

Learning Key Science Vocabulary Using Multi-Sensory Methods

Cindy Woolery

Overview

My earliest memories are centered in nursery rhymes or songs sung with my mom and older sister. My favorite “science song” from my toddler days was: *Twinkle, twinkle little star. How I wonder what you are. Up above the world so high, like a diamond in the sky.* At a very early age I learned science concepts and vocabulary through the repetition of singing this song! I learned the first principal of “doing science” which is to wonder and the second principal which is to “ask a question.” I learned that stars were above the earth and appeared to twinkle. I learned important vocabulary words such as star and world.

As I grew and gained vocabulary, my favorite song became *Old MacDonald Had a Farm*. While remembering the order in which to make the farm animal “noises” I was learning what kind of animals lived on a farm, which was very foreign to a city girl. I was learning how to classify animals and the fact that animals had needs that the farmer met through food, water and shelter.

I watch very young babies’ delight when they hear “This little piggy went to market” and observe that they are eagerly awaiting and anticipating the ending. The baby knows the last little piggy will go “wee, wee, wee, all the way home” and that when this phrase occurs, they will be tickled. The babies are ready to squeal with laughter! Before they can speak, they have connected the words to the actions and are able to anticipate an emotional moment of happiness.

As we see, then, nursery rhymes are often the first steps to children's education. “Twinkle, Twinkle, Little Star” was first published in 1806 and has been translated into many languages. These songs are repeated to children time and time again. They have endured over hundreds of years and do not show signs of going out of style.

This unit is written to build upon the time-tested use of rhymes, repetition, and body movements to build lasting connections to science vocabulary words. The unit will be focused on particular science concepts and words that fifth grade students will need to know in order to pass the North Carolina State end of grade science test and become successfully science literate students beyond the fifth grade. The selected vocabulary words will be addressed in unique ways with the students as the curriculum spirals from kindergarten through fourth grade.

While attending the seminar “*Performing*” *Experiments: Exploring Depictions of Science in Theater* lead by Ann Fox from Davidson College I began to realize how I could use elements of drama to help students, especially the young ones, gain an understanding of science vocabulary words. By encouraging the production of “mini-plays” and dramatic snippets or performances based on science concepts and vocabulary for elementary students, this unit is helping me stretch my thinking and generate material

that will be very useful to my students and that I hope others teachers will find useful as well.

Demographics

J.H. Gunn Elementary School is a suburban elementary school serving students K-5. The school is located in Charlotte, North Carolina in the urban school district of the Charlotte-Mecklenburg School System, which is the twenty-seventh largest school district in the nation. The school has a multicultural population of 761 students and is an English as a Second Language (ESL) designated site. The ESL Program serves approximately twenty-five percent of our student body. Our school also serves many students with special needs including physical, mental and behavioral. Seventy-seven percent of our students receive free or reduced lunch, making us a Focus and Title I school. The school has been an integral part of the J.H. Gunn community, an integrated medium-low income neighborhood (African American, Hispanic, Caucasian and others), for over 75 years.

I am the full time Science Facilitator at our school. I have created a science lab from a classroom. The lab has 6 tables for group experiments and cooperative working groups as well as a media viewing space (rugged area where a computer connected to a LCD, overhead and TV are located). The Science Lab experience is considered a “Special” on the same level as Art, P. E., Music and Computer classes. Every student in the school comes to the lab during the school year for a forty minute lesson one time a week.

I teach Science using the North Carolina Standard Course of Study (NCSCoS) and appropriate teaching methods, resources and strategies related to designing effective science learning experiences for my students. For most lessons I use the Five E’s (*Explore, Engage, Explain, Elaborate, and Evaluate*) in planning interactive lessons. I have discovered many excellent interactive science web sites where students can perform virtual experiments. Viewing these web sites as a group has had a real impact on student learning. Many of my students are lacking in life experiences and the use of the computer gives them background knowledge to be able perform their own discovery experiments.

Rationale

This is the first year that the state of North Carolina has elevated the fifth grade Science test as a “gate-way” test. The Science end of grade (EOG) test has been placed on the same level as Reading and Math EOG. The principal, along with the classroom teacher, will use information from these three tests to determine if a student will be promoted. If enough students at our school do not pass the Science EOG then the teachers will not met their annual yearly progress goals, which will eliminate state bonus money for each teacher at the school.

Schools are often judged by the public on how the students score on the EOG’s. These facts have had a great impact on the teaching of Science at the elementary level. My position as a Science Facilitator is a direct result of the Science EOG. Teachers are

striving to carve out time to make sure Science is taught at least twice a week. Our school system has developed an Elementary Science Leadership Team (that I am glad to be a part of) to look at ways we can teach science. High stakes testing of our students in elementary science is stretching our teaching of science!

The old method of telling students to read the chapter and answer the questions that follow the reading is NOT going to work effectively with the students at my school. So the question is- "What will work?" I believe to reach and teach students we need to look at the varied learning styles, presenting material in ways that students can recall needed information and use multi-sensory teaching techniques. Science investigation at the elementary level should consist of many components. A few of these components would include building background knowledge, inquiry investigation, and the use of technology to support and enhance objectives and science vocabulary.

The NCSCoS sets the specific goals and objectives that need to be cover for each grade level. On each grade level in Science we have four units, with five to seven objectives for each unit. The current science text books that our district adopted covers about 60% of our objectives. Teachers are responsible to locate materials and lessons for the other 40% of the information that must be taught. The current science book adoption also has science kits with materials to perform the experiments listed in the book. The materials in the science kits are useful but in grades third through fifth the teachers are expected to share kits. In my experience the teacher without the kit in their room is less likely to use the materials within the kits.

When teachers asked for a science vocabulary list at the elementary level the official response from the Department of Public Instruction is:

Although, it would not be difficult to devise a science vocabulary list, we at DPI have discouraged the idea. We prefer students to have experiences that offer opportunities to develop an understanding of science concepts. Inquiry science has been, and will continue to be, the focus of our section. With inquiry science, students will understand the meaning of the word and not just memorize the definition. So, we do not plan to include a vocabulary list with our support documents at this time.

It would be wonderful if it were true that students would understand the meaning of the words (which words?) through inquiry science, but I do not see that in my experience. Many of my students are ESL, come from homes where science vocabulary is not used or the student and their families have limited science background knowledge. Some vocabulary words do lend themselves easily to inquiry science, but others do not.

Ever since Robert Yager's (1983) study that suggested (1) the amount of new vocabulary in science textbooks exceeded the number of vocabulary words for learning a foreign language, many educators have been concerned with the number of terms introduced in science classes and methods to help students learn vocabulary. We must begin the work of systematically introducing science vocabulary to our students from the beginning of Kindergarten. Students are naturally curious about the world around them. It

is imperative that we supply them with the tools and language to effectively communicate about their world through the use of science vocabulary.

The NCLB focus on math and English, with the consequential neglect of science in the elementary grades has resulted in many students entering the middle grades with deficits in their science vocabulary(2). The addition of the fifth grade science EOG will directly affect those students who have been well prepared to take the test, as they step into their middle grade experience. This preparation can not wait until the fifth grade to take place. It must begin very early in the students' life so that when they arrive in fifth grade they will be ready to understand the concepts because they already know the language.

A report from Lawrence Hall of Science & West Ed in 2007 indicates that eighty percent of elementary teachers recently reported spending less than an hour each week teaching science while sixteen percent of the teachers reported they spent no time teaching science. This compares to an average of elementary school teachers spending two hours weekly just seven years ago (3). This is a shocking statement to me. If teachers can not find the time to "do" science they should at least find the time to teach the language of science.

In the unique position of a Science Facilitator I have studied and taught the K-5 science units and their objectives for the past three years. I am one of sixteen teachers who hold a similar position in our school district. Using my knowledge of the NCSCoS and the elementary science curriculum, I am writing this unit to identify the key vocabulary words used K-4 that support and align with the fifth grade EOG. In this unit I selected appropriate vocabulary words at each grade level and developed a system using repetition and audio, visual, tactile, or kinesthetic methods to learn these key science words.

In order for my students to be successful on their fifth grade Science EOG (80 multiple choice questions) they must understand science vocabulary! The learning of these key science vocabulary words needs to begin in Kindergarten and continue throughout their lives. Students come to school with vocabularies of different sizes and they learn at different rates through different modalities. Through the creation and implementation of this unit I will help my students acquire a solid foundation of the science vocabulary needed to be successful on the fifth grade EOG and through the rest of their lives.

Through the writing of this unit I will share these activities with the classroom teachers at my school and publish them on the Charlotte Teachers website. It is my hope that this unit will be of assistance to many teachers who may struggle with science vocabulary and/or have a desire to help students at their grade level to be better prepared for the fifth grade EOG.

Background

The teaching of vocabulary is the job of all teachers. The understanding of content vocabulary is, after all, an excellent predictor of success in the subject area (4). While inquiry skills, concept development, and understanding are the main goals, students knowing and using key vocabulary are important outcomes of science education.

Science texts contain many new words that students are expected to learn from reading. These words represent important ideas and concepts that are central to science understanding. However, learning new words encountered in text can be a difficult task for young students. Successful instruction with science texts focuses on conceptually important words that are essential for understanding broad ideas in a unit of study. Teachers plan instruction of these words in ways that encourage an in depth level of understanding.

Students learn new words best when they have many opportunities to hear, say, read, and write the words in a variety of contexts. The ultimate goal of vocabulary instruction is to help students develop the ability to use words in speech and writing in a variety of contexts to explain important ideas. Scientists use journals to record their experiments, ideas, thoughts, predictions, and outcomes.

It is also important that teachers understand and develop the following four core types of vocabulary. (5) The first type is listening vocabulary; these are words we need to know to understand what we hear. The second is speaking vocabulary; these are the words we use when we speak. Next is the reading vocabulary; these are words we need to know to understand what we read. Lastly is the writing vocabulary; words we use in writing. This unit is written to introduce listening and speaking vocabulary as a precursor to reading and writing the selected vocabulary in the upper grades.

Students in elementary grades benefit from vocabulary activities that encourage their involvement in the vocabulary through activities such as interacting with repetitive language and acting out descriptive words and passages. Researchers have found that reading aloud showed students the language, and that drama increased both their understanding of the text and their imagination (6)

One approach many English as a second language teachers use was created by James J. Asher, an emeritus professor at San Jose State University, called [Total Physical Response](#). It operates under the theory that, because your body is connected to your brain, you can learn better if you use more of your body than just your eyes and ears. Instead of simply saying a word and having the students repeat the word, for example, instructors would show them the word through actions and had them do the actions, too. It is linked to the trace theory of memory, which holds that the more often or intensively a memory connection is traced, the stronger the memory will be.

Strategies

Ms. Porter, J. H. Gunn's English as a second language teacher, and I collaborated to produce the *Science Topics & Vocabulary* chart found in appendix 1. We used the

NCSCoS to identify the vocabulary words within the twenty-four elementary science units that are taught each year. The fifth grade Science units of “Forces and Motion”, “Ecosystems”, “Landforms” and “Weather” were used to select the key vocabulary at each grade level this curriculum unit will focus on.

Some elementary units do not correlate to the four units taught at the fifth grade level and will not be considered for this curriculum unit, although the words are listed in the appendix for the reader’s reference. A few examples are the third grade unit “Earth, Moon, Sun and Stars” and fourth grade units “Food and Nutrition” and “Electricity & Magnetism” since they do not directly correlate to one of the four science units taught in fifth grade.

Starting with the Kindergarten units, I selected words or concepts that will help students build background knowledge for the science vocabulary they will encounter on the fifth grade EOG. I will then determine what kind of multi-sensory performance using repetition and visual, auditory, verbal, musical, tactile or kinesthetic learning modalities are appropriate for the grade level. Will it be a song with hand motions, a stomp with body movements, a poster, a story, or even a rap? I want to meet the needs of my students to know basic science vocabulary in ways that build knowledge, recall and understanding.

One strategy is to have my fifth grade students help me to generate the performances. The words/concepts are selected on the basis of it being useful for the 5th grade EOG, and fifth grade students have unique insights into how other students might learn the vocabulary. I asked the students to come up with “mini performances” for the selected vocabulary. After sharing their creative products, I asked the fifth grade students to help in teaching the younger students the performances. I selected the best fifth grade products to include in this unit. I documented the words and movements so that I can use them throughout the school year and many times within the science units and grades that they are intended for. As the fifth grade students focus on the vocabulary that the younger students are learning they also are learning some unique skills. First the older students have to come to a clear understanding of the meaning of the word and how to break that understand into smaller “chunks” so that younger students can grasp the concept of the word. Their purpose for learning the vocabulary is changed as they are charged with the important work of teaching others.

I asked my fifth grade students to compose posters with the key vocabulary words and directions to the performances on them. I use these posters in the lab, give each of the teachers who will use the performance in her room one and post any additional posters throughout the school. In this way students will “see” their performances in print.

As I begin to teach the performance I break it down into small segments. When the students accomplish the first segment I add the next and so forth. When the performance rehearsal is complete I ask for volunteers to come to the front of the class to lead the class. Sometimes the whole cooperative learning group will lead the other students.

Once the performance is learned and practiced, the students will document the performance in their science journals. Non-writing students, most kindergarten and some first graders, will illustrate their performance. Other students will illustrate, label and write about their performance connecting science vocabulary with literacy.

A successful strategy has been to ask the classroom teacher to come to the lab five minutes early to watch the students' performance. This has been very helpful in getting the classroom teachers' participation and cooperation in utilizing the performance throughout the entire nine week unit. Classroom teachers have used these performances as transition breaks and as an opening activity for their science lessons.

At our school we have a closed circuit broadcast every morning. Students who have accomplished the performance are invited to "perform" for the entire school on the broadcast. This strategy has been very effective as a pre-teach or early introduction for the younger students. If a third grade performance is featured once a year then our current Kindergarten students will have been exposed to it three times before they become the performers.

Another strategy is to have the students teach the performance to someone at their home as homework. I have used this strategy with great success with my first and second graders. Since many of the students at my school come from non-English speaking homes, their parents enjoy the science/language lesson and their child has an opportunity to share knowledge with their parents.

Classroom Activities

Kindergarten

The kindergarten concepts and vocabulary words that spiral into the fifth grade units include habitat, needs of animals and camouflage in the unit entitled Similarities and Differences of Animals.

This "mini" performance is said in a round format with the teacher saying and demonstrating the words of the first line and students repeating both words and actions. I will introduce the song at the very beginning of the unit and use it throughout the unit. Students will be encouraged to take the lead in making up their own verses with actions as the unit continues and we study other animals and their habitats. Some animals may have more than one habitat such as a lion that could live in a jungle or in a zoo.

Teacher: Where does fish live? (Hands together at waist level "swimming" back and forth.)

Students: Where does fish live? (Students will mimic teacher)

Teacher: In a pond. (Cup hands, palms up to make a large bowl gesture.)

Students: In a pond. (Students will mimic teacher)

Teacher: The pond is fish's habitat; the pond gives fish this and that. (Place hands with finger tips touching making the sign of a shelter)

Students: The pond is fish's habitat; the pond gives fish this and that. (Students mimic teacher)

Teacher: Food, water, home. (Use right hand fist and pop up one finger for each of the needs the pond supplies for the fish)

Student: Food, water, home. (Student will mimic teacher.)

Verse two: Where do deer live, in the woods . . .

Verse three: Where do birds live, in the tree. . .

Verse four: Where do bees live, in a hive . . .

The next performance is a vocabulary stomp using the word camouflage. While saying the word "camouflage" teacher and students will stomp their foot, then they will clap their hands three times as they say "hard to see" and finally they will spread their fingers and clasps their hands and fold their fingers down while saying "blending in".

First Grade

In first grade the students study Needs of Living Organisms. The science concepts and vocabulary words that I will focus on are organisms, needs of animals, and classifying animals into six categories. First grade students also study Balance, Weight, and Motion. From this unit they will understand the science concept of motion.

The first performance is a vocabulary stomp using the word organisms. While saying the word "organisms" teacher and students stomp their foot, then they will clap their hands three times as they say "living things". Next you hold up your right hand making a palm tree with your arm, hand and fingers as the branches and say "plants". Cross over your mid-line with your right hand and touch yourself on the upper chest as you say "or" then take your left are and hold up your hand and with your thumb and forefinger make a birds mouth that opens three times as each syllable of "animal" is said.

The second performance is said to the tune of "Head, Shoulder, Knees and Toes" and the body movements are arms stretched wide for air, hands facing palms down making wave motions for water, finger tips from each hand touching making a roof for shelter, and pretend to eat something (hand to mouth) for food. The words are as follows:

Air, water, shelter, food, shelter food,

Air, water, shelter, food, shelter, food.

Animals' needs are met this way

Air, water, shelter, food, shelter food.

The third mini performance is sung to the tune of "Wheels on the Bus". It teaches the students that animals come in six categories and helps them remember the names of the categories.

Animals come in six categories, categories, categories (hold up 6 fingers)

Animals come in six categories, this is something I know.

Birds, insects and reptiles, reptiles, reptiles (birds = flap wings, insects = catch a bee, reptiles = one hand crawling across the other)

Birds, insects and reptiles, this is something I know.

Fish, amphibians and mammals, mammals, mammals, (fish = hands with palms together in swimming motion, amphibians = one hand crawling up the arm, mammal = point to yourself.

Fish, amphibians and mammals, this is something I know.

The last mini performance for first grade will be a vocabulary stomp using the word motion. We will stomp on the word motion then clap the syllables for "is a force". Next we will pretend that we are pushing our chairs in as we say "a push" and then pretend we are pulling our chairs out as we say "or a pull".

Second Grade

In Science the second grade students study a unit called Changes in the Weather. During this unit the students will learn about the water cycle and clouds. A second unit of study is Animal Life Cycles in which they need to know the concepts of extinct and endangered.

This mini performance is to the tune of She'll Be Coming Around the Mountain when She Comes.

Water travels in a cycle, yes it does.

Use pointer finger to draw large circle in air.

Water travels in a cycle, yes it does.

Repeat above motion.

It goes up as evaporation,

Raise arms at side with palms up.

Forms clouds as condensation,

Brings hands together above head, forming large cloud shape with arms.

Then falls down as precipitation, yes it does.

Slowly lower arms at side with palms down, fingers moving.

The second mini performance will be a rap. Students will be given the following rap and asked to “perform” the rap. The students can make up a dance, create mini posters to use while performing it, or come up with other creative ways to share the message with their peers.

Clouds, Clouds, Clouds

Clouds, clouds, clouds,
Let me tell you about,
Clouds, clouds, clouds. NOW --
When its gray and oh-so-drizzly,
Stratus has been working busily.
You’ll find Cumulus when it’s sunny,
He’s the one whose shapes are funny.
Clouds, clouds, clouds,
Let me tell you bout
Clouds, clouds, clouds. NOW --
Cirrus has no special weather,
He lives up high and looks quite feathery.
And when you want some hail and snow,
Cumulonimbus is the name to know!
Clouds, clouds, clouds,
Let me tell you bout,
Clouds, clouds, clouds. Clouds!

The third mini performance is sung to the tune of Pop Goes the Weasel. The poem was written by Meish Goldish and I believe it is an excellent way for students to begin to understand thunder and lightning.

Thunder and Lightning (7)

When a storm begins in the clouds,
It sometimes may look frightening.
You see a quick electrical spark--
Flash! goes the lightning!

students form pretend clouds above their heads
students make faces of horror
click fingers
start with hands in a ball and on the word flash
extend the fingers

Long and thin and streaky and fast,
Its glow is oh so brightening.
Watch for the electric spark--
Flash! goes the lightning!

students use finger to make a zig zag line
hands radiant from the face
click fingers
start with hands in a ball and on the word flash
extend the fingers

When a storm begins in the clouds,
It truly is a wonder.

students form pretend clouds above their
heads
use one finger to make a question mark

You hear a rumble loud in the sky--
Clap! goes the thunder!

roll fist over fist
everyone claps

Lightning bolts are heating the air,
Over clouds and under.
When the air expands enough--
Clap! goes the thunder.

students use finger to make a zig zag line
extend hands as high as they go and then low
reach hands out wide
everyone claps

I wrote this song to teach second grade students the concepts of endangered and extinct. It is sung to the tune of "Oh Where, Oh Where Has My Little Dog Gone". Students selected an endangered or extinct animal and drew a large picture of the animal. As they sang the song they held up their pictures at the appropriate times.

Oh where, oh where did the extinct animals go?
Oh where, oh where can they be?
Never to roam on this earth again
We lost them can't you see?

Oh where, oh where did the endangered animals go?
Oh where, oh where can they be?
We must take care of them if they are to live
It's all up to you and me!

Third Grade

Plant growth and adaptation is one of the third grade units. The concept that plants produce their own food and are at the beginning of the food chain is an important building block for the students in fifth grade to understand food chains, food webs and ecosystems.

Plants are Producers is sung to the tune of "The Wheels on the Bus Go Round and Round".

Plants produce their own food, their own food, their own food,
Plants produce their own food, from nutrients, light and water.
The food chain begins with plants, begins with plants, begins with plants
The food chain begins with plants and they are called producers.

Fourth Grade

The fourth grade unit on Animal Adaptation helps to "set the stage" for the fifth grade unit on Ecosystems. Students who acquire a firm grasp of vocabulary during this unit of study will have a easier time understanding the concepts introduced in fifth grade. The first mini performance uses a poem written by Evie Boss (8) and is sung to the tune of

“The Farmer in the Dell”. I will use this song as an example of how my students can make their own mini performances. I will assign each cooperative learning group a biome and ask them to look for predator/prey relationships within their biome. I will then ask students to create their own mini performance using the relationships that they discovered and the song as a guide. Each group will “perform” their unique song for the class. The mini performances that the students create can take on many forms and are limited only by the students’ imagination. Some may want to create a rap while others may create a skit. I have purchased a mini camera that can record a short video clip then play it back on the computer that is hooked to an LCD player. I will use this camera to record the students’ performances and play it back for the entire class to enjoy and learn from.

The predator eats the prey, the predator eats the prey,
High-ho it’s nature’s way the predator eats the prey.

The mantis eats the moth that was munching on your cloth...

The cat eats the mouse that snuck into your house...

The snake ate the frog that was hiding by the log...

The robin ate the worm as it wiggled and squirmed....

Summary

This curriculum unit is written in hopes that you, the teacher, will be inspired by the unit to create your own “mini performances.” The process is quite simple and entertaining once you get the hang of it! First, think of the core vocabulary words you want your students to understand. Second, write out the content knowledge you want your students to gain as they make the science vocabulary word their own. Last of all, get creative! Do you want to use the word in a vocabulary stomp? Can you think of a song that the science vocabulary and content can be sung to? In what ways can the students move their hands, feet, faces, or whole bodies that will connect the word to the meaning?

If you do not feel creative or have the time to think of anything, assign your students to come up with some ideas. I have even seen my students using their recess time to create a mini-performance! What we know is that as they are thinking about the word and its meaning, talking to others about science vocabulary and working toward a performance they are internalizing the word and the meaning of the word along with placing the information into their long term memory.

Contained within the unit are a few examples to get you started. I would love to hear what you have created or what works well with your students. If you create or find a “mini performance” with your students that helps foster learning for our fifth grade students (see appendix 1) please email me with your ideas clearly written. I will add them to my list and respond by return email with mine, yours (giving credit where credit

is due) and other teachers who have contributed to this on-going endeavor. Please email all suggestions to cindy.woolery@cms.k12.nc.us.

Notes:

(1) R. E Yager. "The Importance of Terminology in Teaching K-12 Science," *Journal of Research in Science Teaching* (1983): 577.

(2) P. M Cunningham and R. L. Allington, *Classrooms That Work: They Can all Read and Write. 4th ed.* (Boston: Allyn and Bacon, 2007)

(3) R.Dorph, D. Goldstein, S. Lee, , K. Lepori, S.Schneider, and S. Venkatesan. "The Status of Science Education in the Bay Area: Research Study E-report," *Lawrence Hall of Science, University of California, Berkely, California* (2007): 9

(4.) J. Wilcox. "Chicago Teachers Learn to Build Academic Vocabulary" *ASCD Education Update* (2006): 1-2.

(5.) Bonnie B. Armbruster, "Put Reading First : the Research Building Blocks for Teaching Children to Read : Kindergarten Through Grade 3" (*Jessup, MD: National Institute For Literacy, National Institute Of Child Health And Human Development, U.S. Dept. Of Education, 2001*).

(6.) Myra Barrs, and Valerie Cork. *The Reader in the Writer.* (San Francisco: Centre For Language In Primary Education, 2002), 57.

(7.) Meish Goldish, *101 Science Poems & Songs for Young Learners - Grades 1-3.* (New York: Scholastic, 1996)
http://www.k12.hi.us/~shasincl/poems_prop_cycle_weather.html#Links (accessed Oct 1, 2009).

(8) Evie Boss, "The Predator Eats the Prey." Songs for Teaching.
<http://songsforteaching.homestead.com>.

Bibliography

Allington, Patricia M Cunningham Richard L. *Classrooms That Work: They Can All Read and Write (4th Edition) 4th edition.* Boston: Pearson, Allen & Bacon, 2007.

Armbruster, Bonnie B.. *Put reading first : the research building blocks for teaching children to read : kindergarten through grade 3 (SuDoc Y 3.L 71:2 R 22).*
Jessup, MD: National Institute For Literacy, National Institute Of Child Health And Human Development, U.S. Dept. Of Education, 2001.

Barrs, Myra, and Valerie Cork. *The Reader in the Writer.* San Francisco: Centre For

Language In Primary Education, 2002.

Boss, Evie . "The Predator Eats the Prey." Songs for Teaching.

<http://songsforteaching.homestead.com> (accessed October 7, 2009).

Bromley, Karen D'Angelo. *Stretching Students' Vocabulary (Teaching Strategies.)*. New York, NY: Scholastic, 2002.

Cleary, Brian P.. *Mrs. Riley Bought Five Itchy Aardvarks and Other Painless Tricks for Memorizing Science Facts (Adventures in Memory)*. Brookfield, CT: Millbrook Press, 2008.

Dorph, R., D. Goldstein, S. Lee, K. Lepori, S. Schneider, and S. Venkatesan. "The status of science education in the bay area: Research study e-report.." *Lawrence Hall of Science, University of California, Berkely, California* (2007): 1-10.

Gardner, Howard. "Multiple Intelligences as a Catalyst." *National Council of Teachers of English* no volume, no. December (1995): 16-18.

Goldish, Meish. *101 Science Poems & Songs for Young Learners - Grades 1-3..* New York: Scholastic, 1996.

Koppleman, Vivian, and Marilyn Werna. "Middle School Students Increase Their Vocabulary Knowledge Using Learning Style Perferences." *Research in Middle Level Education Online* no volumne # (2002): 1-11.

R. E., Yager . "The Importance of Terminology in teaching K-12 Science." *Journal of Research in Science Teaching* 20, no. 6 (1983): 577-88.

Schiller, Pam, and Thomas Moore. *Where is Thumbkin?.* Mt. Rainier: Gryphon House, 1993.

Schiller, Pam. *Bugs, Bugs, Bugs: 20 Songs and Over 250 Activities for Young Children (Pam Schiller Book/CD Series)*. Beltsville, Maryland: Gryphon House, 2006.

Department of Public Instruction, NC. " Science ." North Carolina Public Schools.
<http://www.dpi.state.nc.us/curriculum/science> (accessed May 11, 2009).

Wilcox, J.. "Chicago Teachers learn to build academic vocabulary." *ASCD Education Update* 48, no. 6 (2001): 1-2.

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SCIENCE TOPICS & VOCABULARY

	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
K	<p style="text-align: center;">WEATHER</p> <p>snow, snowy rain, rainy sun, sunny wind, windy shadow, shade, heat clouds seasons (winter, spring, summer, fall) clothes (What do you wear in different seasons?)</p>	<p style="text-align: center;">SIMILARITIES & DIFFERENCES OF ANIMALS</p> <p>habitat: Where an animal lives is called its habitat. walk, crawl, creep, fly insect, reptile, mammal, fish, birds, amphibians skin, claws, eyes, legs eggs, hatch, nest air, water, shelter, food skin, fur, scales, shell, feathers camouflage grow, change (babies)</p>	<p style="text-align: center;">PROPERTIES OF OBJECTS</p> <p>paper, cloth (bend, fold, tear, cut) soil, dirt, earth rocks, pebbles, sand solid, liquid sink, float wood, metal</p> <p>properties of an object— (how it looks, feels, smells, tastes, or sounds)</p>	<p style="text-align: center;">TOOLS & MEASUREMENT</p> <p>volume (of water) measure (nonstd. units—such as “unifix cubes”) length living, nonliving (plant observations) shadow (measure) length, weight, capacity—how much it holds—, temperature How far? (distance)</p> <p>tools: scissors, pencils, crayons, paper clips, hammers</p> <p>book connection: The King’s Bed (non-std. msrmt.)</p>
1ST	<p style="text-align: center;">NEEDS OF LIVING ORGANISMS</p> <p>living things, nonliving things grow, change hatch tadpole, frog (dog, duck, frog) lungs, gills</p> <p>needs of plants: air, water, light, space needs of animals: air, water, food, shelter, space plants—oxygen (Plants use air, water & light to make their own food. They give off oxygen. People & animals use this oxygen to breathe.) plants: roots, leaves, stem, seeds, fruits, flower, trunk, seedling warmth & water wide variety of living things on Earth—classify birds, fish, amphibians, reptiles, fish, insects</p> <p>Leaves make food for a plant. Roots take in water for plants & hold them in place. Living things grow & change. They need air, food, water and space to live.</p>	<p style="text-align: center;">SOLIDS & LIQUIDS</p> <p>matter: Matter is made up of small parts too tiny to see. properties, mass ruler, balance scale mixtures (2+ things put together; can separate later... cereal & milk, oil & water) solutions (2+ things put together; cannot separate later... chocolate milk, cake batter) measuring cup sink, float</p> <p>properties of an object (how it looks, feels, smells, tastes, or sounds)</p>	<p style="text-align: center;">SOLID EARTH MATERIALS</p> <p>rocks minerals natural resources soil oxygen soil—bricks—clay color hardness shape size</p>	<p style="text-align: center;">BALANCE, WEIGHT, & MOTION</p> <p>push, pull, force, position</p> <p>magnet’s poles--A magnet will attract (pull) or repel (push) certain objects.</p> <p>balance scale</p>
2ND	<p style="text-align: center;">WEATHER TOOLS (changes in weather)</p> <p>erosion wind vane, anemometer, thermometer, rain gauge evaporate, water vapor, condense, water cycle, precipitation</p>	<p style="text-align: center;">ANIMALS’ LIFE CYCLES</p> <p>how animals grow & change tadpole, frog, caterpillar eggs life cycle: birth, developing into an adult, reproducing, aging & death) insects need: food, air, space extinct, endangered butterfly: larva, pupa mealworms, ladybugs, crickets, guppies, frogs</p>	<p style="text-align: center;">3 STATES OF MATTER (changes in properties)</p> <p>solid, liquid, gas volume matter mass property temperature heat energy</p>	<p style="text-align: center;">SOUND</p> <p>sound vibrate pitch (high/low, loud/soft)</p> <p>sound waves ear eardrum ear lobe ear canal</p> <p>Introduce: <i>hammer, anvil, stirrup, cochlea</i></p>

<p>3RD</p>	<p>SKELETAL & MUSCULAR</p> <p>joints (immovable, movable) joints, 3 kinds: gliding, ball-and-socket, hinge & pivot</p> <p>bone, joint, skeleton, marrow, ligament, sprain, fracture, cartilage muscles (move bones & other body parts) skeletal muscles, tendon, cardiac muscles, smooth muscle, involuntary muscle, voluntary muscles, contract, heart, blood vessels, blood, lungs, organs, biceps, triceps, cells</p> <p>bone functions: support, protection, locomotion</p>	<p>SOIL</p> <p>soil, bedrock, subsoil, topsoil properties: color, texture, capacity to hold water basic components: sand, clay, humus composting, heat, decay</p> <p>water cycle, evaporate, condense, groundwater, conserve precipitation transpiration</p> <p>landform, mountain, sand dune, beach, valley, plain, river Earth's surface</p> <p>weathering --breaking down of earth materials erosion—moving earth materials</p> <p>glacier</p> <p>heavy rain/gentle rain, hurricane, tornado, flood, earthquake, volcano</p>	<p>EARTH, MOON, SUN, & STARS (LIGHT)</p> <p>opaque, reflect, refract (Light is reflected &/or absorbed.) sphere, rotate, axis, revolve, orbit—(day/night, seasons, path changes) shadow solar system, planet, star, telescope, lens sun, moon phase (moon), satellite</p>	<p>PLANTS (plant growth & adaptation)</p> <p>living/nonliving organism, reproduction, environment, cell, respond nutrients, light, water, environment</p> <p>stages in plant life cycle: growth, survival, reproduction</p> <p>seeds: light, water, nutrients, pollination germinate pollinate (Bees pollinate flowers.) mineral, root, stem, leaf, flower, energy, oxygen</p> <p>plant life cycle, embryo, heredity, flowering plant, conifer</p> <p>light/shade</p>
<p>4TH</p>	<p>ROCKS & MINERALS</p> <p>minerals igneous rock sedimentary rock metamorphic rock rock cycle</p>	<p>ANIMAL ADAPTATIONS (behavior & physical)</p> <p>fossil, embryo, extinct</p> <p>ecosystem, community, population, habitat, producer, consumer, decomposer, food chain, food web</p> <p>drought, overpopulation</p> <p>invertebrates (animals without backbones) vertebrates (animals with backbones)</p> <p>cold-blooded, warm-blooded amphibian, reptile, mammal</p> <p>camouflage, adaptation, mimicry</p>	<p>FOOD & NUTRITION (how food provides energy & materials for growth & repair of the body)</p> <p>calories nutrients</p> <p>protein water fats & oils carbohydrates—starches & sugars</p> <p>digestive system</p>	<p>ELECTRICITY & MAGNETISM</p> <p>static electricity, discharge, conductor, insulator</p> <p>circuit, current, electricity, series circuit, parallel circuit, fuse, circuit breaker</p> <p>pole, magnetic field, electromagnet, electric motor, generator</p> <p>magnets, iron, push, pull</p> <p>conductors/nonconductors</p> <p>lightning</p>
<p>5TH</p>	<p>WEATHER & CLIMATE</p> <p>atmosphere, air pressure, weather, barometer, water vapor, humidity, evaporation, temperature, condensation, precipitation, run-off</p> <p>stratus cloud, cumulus cloud, cirrus cloud, fog, precipitation</p> <p>wind</p> <p>thunderstorm, tornado, hurricane, storm surge</p> <p>climate</p> <p>mountains sea breezes water bodies (ocean, river, lake, stream, creek, pond)</p>	<p>ECOSYSTEMS (interdependence of plants & animals)</p> <p>population, community, ecology, ecosystem, biotic (living) & abiotic non-living) factors, habitat, niche</p> <p>food chain, food web, herbivore, carnivore, predator, prey, scavenger, decomposers</p> <p>threatened, endangered species, extinct</p> <p>types of soil: sand, topsoil, humus</p> <p>biome, grasslands, tundra, desert, taiga, deciduous forest, tropical rain forest</p> <p>human impact on ecosystems</p>	<p>FORCE & MOTION (in technological designs)</p> <p>force, inertia, friction, speed, velocity, acceleration</p> <p>balanced/unbalanced forces, action, reaction, simple machine, levers—(fulcrum, resistance arm & effort arm)</p> <p>simple machine, wheel & axle, lever, pulley, incline plane (screw), wedge</p> <p>gravity, weight</p> <p>acceleration</p>	<p>LANDFORMS</p> <p>fault, geologist, magma, lava, weathering, erosion, deposition</p> <p>Earth's crust</p> <p>runoff, watersheds, sediment, meanders, flood plains, deltas</p> <p>weathering --breaking down of earth materials water & ice, wind, gravity</p> <p>erosion—moving earth materials (& its importance in forming canyons, valleys, meanders, tributaries)</p> <p>deposition of eroded materials--deltas, flood plains</p> <p>mountains, hills, lakes, rivers, streams, islands, peninsulas</p>

