earliest train was made by coal miners pushing wagons that were on tracks, and the "Tom Thumb" was a train that raced against a horse and lost. Trace on a map the route traveled by the famous Orient Express, and write stories illustrating events that actually happened along the way, such as an avalanche in Bulgaria that buried the train for 10 days, or numerous robberies. Design posters advertising cities situated along the route.

5. Calculate how much it costs to own various kinds of cars for a year, adding in the cost of gasoline, insurance, maintenance, license, and registration. Assume you travel 25 miles per day, 260 days a year, and that a bus or other form of mass transit is available. Which is the cheaper form of transportation?

6. San Francisco has trolley cars, Venice has gondolas, the Amish of Pennsylvania use horse-drawn wagons. What other places or people use special means of transportation? Why are they used?

7. Make models of different kinds of aircraft (gliders, sailplanes, helicopters, rockets) from cardboard and string them together to make mobiles. Print related words such as *climbing*, *banking*, *air speed*, and *throttle* on smaller pieces of cardboard and attach to the mobiles.

8. Look up some methods of transportation that are obsolete, such as the steamboat, stagecoach, and hydrogen-filled dirigible. Make a chart illustrating these vehicles and their modern counterparts. Are there any similarities between the different kinds of fuel of the past and the present? (Horses that pulled stagecoaches ate grass; gasohol, made from plants, is being used for gasoline.)

Travelers past and present

1. Make journal entries relating a trip from Europe to the United States on the *Santa Maria*, and record such things as what you see, what you eat, and how comfortable the vessel is. Then do the same for a trip on a modern ocean liner. How much longer did the first trip take?

2. Have several students research people who have made significant contributions to transportation, such as Charles Lindbergh, Robert Fulton, or Henry Ford, then prepare to be interviewed by "reporters." Students who are reporters should ask questions they think the people of that time would like to know, such as "Mr. Wright, how will you land when you fly to another city?"

3. Plan a trip to some far-off city. Obtain train, plane, and bus schedules and fares. Calculate the difference between excursion and regular fares, finding the cheapest rate. Can you go there directly or do you have to transfer? Design a going-away card, including a short poem about the coming trip.

4. Find different names for travelers (*argonaut*, *explorer*, *astronaut*, *nomad*, *tourist*, *ambassador*, and so on) and discuss the meaning of each one. Then draw a cartoon comparing two kinds of travelers, with such captions as "An explorer is like a tourist, except that he doesn't usually show slides when he gets home." or "An astronaut is like an ambassador, except that he doesn't have to know the language."

5. Have a "Transportation Career Day." Look in various career books to find requirements, advantages, and disadvantages of such occupations as train conductors, air traffic controllers, astronauts, bus drivers, mechanics, and travel agents. Gather the information together in a booklet or on a bulletin board. Make posters recruiting people for various occupations, and invite one of these people to speak to the class.

6. Lighthouses send signals to ships in the harbor, using a timed sequence of flashes so that sailors can get their bearings. Provide several children with flashlights, write the alphabet in Morse code on the board, and let kids take turns sending and decoding messages. Then let a group of students devise their own "light code" for others to decipher. Investigate other means of communicating on the high seas, in the air, and on the road. Include the information in a booklet of codes.

Following directions

1. Hide a "treasure" in the classroom, then write instructions for treasure-hunters to follow while using a compass (take two steps north, seven east, and so on).

2. Locate various cities on a map of the world. Find the latitude and longitude of each one and compute the distance to each in miles and meters (considering the directions—north, south, east, and west, as well) from where you are. Arrange the information on a graph, from the city that's farthest away to the nearest.

3. Cut out shapes of common road signs from cardboard and paint each sign the appropriate color. □

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E.T.? That's me!

LANGUAGE ARTS

J.F. Yeager

My language arts curriculum just wasn't working. All efforts to interest my junior high students in writing had failed—and I was fresh out of motivators. For all the progress we were making, I figured I might as well sit back and wait for an idea to fall from outer space. And that's when it hit me. Outer space was in! If anything could interest kids in writing, that was it. So the following Monday, I launched a series of "Astro-English Space Missions" that students really took off on!

I introduced the idea by telling students that twice a month, they were to think of themselves as brave, intergalactic travelers, on a continuing journey through outer space. Of course, they were more than curious at this point—they were all ears!

Next, I explained that they were sure to encounter many adventures along the way and would be expected to write about one of them every two weeks. They could use code names for these assignments, if desired.

Each student was to choose a secret "space partner," who would read his or her completed story aloud to the class. This way, no one would know whose story was being read and I could use the assignments as examples of quality work or to point out trouble spots we needed to work on as a class. Of course, a few students revealed the identities of their space partners, but overall, the gimmick provided just the right amount of anonymity my kids needed to share their writing with classmates.

Next, I explained that during these astro-English writing periods, my code name was to be E.T. (English Teacher). I would be available to coach students on their writing whenever necessary, and would review all completed stories before they were read aloud.

By this time, every student was eager to invent his or her code name, choose a space partner, and start writing. In fact, I had never seen the class so excited about an assignment!

To help them get going, I printed the start of a space adventure on a duplicating master, and ran off enough copies for every student in the class. The situation was as follows: *You have been captured by a group of ape-like, extraterrestrial creatures from the planet Zebraskin, who have thrown you into jail without food or water. Your mission, of course, is to escape. How will you do it? Describe, in detail, how you'll get out of this one!*

Although everyone started with this basic outline, the diversity of the finished products was amazing. Students eagerly read each other's work aloud—and a few actually *volunteered* to read their own. Needless to say, that had never happened before. Clearly, I was onto something here!

With one successful assignment under our belts, we were ready for Mission #002. This one was actually an exercise in persuasive writing. It read: *The Queen of the planet Zebraskin has decided to force you into marrying her wicked sister, Sasha Gropodopolous. (If you are a girl, you must marry her wicked brother, Zero.) The queen intends to use some rather ugly scare tactics and will, in fact, imprison you for life if the marriage does not take place. Your mission? Persuade the queen to give up on you and choose somebody else. Write your argument in a one-page letter to her majesty.* Again, the mission was accomplished with hilarious (and well-written) results.

During the following weeks, interest in the space missions remained high, and I managed to incorporate a different writing skill into each set of mission orders. Once for instance, the kids were instructed to write résumés that might land them jobs on distant planets. Each child had to design an imaginary job (washing the rings on Saturn, or reporting for the Venus Herald, for example), then write a résumé that emphasized the necessary skills. I preceded this assignment with a background lesson on résumé form. Another time they wrote reviews of books written by imaginary authors from outer space.

Astro-English Space Missions can work in any middle- or upper-grade classroom. All they require is a little imagination—and, of course, a dedicated E.T.! □

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BASICS

Snail and slug stunts

SCIENCE

Alan J. McCormack

Snails and slugs may be repulsive to some adults, but most children find them extremely appealing. They are harmless, readily available in most geographical areas, and display a wide range of observable behavior patterns. For all these reasons, snails and slugs make ideal subjects for any elementary science program.

Introduce them to your class, by explaining that the little critters belong to the *Mollusc* family—a diverse group that also includes oysters, clams, and octopi. All *molluscs* have soft bodies, supported by a singular, muscular "foot." They have two long stalks on the tops of their heads for feelers, and behind these, two smaller stalks, each bearing an eye. Other sensory organs are found in their skin. As a result, snails and slugs are sensitive to light, sound, and smells. The only major difference between the two is that snails have shells, while slugs do not.

You might want students to further research snails and slugs in science texts or other reference books before trying the following activities.

Mollusc movement Snails and slugs move on a muscular foot at the base of their bodies. Kids can observe this by watching one crawl along the inside of a glass jar. Point out the movement of the foot as children watch, and instruct them to record their observations. For instance, kids should notice that the foot appears to change color as it touches, then releases itself from the glass. This is due to the contracting and expanding of blood vessels involved in bodily movement.

Favorite foods Snails and slugs are actually vegetarians, but some will eat almost anything that's edible! Explain that these animals consume food by scraping it up with their tongues, called *radulas*.

To demonstrate this feeding behavior, place a few snails or slugs in a glass jar, along with some lettuce. Because these animals eat at night, keep the jar in a dark or shady spot in your classroom for children to observe throughout the day.

Next, conduct a "food preference" experiment. Place one snail or slug on a table in your classroom (in a dark area, of course). A few inches before it, place different types of food, such as mint leaves, small pieces of meat, chocolate chips, and bits of onion. Which types of food does the snail or slug move toward first? (Snails and slugs are likely to prefer lettuce as a first choice and mint leaves as a second.)

Slip-sliding away Both snails and slugs have slime-secreting glands in the front of their bodies. As slime is secreted, it creates a layer of lubrication which prevents friction and allows the animal to move along on the underlying surface. Does this mean a snail or slug can move easily over *any* textured surface? Try this experiment to find out.

Place four-inch squares of sandpaper, burlap, and silky cloth on a table in your classroom, along with a cardboard sheet on which you've sprinkled a thin layer of soil. Now have students observe a snail or slug moving along each of the four surfaces. Which surface allows the greatest ease of movement? Is there any surface on which the animal has great difficulty moving? (Snails and slugs will move easily over any given surface.)

Here's lookin' at you Snails and slugs have eyes consisting only of a simple group of light-sensitive cells. These cells do not create images, but merely provide the animal with information about the relative intensity and direction of light, enabling it to perceive the shadow caused by an approaching predator. Students can simulate the limited vision of a snail or slug with this simple activity.

Start with a plain, brown grocery bag. Open the bag and cut a window in the front panel, large enough for a child to see through. Next, cover the window with waxed paper. When the bag is placed over a child's head, the outside world will appear as a blur of light and dark patches. Have kids take turns wearing the bag. Tell them to face your classroom window, then turn away from it. Do they notice the difference in light intensity? Make sure you watch students carefully when they're wearing the bag so that they don't stumble over objects they can't see clearly. □

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Instructor; v92 n5 p146 January 1983

BASICS

Improving comprehension

READING

Sue M. Wright

If you're responsible for reading instruction, you know that some children with good phonics and vocabulary skills don't necessarily understand what they read. This may be because these children have poor phrasing (inability to group words correctly according to their meaning in context); are unable to identify the main idea; do not understand meanings of key words and phrases; or have poor inference skills.

You can improve your students' abilities in these areas with the following activities. They're organized according to the specific problem, can be adapted for any grade level, and require only a few simple materials.

Poor phrasing

Scrambled phrases Copy sentences on index cards, with each phrase of a sentence on a separate card (for example, the yellow cat—has climbed—the oak tree). Label each card belonging to the same sentence with the same letter of the alphabet. Scramble the cards, then let students pick out phrases with matching letters and place them in the correct order.

Descriptive phrases Print a noun such as *apple* on your chalkboard. Have students write descriptive phrases about the noun (for instance, *a delicious red apple: an old rotten apple*). Collect phrases and write them on a chart for use in reading exercises.

Phrase fill-ins Devise a list of descriptive phrases, leaving out significant words. Write each phrase on a slip of paper and place all in a box. Have each student pick out five slips, fill in the blanks, and read the phrases aloud. (Examples might be: *the big yellow* ______; *for the* ______; *have been* ______.)

Main idea

Paragraph pick Copy several paragraphs or poems on individual index cards (make cards for different levels of ability) and place them in a box. Have students draw out one card and write down the main idea of the paragraph or poem.

Ad writing Select a product for kids to sell and have them write newspaper ads for that product. Tell them the ad costs $1 a word and they have only $10 to spend. Have a contest to choose the five best ads in the class.

Sentence scramble Copy a paragraph on index cards, using one card for each sentence. Place cards in a box. Have children unscramble the cards, write the sentences in the correct order, and underline the main idea.

Literal comprehension

Picture guess Show students a picture from a magazine and tell them to study it carefully for three minutes, committing details to memory. Then ask them literal questions about the picture (What color are the flowers in the vase? What time is it?) and have them respond on paper. Award a prize to the student with the most correct answers.

Personality spotlight Assign three students daily to speak before the class, telling something about themselves—family, pets, likes, dislikes, hobbies, and so on. Afterward, ask questions about their talks and have the class write down answers. Follow the exercise with a class discussion on the answers students wrote.

Inferential comprehension

If I were . . . Write hypothetical situations on index cards. Have each student pick a card, give his or her reaction to the situation, and list what the consequences of that action might be. Some examples: If I were a genie, who would I make president and why? If I was 30 minutes late for work, afraid of losing my job, and caught in a 25 MPH speed zone, what should I do?

Scavenger hunt Conceal an object in the room and prepare a list of clues designed to lead a team of students to that object. Make the clues hints rather than literal directions, such as, Where in the world is the next clue hidden? *(under the globe)*; Never throw *me* away *(under the wastebasket)*; Don't take too much time to find the next clue *(behind the clock)*; and so on. The final clue should tell where the object is located. □

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Instructor; v92 n6 p176 February 1983

BASICS

Which way is north?

SOCIAL STUDIES

Leo J. Panetta

When I asked my fifth graders where north was, the usual answer I got was "up." Most students could calculate distances and directions on a map, but very few could grasp the concept where it really mattered—on the land that maps represent. I took advantage of a class camping trip to a Girl Scout camp in Connecticut to develop an activity that gave students practical experience in the map study skills they had learned in the classroom. This activity can be done successfully on a playground or athletic field as well.

To begin, I asked students why it is easier to get lost in the woods than in a town or city. They were quick to point out that it's because there are no street signs or familiar landmarks—that "many trees look the same." Through our discussion, pupils discovered the two factors needed not to get lost: you must know which way to go (direction) and how far to go (distance).

We tackled distance first. We took a short hike to a "pace-count" course I had set up beforehand, and I asked kids to estimate the distance in yards they would travel. When we arrived at our destination, some kids had counted steps, some had counted seconds, and there was a wide range of guesses as to how far we had traveled, from 50 yards to more than 400. I then explained the pace-count course. The path was marked by two trees, 50 yards apart, with ribbons tied to them. I asked students to count their natural steps from one tree to the other. When each had completed this task, the number of steps counted became the student's pace count for 50 yards; if it took 68 steps for one child to walk from one ribboned tree to the other, then every 68 steps equalled 50 yards for that child. Students now had an accurate way of measuring distances.

To understand direction, we borrowed compasses from the National Guard (students who are Boy or Girl Scouts often have their own compasses). After some practice, students realized they had to turn their whole body, not just an arm, to make the needle move in the desired direction. They discovered that if the needle was pointing to W, they must be facing west, and to get the needle back to W they had to face the same direction. When we had located north, south, east, and west, we put distance and direction together.

To do this, we walked to a tree with a black paper E tied to it. This tree was in the middle of a compass course I had set up earlier. The course consisted of an area of 100 square yards, bordered by trees that had black letters tied to them. Each tree was 50 yards away from another tree. At point E, I divided the group into four teams, gave each team a compass, clipboard, pencil, and these instructions:

Team 1

1. From point E, go 50 yards north. Write the letter (tied to the tree) you find here.
2. Next go 50 yards west. Write the letter you find here.
3. Now go 50 yards south. Write the letter you find here.
4. Now go 50 yards east. Write the letter you find here.

The other three teams' instructions were similar but told them to go in different directions. Team 2's directions were to go south, west, north, and east; Team 3's, west, south, east, and north; and Team 4's, east, south, west, and north—all teams ended up at point E again. And when the teams had completed their courses, the letters they had found spelled these words: bore, care, race, and nice.

If you use a wooded area for this activity, be sure to take a few precautions. Make certain students understand they are not to go off beyond any of the lettered signs. Black letters on an orange background are especially good to use because of their high visibility. And since all sets of instructions begin and end at point E (or whatever letter you choose), you can stand in the center where you can keep each team in sight.

I found our land navigation activity to be a valuable tool for developing map study skills. My fifth graders no longer answer "up" when I ask them where north is, but simply point out the window in the direction of Massachusetts. □

Leo J. Panetta teaches seventh grade language arts at the McGee School in Berlin, Connecticut.

Try comic relief!

LANGUAGE ARTS

Dorothy Zjawin

Well-loved comic strip heroes like Superman, Dennis the Menace, Little Orphan Annie, and Popeye have become even more popular since becoming stars of movies and TV shows as well. Pick some of your children's favorite characters and use them as learning motivators in a variety of subjects. Here are some activities to start with—all you need are the comics pages from the latest Sunday newspaper.

Comic jobs Have kids make a list of occupations that are represented in comic strips—doctor, reporter, sailor, soldier, and so on. How closely does the character in each job conform to the stereotype of that particular occupation?

Snoopy in Africa Ask each student to take a favorite character and put him or her in a different setting or time period: for example, Superman in the Middle Ages. What is his daily life like? What adventures does he have? Let children draw their own comic strips or write stories illustrating these adventures.

Heroes and villains Have each student make a list of qualities he or she finds desirable in a character and then make up a comic hero, using a combination of these qualities (drawing the character too, if possible). Let students use the same technique to create villains and then make up stories about their new characters.

Top comic Take a class poll of favorite comic characters and make a graph showing who came in first, second, third, and last.

Comic strip grab bag Cut frames apart from at least four comic strips and place these in a shoe box. Have students sit in a circle. The first child picks a frame from the box, reads it, and starts an original story based on the frame. The next player adds to the story's plot, as does the next, and so on until someone can't extend the story further. He or she then draws from the box to begin a new story.

Spotlight on artists Ask children to compare the different styles used by artists of comic strips. Call attention to the lines, ovals, and circles used in making characters and things like furniture and scenery. How does the artist make characters more realistic looking in a strip like "Mary Worth," for example, than in a strip like "Popeye"? Let students experiment with circles and ovals, using charcoal and crayons, to see how many kinds of heads and bodies of cartoon characters they can create. Point out the way we use our bodies to express certain things, such as holding our hands to our eyes in order not to see any more.

Comic beginnings Did you know that the first comic book ever published was "Mutt and Jeff" in 1911? What's the oldest comic strip still being published? ("The Katzenjammer Kids.") Have kids research the history of "funnies" to come up with other interesting comic facts.

Comic maps Pick a strip such as "Prince Valiant," "Family Circus," or "Beetle Bailey." On a large piece of wrapping paper, have children lay out a map showing the main character's home, place of work, travel destinations, locations of friends' homes, and important buildings and landmarks.

Comic critics Have each student write a review of his or her favorite comic strip, telling what makes it so special.

Missing dialogue Cut out the dialogue balloons from comic strips and pass strips out to students. Have them supply their own dialogue to go in the empty balloons.

Comparing customs Some comic strips, such as "Andy Capp" and "B.C.," take place in a foreign country or another period of time. Ask children to compare names, places, and customs featured in these strips to those of the actual country or time. Did people really ride dragons like they do in "The Flintstones"?

Folktale comics Have students invent their own comic strips by taking familiar folktales or fairy tales and changing the beginning, middle, or end of the plot. For example, a child could use *Rip Van Winkle*, and instead of having Rip fall asleep from the very start, he could decide to go exploring and find first one gold coin, then another, and then another. Have kids draw pictures and write dialogue for their folk characters as the lead them on original adventures. □

Dorothy Zjawin, a teacher in the Jersey City, New Jersey area, is a contributing editor for INSTRUCTOR.

BASICS

Discover rules of divisibility

MATHEMATICS

Sandra McAmis

A certain amount of drill is necessary to acquire basic mathematical skills. But it need not be mechanical or boring, as the word *drill* implies. Drill on a math skill like division can be the basis for a thinking activity that lets students stretch their imaginations to the fullest and make exciting discoveries on their own.

In this math project, kids try to discover different rules of divisibility. They do this by studying sets of numbers you give them. Then, working in small groups, they are to make observations about the numbers, discuss them among themselves and form hypotheses, verify or reject these hypotheses, and finally come to a consensus. This is also a good way for kids to practice using calculators although they are not necessary.

Before beginning this activity, review simple division problems, ones without remainders. Then present the following problems one by one, as children are ready for them. The problems get progressively more difficult—it is likely only the most gifted students will be able to figure the last few. As students discover each rule of divisibility, have them add it to a chart.

Problem 1 Tell students the following numbers are divisible by 2 and write them on the board: 246, 354, 730, 7684. Then write the following numbers on the board and tell students these are not divisible by 2: 245, 463, 781, 8447. Now write these numbers on the board and ask kids which are divisible by 2: 248, 427, 809, 456. When students have answered correctly (248, 456), ask them to work in groups to write some numbers of their own that are divisible by 2 and then come up with a rule about numbers that are divisible by 2. (The last digit is an even number.) Follow this same procedure for each of these problems.

Problem 2 These numbers are divisible by 4: 124, 320, 512, 9784. These are not: 513, 910, 306, 1658. Which of these numbers are divisible by 4? 316, 940, 500, 748. (All are. Rule: the last two digits in the number are divisible by 4.)

Problem 3 These numbers are divisible by 8: 824, 320, 6352, 1096. These are not: 566, 324, 2164, 3602. Which of these numbers are divisible by 8? 632, 920, 4248, 3574. (632, 920, 4248. Rule: the last 3 digits in the number are divisible by 8.)

Problem 4 These numbers are divisible by 5: 345, 790, 430, 1645. These are not: 153, 357, 509, 1564. Which of these numbers are divisible be 5? 360, 955, 957, 4000. (360, 955, 4000. Rule: the last digit in the number is either 5 or 0.)

Problem 5 These numbers are divisible by 10: 560, 880, 540, 6720. These are not: 805, 972, 906, 4003. Which of these numbers are divisible by 10? 790, 485, 362, 9990. (790, 9990. Rule: the last digit in the number is 0.)

Problem 6 These numbers are divisible by 3: 111, 213, 639, 7020. These are not: 451, 620, 332, 2411. Which of these numbers are divisible by 3? 923, 254, 432, 1440. (432, 1440. Rule: the sum of all digits in the number is divisible by 3.)

Problem 7 These numbers are divisible by 9: 396, 441, 225, 2340. These are not: 155, 433, 253, 9249. Which of these numbers are divisible by 9? 342, 360, 522, 3961. (342, 360, 522. Rule: the sum of all digits in the number is divisible by 9.)

Problem 8 These numbers are divisible by 6: 132, 504, 336, 2418. These are not: 135, 229, 467, 4250. Which of these numbers are divisible by 6? 540, 339, 645, 6150. (540, 6150. Rule: the last digit is even and the sum of the digits is divisible by 3.)

Problem 9 These numbers are divisible by 7: 161, 378, 651, 4662. These are not: 286, 409, 248, 6534. Which of these numbers are divisible by 7? 385, 680, 645, 2709. (385, 2709. Rule: the last digit doubled and subtracted from the remaining digits is a difference divisible by 7.)

Problem 10 These numbers are divisible by 11: 704, 638, 297, 2728. These are not: 497, 651, 641, 2576. Which of these numbers are divisible by 11? 385, 545, 737, 6743. (385, 737, 6743. Rule: if you add every other digit, then subtract the remaining digits, the difference will be 0 or 11.) □

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Instructor; v92 n7 p115 March 1983

Friction – what a grind!

SCIENCE

Sandra Markle

Everything that touches, grinds or rubs together. This process is called friction, and it causes heat to be produced, parts that are rubbed to wear out, and movement to slow down. Your students can easily feel the heat that is produced by friction. Ask them to rub their palms together briskly for 30 seconds. How do their hands feel afterward? (They'll feel warm.) Have each child hold a paper clip in one hand, and with the other hand, rapidly bend and unbend the open end of the clip 20 times. Then ask kids to touch the paper clip to their lower lip. Does the clip feel cool or warm? (It will feel warm because the friction of the metal's movement has generated heat.)

To show how friction wears things out, ask students to look at the heels on their shoes. How worn down are they? Are older shoes more worn than newer ones? Give kids examples of other things that are worn down by friction (tread on tires, parts of machinery, the floor where a door rubs as it opens and closes, a toothbrush, wood by sandpaper) and ask them to give other examples.

To show how friction slows down movement, ask your students, if their hands are not too tired out, to rub them together lightly as fast as they can. Then ask them to rub hard, with much pressure, also as fast as they can. They will see that when there's more pressure (friction) they can't rub as fast.

What effects do weight, surface, and such friction-reducers as ball bearings have on friction? Try these experiments using a simple friction-testing tool to find out.

How does the weight of the load affect friction? For this experiment you'll need an empty half-pint milk carton, scissors, a strong rubber band, a stapler, 2 cups of sand, a measuring cup, a ruler, and a smooth floor or table top.

1. Wash out the carton and tape or staple shut the spout. Lay it on its side and cut open the side facing up.
2. Staple one end of the rubber band to the back end of the carton. Make a pen mark on the rubber band 5 centimeters from the other end of the rubber band.
3. Hold the band at this mark and pull gently with the band straight out until the carton starts to move. When the carton is moving steadily, stop without letting the rubber band contract from its stretched position.
4. Measure the distance between the edge of the carton and the mark on the rubber band to record how far the band stretched.
5. Now pour ½ cup of sand into the carton and repeat the test. Record how far the band stretched.
6. Repeat this test with 1 cup of sand, then 1½ and 2 cups, and record the measurements.

How did the weight of the load affect how much the rubber band stretched? (The more weight, the more it stretched.) What did the amount of stretch show about the friction between the bottom of the carton and the surface it was moving over? (The more weight, the greater the friction between the carton and the surface, and therefore the more pull required to move the carton.)

How does the surface the load is on affect the amount of friction? For this experiment you'll need an empty milk carton as before, with rubber band attached, sandpaper (enough to cover an area 30 centimeters long), a piece of carpet 30 centimeters long, a cookie sheet, petroleum jelly, and a ruler.

1. Tape sandpaper to a flat surface 30 centimeters long and as wide as the carton. Put the carton on the sandpaper and pull gently with the rubber band.
2. When the front edge of the carton reaches the end of the sandpaper, or the carton won't move any farther, stop pulling. Measure the distance from the edge of the carton to the mark on the rubber band while the band is still fully stretched. Record this measurement.
3. Repeat this test with the carton on the carpet and record the results.
4. Mark 30 centimeters on the back of the cookie sheet. Coat this area with petroleum jelly. Repeat the test, pulling the carton over the greased surface, and record the results.

On which surface did the rubber band stretch the least? (The greased cookie sheet.) Why? (There was less friction, so the load moved more easily.) On which surface did the rubber band stretch the most? (The sandpaper, where there was the most friction.)

How do ball bearings help reduce friction? You will need 24 plastic straws, tape, empty milk carton as before, with rubber band attached, sand, and a ruler.

1. Tape 12 straws onto a smooth surface with about one centimeter between each one. Keep the straws parallel to each other.
2. Lay the other 12 straws down in the same formation as the taped straws, but don't tape these.
3. Fill the carton with sand and place on the taped straws. Hold the rubber band at the pen mark and pull carton gently over the straws.
4. When the front end of the carton is at the end of the straw path, stop pulling and measure the distance from the edge of the carton to the mark on the band. Record the results.
5. Repeat this test on the untaped straws, recording the results.

Which test caused the rubber band to stretch less, showing less friction between the carton and the surface? (The one on the rolling straws.) Ball bearings are like the untaped straws. By rolling with the movement rather than resisting the force in contact with them, ball bearings reduce friction.

Friction makes a big difference in our everyday lives. If our shoes didn't rub on floors and sidewalks, we would constantly slip and fall. Without friction, brakes on cars wouldn't work and we couldn't drive safely. What is important for us to know is how we can affect the amount of friction there will be. When we understand that a heavy load and a rough surface increase friction while lubricants and ball bearings decrease friction, we can help prevent parts from wearing down and movement from slowing. □

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BASICS

We "break" for music!

MUSIC

Martha Christine

Mary and Jennifer are whispering back and forth. John and Keith are sharpening their pencils for the third time in 10 minutes, and Jason is staring out the window. Fifteen minutes remain until lunch. What now? Time for a music break! What's that? Pretty much what the name implies: a short break from regular classroom activities in which students move or sing to selected music.

Following are a few simple activities you might want to try the next time your class is restless or needs a break from daily routine. As far as equipment goes, you'll need a record player or tape player and a good assortment of recordings of different kinds of music (classical, jazz, folk, popular). Most activities are followed by one or more variations you can introduce once children master the original one. As children become familiar with the activities, you also might want to choose a child to take your place as leader.

Keep the beat These first two activities involve what might be called the foundation of music—rhythm. Play a piece of music that has a steady beat (a march or popular song might be best) and ask children to keep time by either clapping along with the beat, clapping on some part of their body, or striking an object in the room such as a book or table. Tell students that you're going to stop the music but they should keep clapping rhythmically. Then turn the volume down for a short time, and turn it up again to see if they have kept the beat.

Variations To the same music, ask kids to walk around the room in time to the beat as they continue clapping. Have one child be the leader and lead the rest in and out of rows of desks.

Or have children walk around the room without clapping, and continue walking when you stop the music. Start the music again to see who is staying in time.

Feel the rhythm Clap a short rhythm pattern and have the class repeat it. Divide the class into groups of five or six and give them progressively harder rhythms, letting each group try to repeat them in turn. Keep score to see which group does the best.

Variations Add different movements to the rhythm pattern, such as snapping your fingers, stamping your feet, or brushing your hands together.

Clap a rhythm with hands on different parts of the body (head, shoulders, elbows, feet, and so on) and have the class repeat.

Or pick a fairly simple rhythm pattern with an even number of beats and have students clap it as a round. To do this, divide the class into four groups; after you clap four beats, the first group comes in, four beats later the second, and so on.

Pitch, volume, speed These are three of the most basic elements of music. To illustrate pitch, play an ascending scale on a piano or harmonica if you have either handy; otherwise sing one. Have students kneel on the floor and slowly rise as the notes go higher. Then have them extend an arm and raise or lower it as the notes in your scale go up or down.

To illustrate volume, have the class sing one of their favorite songs three times. The first time they should sing it loudly, the second time more softly, and the third time more softly still.

To explore the concepts of fast and slow, ask kids to sing another song and set a slow pace for them to follow. Then as they sing it again, set a faster pace, and the third time an even faster one.

Muscle dances Have the class stand at their desks while you put on some soothing music. Ask kids to move their heads to the front, back, and each side in time to the music. Then have them move their heads in one full circular movement several times clockwise and counterclockwise. Do the same thing with all parts of the body—shoulders, chest, waist, hips, knees, feet, arms, and hands in turn.

Variation Write three body parts on the board, such as head, hips, and shoulders. When you say "one," the children should move only the head in a rhythm pattern that you specify or to a piece of music. When you say "two," they should move head and hips, "three," all three parts of the body. □

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Instructor; v92 n9 p100 May 1983