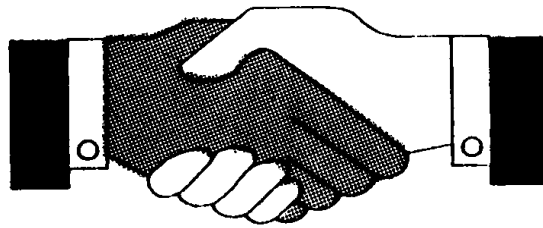


PARTNERS IN SCIENCE TRAINING MANUAL

For Technical Professionals Working in the
Ravenswood City School District



COMPILED BY:

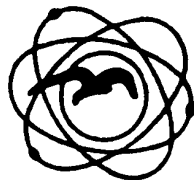
Joyce R. Blueford, Math/Science Nucleus

Lisa Asato, Hewlett Packard Corporation

James J. Gonzales, Math/Science Nucleus

Paulette Johnson, Ravenswood City School District

A Publication of The Math/Science Nucleus



PARTNERS IN SCIENCE

RAVENSWOOD CITY SCHOOL DISTRICT

TRAINING MANUAL

**Guide for professional volunteers using the
Integrating, Science, Math and Technology Curriculum
as a district wide science program**

**Math/Science Nucleus
4009 Pestana Place
Fremont, CA 94538**

(510) 490-6284



TABLE OF CONTENTS

Introduction	2
Philosophy/Approach	3
Content Summary	4
Roles and Expectations	8
Coordination	9
The Student Lab Manual	11
Classroom Management	12
Relating to Students	13
Limited English Proficient (LEP) Students	14
Skills and Curriculum by Grade Level	16
<i>Kindergarten</i>	17
<i>First</i>	18
<i>Second</i>	19
<i>Third</i>	20
<i>Fourth</i>	21
<i>Fifth</i>	22
<i>Sixth</i>	23

PARTNERS IN SCIENCE
TRAINING MANUAL FOR
RAVENSWOOD CITY SCHOOL DISTRICT



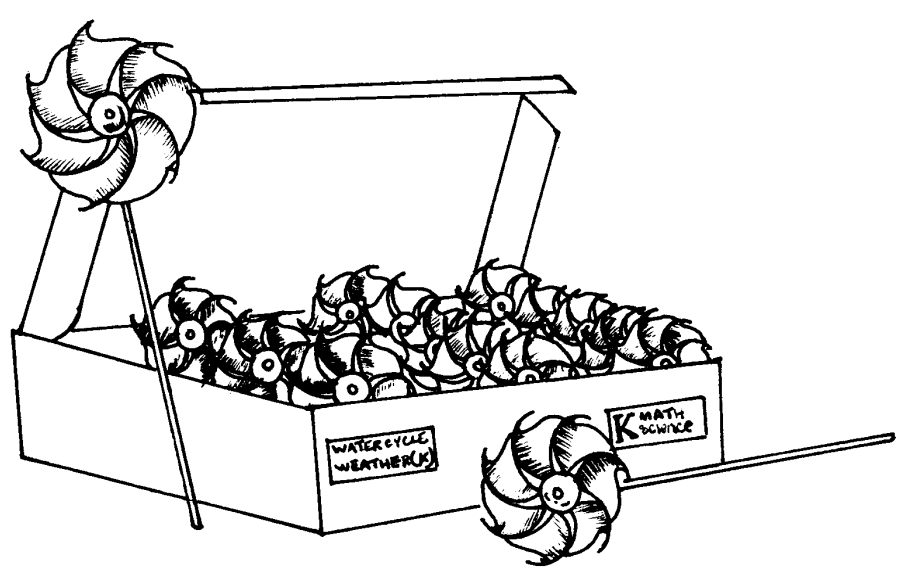
Using the Integrating Science, Math, and Technology (I. Science MaTe) Program
as a guide for teaching elementary students science.

INTRODUCTION

You are embarking on what may be one of the most memorable adventures of your life. Working with children is rewarding because it's a chance for you to make a difference and help them feel good about themselves. In exchange for your time, energy and commitment, the children will shower you with affection and appreciation.

The information and suggestions provided in this manual are offered to maximize your chances for success. They are based on the experiences of previous volunteers and what they have found to work for them. The term "scientist" refers to all volunteers helping with science education in the classroom.

If there are any problems or questions that your teacher cannot answer, please contact James Gonzales at the Math/Science Nucleus (510) 490-6284 or fax a message to (510) 490-7093. You can also speak to either the school site coordinator or your company coordinator for common questions and concerns.



Teachers will have available the appropriate material for each lab. Check with teacher prior to lab to make sure they can retrieve the material.

PHILOSOPHY/APPROACH

The primary objective of the Integrating Science, Math and Technology (I. Science MaTe) curriculum is to give elementary students a basic foundation of science. The program is designed so that scientific concepts are built upon by repeating them in more complexity each year. You should have a copy of the scope and sequence which outlines 34 weeks of instruction based on the Integrating Science, Math, and Technology curriculum. If you do not have one, please contact the Math/Science Nucleus to obtain a copy.

Children learn key scientific concepts by repetition. We do not expect students to memorize the content, but to experience scientific phenomena through hands-on materials. Do not feel discouraged or frustrated if the younger children do not absorb or even understand it all. The goal in the early grades (K-2) is to expose the children to the concepts so that when they are revisited in subsequent years, they will be familiar.

If this is the first year your students are being exposed to the curriculum, you and your teacher may feel you are spending all your time getting them "caught up." Just because you are working with second graders does not mean you must teach the second grade units. If the material seems too advanced for your students, talk to your teacher about using the first grade or Kindergarten units and labs.

The curriculum is intended as a structured guide. You and your teacher should adapt the lab activities and lectures as you see fit. Feel free to suggest any ideas or enhancements to your teacher, or let him or her know if you would feel comfortable leading a discussion on a particular topic.

You may hear the word "thematic instruction" used by teachers and educators. Teachers have been using thematic instruction for a long time, but has fairly recently been identified as such. Most simply put, thematic instruction is a way of organizing curriculum and classroom activities so that concepts are not taught in isolation, but are reinforced throughout many subjects.

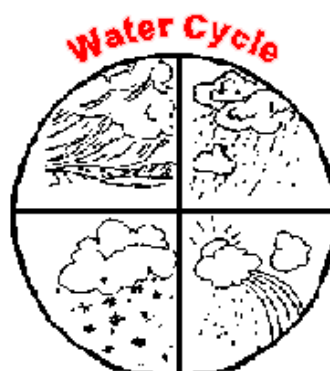
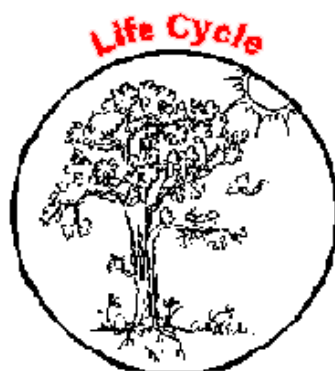
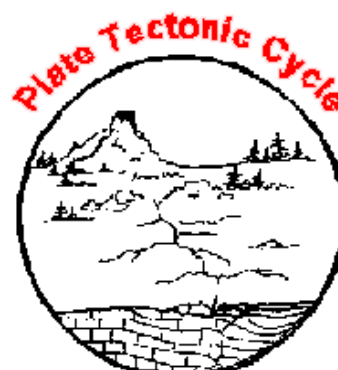
Some classes or schools may have a year-long theme. The theme is often displayed on a theme board in the class. If the theme were something like "Keepers of the Earth," the teacher would incorporate environmental concepts throughout as many subjects as possible. The teacher may have the children read a book for English/Literature about kids who recycle. If they are studying the water cycle, the teacher may discuss pollution of the ocean.

Talk to your teacher about his/her year-long theme so that you may ask questions during discussions that reinforce material that is being covered in other subjects.



CONTENT SUMMARY

INTEGRATING SCIENCE, MATH, AND TECHNOLOGY



Teachers need to understand that science is interrelated. Many elementary school teachers may only have had only one science course during their entire college career. Try to help your teacher understand that science is a wonderful series of questions that sometimes have no answers. It is an exciting subject to teach because it can make children speculate about their world. Unfortunately, teachers feel uncomfortable if they cannot answer a question. Teach them it is "ok" not to know everything and that a search for knowledge is as rewarding as knowing the answer.

The I. Science MaTe Curriculum tries to structure the learning of children throughout their elementary experience in a district. The goal is to expose children to the major disciplines of science before a child leaves elementary school. Children prefer science more than any other subject if it is taught in a hands-on approach that makes them understand phenomena that they observe. This program tries to make children discover,



describe, compare, and interpret.

Developing a program that allows teachers and children to appreciate science is not an easy task. The I. Science MaTe program took over 5 years to generate its major themes and to weave them into a structured curriculum. It took another 3 years to pilot the material in enough schools around the country before the Math/Science Nucleus was sure that this program would help districts develop a science program that would fill the needs of their students throughout their elementary school careers.

The following is a quick look at the different content areas that you will be experiencing with your teacher and students. A complete explanation can be found in the cited books which are available from your teacher or from the Math/Science Nucleus. The order of the list implies the order in which they are taught.

APPLIED SCIENCE - OUR TECHNOLOGICAL WORLD by J.R. Blueford.

Hands-on activities illustrate how math and science are related. Applied Science includes all sciences "rolled" into some product or principle that we use everyday.



Science and Math - Introduces that math is a fundamental part of science. Activities aimed at getting students to see that science is fun.

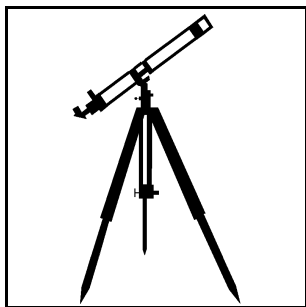
Physics - Allows students to experience different phenomena like electricity, magnetism, and gravity. Students begin to describe what is happening around them.

Technology - Students examine everyday items and think about how they operate. The examples used in these units illustrate principles that students experienced during the physics units.

Built Environment - Students investigate how the technology they worked with in previous labs affects the society in which we live.

UNIVERSE CYCLE - THE SEARCH FOR OUR BEGINNING by J.R. Blueford.

Hands-on activities teach students about facts and fantasies of the Universe. We take a closer look at the Earth and its role within our solar system.



Universe - Students can look at the night sky and realize that everything "out there" is called the **Universe**. The universe is not understood, but is fascinating to think about.

Solar System - Students learn that the solar system is a subset of the Universe and is part of our Earthly history. They compare and contrast the planets and learn that we don't know everything about our planets.

Earth - Allows students to picture the Earth as a rotating and revolving sphere in space. Students will realize that the Earth has unique features.

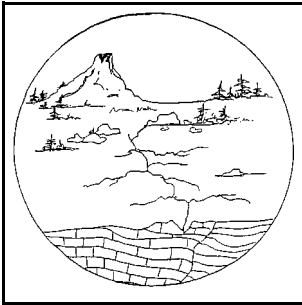
Geography - Although this is not science, it provides a template that is used to record data from different fields of science. Learning to locate oneself is a skill needed not only in science



but for general living.

PLATE TECTONIC CYCLE - EARTH'S MOVING FORCE by J.R. Blueford.

Hands-on activities teach students how scientists investigate the Earth with information gained from earthquakes and volcanoes and how to challenge and think about present theories. Learning how to cope with disaster caused by plate tectonics is also emphasized.



Volcanoes - The Earth is moving and volcanoes provide structural evidence for that movement. Students learn about the different types of volcanoes and the significance of where volcanoes occur.

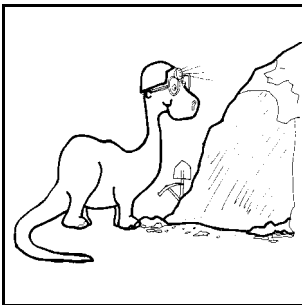
Earthquakes - The moving Earth also creates earthquakes. An earthquake occurs when the Earth needs to release energy.

Plate Tectonics - The data collected from volcanoes and earthquakes allows scientists to understand that our Earth is moving in a very directed motion.

Hazards - Students need to be aware that all around the world there are risks involved with earthquakes and volcanoes.

ROCK CYCLE - UNDERSTANDING THE EARTH'S CRUST by J.R. Blueford.

Within the Rock Cycle chemistry comes alive as students learn about the periodic table and how elements combine to form minerals. Throughout this cycle emphasis is placed on how rocks are created. The remains of past life or fossils preserved in sedimentary rocks are used to show how the "present is the key to the past" and why evolution is important in timing events on Earth.



Chemistry - Students learn to appreciate the periodic table of elements. They learn about the different characteristics of elements.

Minerals - Minerals are an expression of elements and compounds that students can touch and hold. They learn that minerals have characteristics that can be used to identify them.

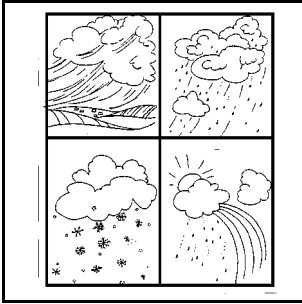
Rocks - Students learn that rocks provide clues to the Earth's history. Students also learn to distinguish where rocks were formed.

Past Life - Fossils are a child's delight. They allow children to use their imaginations to understand the lives of organisms that preceded humans.



WATER CYCLE - THE EARTH'S GIFT by J.R. Blueford, A. Montez, and J. Marshall.

Students discover the properties of water that make it the perfect liquid to sustain life. Students learn about the molecular structure of water and the uniqueness of water, including surface tension, capillary action, density, and other physical properties. Students learn about how the oceans, atmosphere, and water are interrelated.



Water - Children learn that water is a unique chemical. They experience the unique characteristics that allow water to provide life on this planet.

Oceans - Students will see that the Earth is a water planet, but most of the water is salty. They will uncover the bottom topography as well as how the ocean moves.

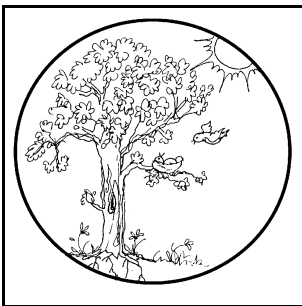
Atmosphere - The envelope of air that surrounds the earth becomes an exciting area that allows humans to move around freely. Students learn the composition of the atmosphere and how the air moves around the Earth.

Weather - Students will begin to recognize the different elements of weather and how the oceans and atmosphere provide the "fuel" for all weather phenomena.

LIFE CYCLE - DIVERSITY IN A BALANCE by J.R. Blueford, J. Gonzales, A. Montez, J.

Marshall, and D. Davidson.

Students learn about themselves and their environment. They study tissues, organs and body functions, diseases, and genetics. Hands-on activities include looking at various organisms by determining the different groups of vertebrates and invertebrates. Students learn about plant parts, photosynthesis, the carbon cycle, and why plants are important. The food chain and how it is involved in the natural environment gives students a perspective on how all organisms are interrelated on this planet.



Organisms - The living planet has many residents. Students learn to systematically observe and compare the different kingdoms.

Human Biology - Students learn that their bodies function as working machines. They compare and contrast the parts of their bodies.

Plants - Students take a closer look at the kingdom that uses energy from the sun to create nutrients. Plants are used to illustrate the different modes of reproduction.

Natural Environment - Students learn to look at the world as a place where different organisms react with each other. Students will discover how even inanimate substances help make the Earth a place to live.



ROLES AND EXPECTATIONS

The key to the success of your experience hinges on the relationship between you and your teacher. Though it will not happen overnight, we hope that you and your teacher will develop a positive and supportive relationship and that each of you will be open to new ideas and suggestions. If, for any reason, an unresolvable problem develops between you and your teacher, contact James Gonzales at the Math/Science Nucleus, (510) 490-6284 or fax (510) 490-7093.

The teacher will:

- share teacher manuals with the scientist
- retain complete control of the classroom at all times
- initiate contact with the scientist and establish a regular time and day for their visits
- at the initial meeting with the scientist, share teaching/classroom control techniques
- obtain advance approval from the principal or science mentor for purchasing supplemental materials
- lead pre- and post- discussions
- co-lead labs with scientists
- inform scientist when a lab is canceled or postponed due to illness, holidays, etc.
- ensure all materials required for labs are in the classroom before the scientist arrives
- call the scientist/engineer at least two days prior to the lab to plan the lab

The scientist will:

- co-lead labs with teacher
- give advance warning when s/he cannot attend a scheduled class or meeting
- be available for phone consultation

The principal will:

- facilitate communication between other teachers/scientists by holding regular meetings to share problems/best practices
- resolve any problems related to the "Partners in Science" program that arise on his/her site and will directly contact James Gonzales if assistance is required
- appoint a science mentor if a science resource teacher does not exist

Science mentor/science resource teacher will:

- ensure that kits and supplemental materials are readily available to all teachers
- resolve problems related to kit or material availability



COORDINATION

Arrange teaching schedule by using the grid on the next page. It is important to plan the science program to avoid any miscommunication. Teachers and scientists should determine how they best complement the teaching of science. Ideally, the teacher should do the **PRE LAB** before doing the **DURING LAB**. The students need the PRE LAB to make the DURING LAB meaningful. To reinforce what was learned in the DURING LAB, teachers need to follow the POST LAB.

Teachers can also use this grid to give their principals their lesson plan schedule for science.



DATE	THEME		CYCLE
	SCIENCE AND MATH	3 WEEKS	APPLIED SCIENCE
	PHYSICS	2 WEEKS	
	TECHNOLOGY	2 WEEKS	
	BUILT ENVIRONMENT	1 WEEK	
	UNIVERSE	1 WEEK	UNIVERSE CYCLE
	SOLAR SYSTEM	1 WEEK	
	EARTH	1 WEEK	
	GEOGRAPHY	1 WEEK	
	VOLCANOES	1 WEEK	PLATE TECTONIC CYCLE
	EARTHQUAKES	1 WEEK	
	PLATE TECTONICS	1 WEEK	
	HAZARDS	1 WEEK	
	CHEMISTRY	1 WEEK	ROCK CYCLE
	MINERALS	2 WEEKS	
	ROCKS	2 WEEKS	
	PAST LIFE	1 WEEK	
	WATER	1 WEEK	WATER CYCLE
	OCEANS	1 WEEK	
	ATMOSPHERE	1 WEEK	
	WEATHER	1 WEEK	
	ORGANISMS	2 WEEKS	LIFE CYCLE
	HUMAN BIOLOGY	2 WEEKS	
	PLANTS	2 WEEKS	
	NATURAL ENVIRONMENT	2 WEEKS	



THE STUDENT LAB MANUAL

Students in Grades 2-6 will receive three lab manuals provided by the district. Your teacher should provide you with a copy of the manuals. If you do not receive a copy please contact the Math/Science Nucleus. The manuals will contain the appropriate lab sheets by grade for the Applied Science/Universe Cycle, Plate Tectonic/Rock Cycle and Water/Life Cycle. The manuals will help guide the students through their weekly hands-on activities and will reinforce what they are learning. The entries made by the students will strengthen penmanship, writing, and art skills. Many of the questions are open-ended to encourage critical thinking and creativity.

Limited worksheets are available for Kindergarten and First graders.



CLASSROOM MANAGEMENT

Though it may be challenging at times for groups of children to share materials, the experience encourages cooperation and cooperative learning among the children. Children who habitually refuse to cooperate or break materials should be removed from the classroom.

Talk to your teacher about his/her techniques for classroom management and how they reward and discipline. One teacher may put his fingers to his lips in a "Shhhh!" fashion and raise a hand and have the rest of the children follow suit to regain control of the classroom after a noisy lab activity.

Below are some techniques that serve as a starting point for a discussion with your teacher about teaching techniques/philosophies:

- Smile and feel comfortable telling amusing anecdotes
- Use student volunteers to help
- Require that students raise their hands to participate
- Call on many different members of the class
- Give specific directions when distributing materials
- Use prearranged signals to get students' attention during activities
- Stop and wait for students to let you continue speaking if they get noisy
- Praise attentive or helpful behavior
- Wait to give handouts/materials until it is time to read or use them because they can be distracting to the students



RELATING TO STUDENTS

Share yourself. Do share both personal and professional aspects of your life with the kids. Help the kids understand what you do at work, what's interesting or unique about your job, and how you got involved in your career. Show how your work affects their lives and how it will make their lives better or different. How does your work relate to what they are learning in science?

Stimulate thinking by asking open-ended questions. Ask questions that ask students to make a prediction, give an explanation, state an opinion or draw a conclusion. Give students time to think before anyone gives an answer.

Use language the students will understand. Be conscious of vocabulary. Try to use simple words and define words students may not know. For example, don't say, "I design ICs." Rather ask students if they know what chips or Integrated Circuits are, how they are made and what they do.

Ask for an evaluation of your efforts. Ask the students what they liked or didn't like about your visit. After class, ask the teacher to critique your presentation and help improve your in-class skills.



LIMITED ENGLISH PROFICIENT (LEP) STUDENTS

Scientists may be unfamiliar with the vast array of education theories on teaching English to students. Although a school district may adhere to one ideology, the classroom teacher may not agree with or use that particular methodology.

You may want to consult with your teacher to determine the approach you will be taking. The following 7 points outline the different teaching strategies you may encounter.

1. TRANSITIONAL BILINGUAL EDUCATION

Students receive native language instruction in the early stages of the program and gradually English is introduced. Ultimately, the purpose is to help LEP students make the transition quickly (hence the name "transitional") to all-English classrooms.

2. LATE-EXIT BILINGUAL PROGRAMS

Students receive native language subject-matter instruction, native language literacy development, and instruction in the English language so that LEP students' acquisition of subject-matter is not delayed while they are learning English.

3. ENGLISH-AS-A-SECOND LANGUAGE (ESL)

ESL classes are usually focused on the teaching of communicative competence in English. Communicative competence includes, and often integrates, the four language skills (listening, speaking, reading, and writing.) ESL is also known as "English Language Development" (ELD).

4. SHELTERED INSTRUCTION

Teachers of sheltered subject-matter instruction utilize teaching methodologies that include active learning opportunities; use of manipulatives; structured introductory activities to prepare the students for the lesson; and the use of concrete objects, visual images, real-life examples, and manipulatives. The concepts of the lessons should not be watered down, nor should the teacher use simplistic language in the teaching of the lesson.

5. CANADIAN-STYLE IMMERSION

Students are placed in classrooms where the only language of instruction is the second language where none of the students speak the target (second) language.



6. BILINGUAL IMMERSION PROGRAMS

Also known as "two-way bilingual programs," the purpose of this approach is to teach English to language minority students and to teach a second language to English-speaking students.

7. SUBMERSION

Also known as the "sink or swim" approach to English-language acquisition, children are placed in the English-only classes with no special assistance to help them acquire English-language skills. This form of instruction is illegal in the United States.

TIPS FOR WORKING WITH LEP STUDENTS

Simplify your speech.

- Slower speech rate
- clear enunciation
- simple vocabulary
- short sentences
- limited use of idioms/slang

Check frequently for understanding

- confirmation checks
- comprehension checks
- have them repeat

Use contextual clues.

- gestures
- facial expressions
- act out meaning
- props
- visual
- manipulatives



SKILLS BY GRADE LEVEL

This section is intended to help you understand the general skill level of your students from kindergarten to sixth grade and to help you incorporate other themes into science discussions. Your teacher, who is most familiar with current themes, is best equipped to share the specific themes with you.

With regard to science, all cycles (Applied Sciences, Universe Cycle, Plate Tectonic Cycle, Rock Cycle, Water Cycle and Life Cycle) are covered in every grade and in increasing complexity. All students (K-6) are also encouraged to complete a science fair project.

While the district curriculum also covers Performing Arts and P.E. only the core subjects will be summarized below by grade level.



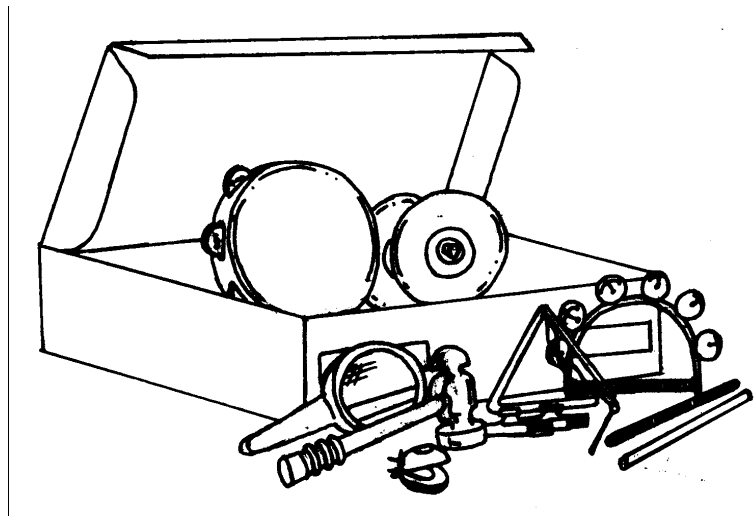
KINDERGARTEN

English/Language Arts: listening, speaking, word analysis, vocabulary, comprehension, writing, language mechanics and handwriting

Mathematics: operations with numbers, measurement, geometry, patterns and functions, statistics and probability, logic and algebra

History/Social Science: help students learn to be learners, workers and cooperative classmates, how these skills applied in the past and are currently applied in daily life, emphasis on family

Health: Activities to promote healthy, physical, emotional and personality growth such as nutrition, exercise, personal health, disease prevention and control, safety and community health



Students learn about the sounds of earthquakes as they think about what to do during an earthquake. This is a Kindergarten lab in Plate Tectonics - Hazards.



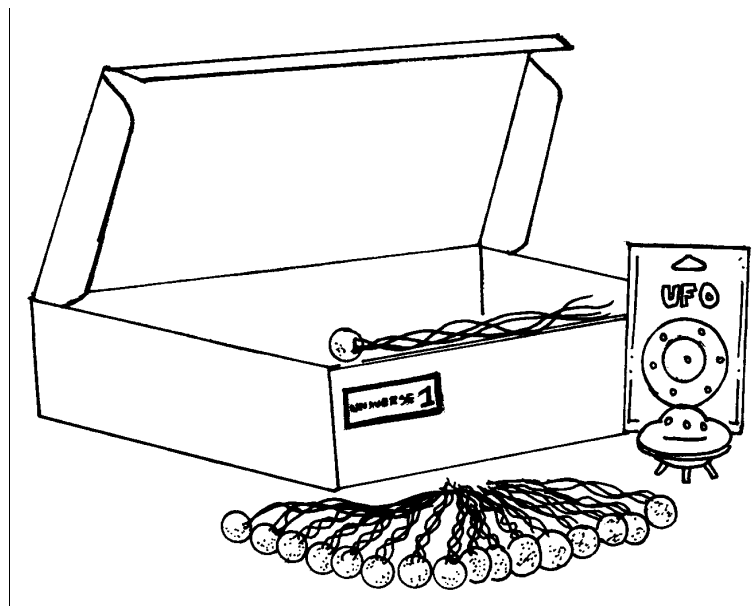
FIRST

English/Language Arts: Grammar, spelling, library/reading skills, concepts introduced in Kindergarten are developed in greater complexity

Mathematics: Students count by ones, twos, fives and tens to one hundred, read and write numbers, match correspondences, name and use ordinals, order, group objects by number, and identify different kinds of sets, use written and symbolic terms to express numbers, compare, add, subtract, interpret word problems and develop mathematical statements to represent situations, continued development of measurement, geometry, patterns and functions, statistics and probability, logic and algebra

History/Social Science: Focus on assisting students to learn more about the world they live in and their responsibilities to others, geography, economics and cultural diversity

Health: Activities to promote healthy, physical, emotional and personality growth such as nutrition, exercise, personal health, disease prevention and control, safety and community health



Students experience reflected light from "heavenly bodies." They compare reflected light with light created by a star.



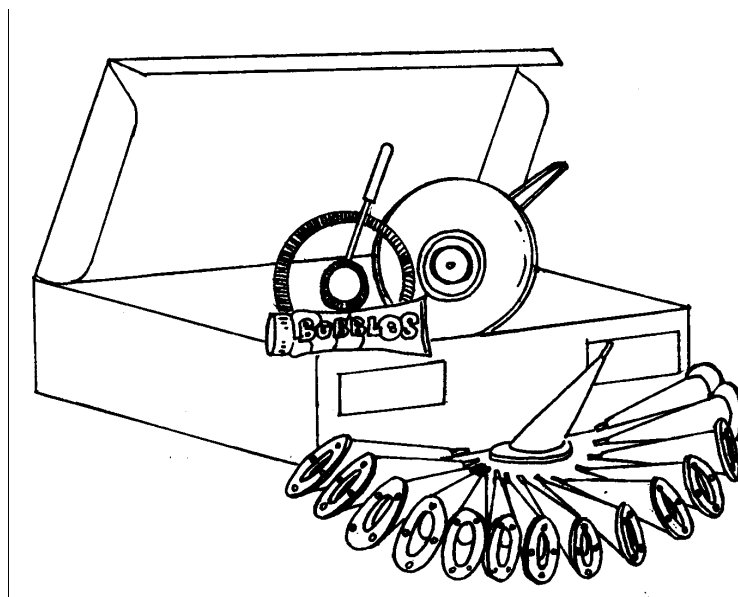
SECOND

English/Language Arts: Build upon concepts previously taught, develop skills through written, verbal and dramatization of things learned

Mathematics: Place value, descriptions of quantities and relationships, regrouping, reading fractions and application of numerical concepts, different units of measurement, estimation, telling time, using calendars and thermometers, continued development of measurement, geometry, patterns and functions, statistics and probability, logic and algebra

History/Social Science: people who make a difference and who meet our needs, such as parents, grandparents and ancestors, people from other cultures and how they lived and live

Health: Activities to promote healthy, physical, emotional and personality growth such as nutrition, exercise, personal health, disease prevention and control, safety and community health



Second graders experience making bubbles using bubble trumpets. They also learn that not all liquids make bubbles.

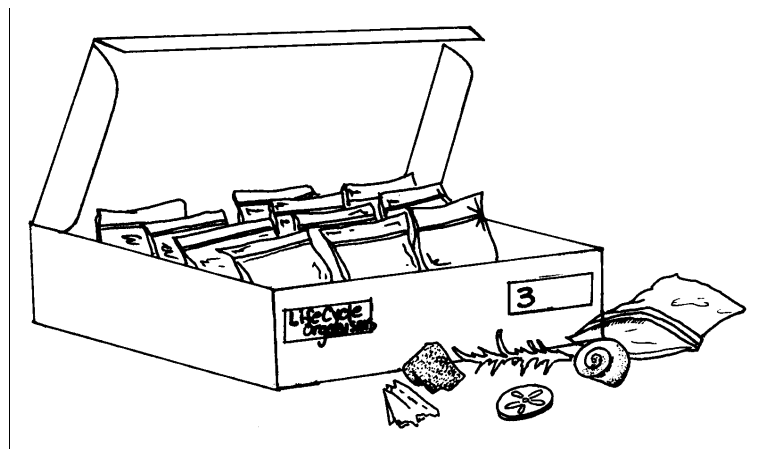
THIRD

English/Language Arts: composition skills, parts of speech, cursive writing

Mathematics: how to count, read write and order numbers up to 10,000; compare numbers; decimals to the tenths and hundredths using manipulatives; work continues with fractions, addition, subtraction and previously introduced concepts

History/Social Science: Continuity and change through local history and traditions including biographies, folktales and legends

Health: Activities to promote healthy, physical, emotional and personality growth such as nutrition, exercise, personal health, disease prevention and control, safety and community health



Third graders compare and contrast different types of marine organisms.

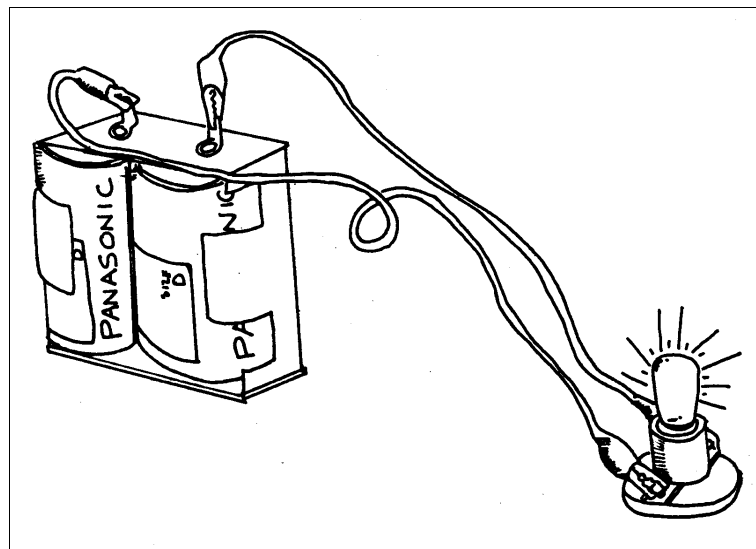
FOURTH

English/Language Arts: different points of view, making and listening to oral reports, syllabication, compare and contrast, prefixes and suffixes, composition (journals, essays, reports and creative), fact vs. fiction, elements of fiction (setting, characters and plot), writing for a specific audience

Mathematics: Read, write, order and compare whole numbers, decimals and fractions; add, subtract and multiply fractions; estimate and round off; compute and understand multiplication and division of three digits by two digits; multiple step word problems; conversion of units of measure; polygons to determine regularity and equality

History: California: geography, pre-Colombian people, colonial history, missions, ranches, Mexican war for independence, Gold rush, statehood and westward movement, modern California

Health: Growth and development, body systems, nutrition, physical fitness, drug use and abuse safety and first aid, health careers



Students will use the Electricity Demonstration Kit to create electric circuits. Fourth graders will learn the meaning of electricity and how it is connected to magnetism.



FIFTH

English/Language Arts: taking notes, making presentations, writing reports, grammar and punctuation, elements of composition (topic sentences, metaphor, simile, personification, hyperbole), using reference books

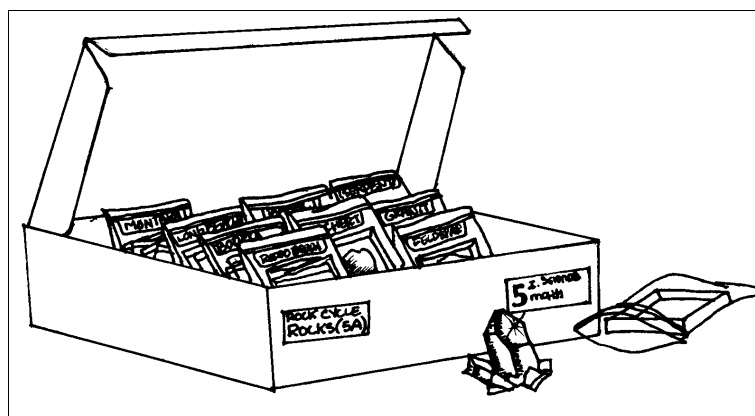
Mathematics: read, write, order to a million, write expanded notation, add and subtract up to six digits, round decimals and rename fractions, reducing fractions, multiplying and dividing three digit numbers, identifying prime factors, complex word problems.

Geometry: understand and use tools to measure diameter, radius and angles, and identify parallel and perpendicular lines, polygons and special angles, identification of lines of symmetry, tilting of plane and relationship between points, lines, rays and segments

Probability/statistics/logic: identifying the probability of events using mean, average, mode and range, interpret and analyze data/graphs. Students learn to organize and solve simple logic problems using role play and modeling, make valid inferences

Algebra: finding replacement for variables that make simple number sentences true; represent arithmetic relationship using algebraic expressions; demonstrate the principal of substitution with formulas, express simple word problems/sentences as algebraic expressions

History: U.S. history and geography from pre-Columbus through westward expansion, including settling of colonies and war for independence; focus on American peoples from past to present



Fifth grade students try and find the "Mother Rock" of different sands in California by comparing rocks.



SIXTH

English/Language Arts: continue to build on listening, speaking, comprehension, library/reference, oral/silent reading, composition and reporting, grammar, mechanics and spelling skills. Students read, study and produce all forms of writing

Mathematics: continue to build on prior concepts, fractions, percents as related to fractions and decimals, least common denominators, parallel, perpendicular and intersecting lines and planes, relationships between congruent and similar figures. In algebra: numerical relationships between numbers through variables, identifying true, false and three types of open sentences, ability to represent mathematical patterns using variables

History: world history and geography of ancient civilizations from early humankind to Rome. Cultures and areas include Africa, ancient Hebrews, Greeks and Romans and Central America and Mexico

Health: Same as fourth



Students by the sixth grade will have learned how to use a microscope as a tool in scientific experiments.

