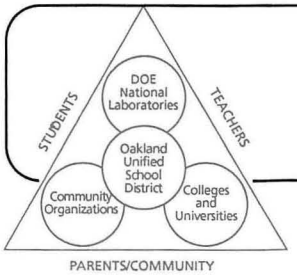


BASTEC Connection

Bay Area Science & Technology Education Collaboration

A publication for science, mathematics, & technology teachers in the OUSD

About BASTEC

What is BASTEC?

The Bay Area Science and Technology Education Collaboration (BASTEC) is a group of Oakland teachers and administrators, U. S. Department of Energy national laboratory representatives, and representatives from various research and educational institutions.

What's it all about?

Many of you are probably wondering exactly what BASTEC is all about and where you might fit in the BASTEC picture. BASTEC is currently working on several projects in the OUSD. It is helping with the March 19, 1991, Science and Mathematics Conference for teachers, and an April 11, 1991, Student Science and Mathematics Day. It is the sole funder of the BASTEC grants program, this newsletter, and several summer staff development activities. In addition, we are working on establishing a BASTEC resource center. BASTEC members also sponsor various other OUSD activities, and Oakland teachers will be able to participate in many BASTEC programs.

Where did it come from?

The original idea came from the Math/Science Action Conference held at Lawrence Hall of Science in October, 1989. Secretary of Energy, Admiral James Watkins, and Nobel Laureate, Dr. Glenn T. Seaborg, were co-chairmen of the conference which dealt with ways in which federal agencies and corporations could work together to help mathematics and science education. The Oakland School District was of particular interest because of its large minority population and proximity to four DOE national laboratories.

Where does it go from here?

BASTEC will continue working with the OUSD toward accomplishing its goals.

U.S. Department of Energy National Laboratory representatives and OUSD Superintendent Pete Mesa sign the BASTEC Memorandum of Understanding on November 13, 1990.

BASTEC Mission

The mission of BASTEC is to enable teachers to improve the teaching and learning of mathematics, science, and technology for all K-12 students with special emphasis on underrepresented populations – females, minorities and the disabled. This will be accomplished through a collaboration of the Oakland Unified School District with educational and research institutions, community organizations, national laboratories, and businesses.

BASTEC Goals

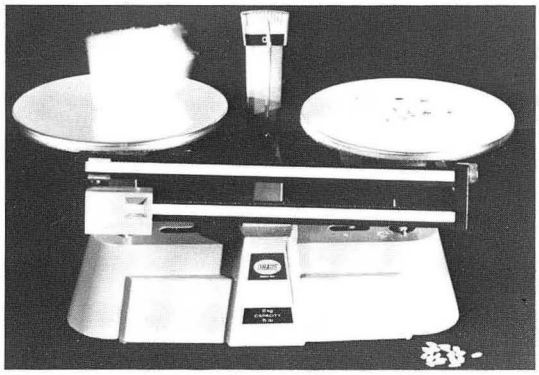
- Institutionalize a structure for an ongoing planning process for district-wide science, mathematics, and technology education involving collaboration with educational and research institutions, community organizations, national laboratories, and businesses.
- Create an environment which supports teachers in developing approaches to science, mathematics, and technology instruction and which involves them and their students in the exploration, synthesis, and application of basic science concepts.
- Identify, disseminate, and institutionalize effective programs for the teaching and learning of science, mathematics, and technology.
- Strengthen teachers' knowledge of science, mathematics, and technology and their ability to transmit that knowledge effectively, thus increasing scientific literacy.
- Assist OUSD in developing and implementing a comprehensive and articulated science, mathematics, and technology curriculum, K-12, that is aligned with the state frameworks and underlying concepts and principles in science, mathematics, and technology.
- Increase the number of students from OUSD, especially from underrepresented populations, who will (1) complete a K-12 education, (2) advance to the highest levels of science, mathematics, technology education, (3) enter careers in mathematics, science, and technology, and (4) complete teaching programs in these fields.
- Involve families and community organizations in the teaching, learning, and support of science, mathematics, and technology programs in OUSD.
- Establish, nurture, and institutionalize partnerships in science, mathematics, and technology among OUSD, educational and research institutions, community organizations, national laboratories, and businesses.
- Integrate mathematics, science, and technology in all subject areas of the curriculum at every grade level. Students should read, write, and talk about scientific, mathematical, and technological issues.

DISCLAIMER

Science Update

Lawrence Livermore National Laboratory

Silica Aerogels: Super-lightweight materials



A sample of silica aerogel weighs less than 13 sunflower seeds, or about 25 thousandths of an ounce.

A wispy, bluish-and-white material called silica aerogel isn't lighter than air, but then no solid substance around weighs less than this ghostlike material, either. For example, a huge hunk of silica aerogel the size of a small refrigerator would tip the scales at a mere one pound.

Key research to advance silica aerogels, as well as the development of a number of other new and innovative materials, is being performed by scientists at Lawrence Livermore National Laboratory (LLNL). Among all of these materials, however, it is silica aerogels that are currently in the most shining spotlight.

Since LLNL scientists announced in mid-January that they had created the airiest aerogels ever produced, their advance has received international attention in the news media. It has also generated more than 400 inquiries from all kinds of businesses, including sign companies, insulation firms and toy manufacturers, interested in possible commercial applications.

In addition, the four-man team of LLNL scientists that developed the newest aerogels has reaped two awards for its work, one from *R & D Magazine*, the other from *Popular Science*.

This past summer, the Laboratory's aerogel scientists assisted about 70 Bay Area teachers who participated in the LLNL Science Education Center's Summer Technology Institute for writing science lessons. They wrote one lesson on silica aerogels, which are composed of long pearl-like strands of oxygen and silicon atoms, are about 99.9 percent air and weigh only two-and-a-half times more than air per equal amounts.

Silica aerogels were invented in the 1930's by Stanford University researcher Steven Kistler. However, for decades they remained mainly a laboratory curiosity, before eventually finding applications in detectors used in atom smashers. For the past eight years, researchers at Lawrence Berkeley Laboratory have been developing aerogels for transparent insulation for windows and skylights, as well as for solar collector covers.

In recent years, there has been a resurgence of interest in the superlightweight materials, with the LLNL scientists starting their own projects for possible LLNL applications in 1985.

Two years ago, NASA learned of the Laboratory's work and inquired about whether a newer generation of the material might be utilized as a part of an experiment to capture micrometeoroids in space.

Sandia National Laboratories, Livermore

Sandia Destroys Hazardous Wastes in Simulated Testing

In its commitment to research for the nation's benefit, Sandia National Laboratories attacks problems of widespread significance. The recognition of the increase of hazardous wastes prompted engineers and scientists from Sandia to collaborate with Model Development Corporation of Natick, Massachusetts, in a series of experiments on the ability of supercritical water oxidation (SCWO) to destroy certain wastes.

While previous research has demonstrated the efficiency of SCWO for destroying a variety of organic compounds, the present demonstration focused on simulated waste consisting of non-metallic inorganic components. No technology is commercially available to treat mixed wastes such as those from the electronics industry.

Three broad classes of aqueous-based, simulated wastes were successfully processed in a laboratory-scale, SCWO flow reactor: (1) inorganic streams containing mixed hazardous and radioactive waste surrogates (rare earth substituted for radionuclides) with a small amount of organic complexing agents, (2) organic streams containing halogenated hydrocarbons, and (3) organic streams containing nonhalogenated hydrocarbons.

Corrosion is expected to be a significant problem for mixed waste streams. Wires of Inconel 625, Hastalloy C-276, and titanium in the preheater, reactor, and cooldown exchanger indicated selective dissolution for others.

Additional research is planned to evaluate the scalability, reliability, and economics of SCWO reactor components and systems, particularly for mixed wastes. Future research must also explore a parameter space (temperature, pressure, pII, residence time, etc.) focused on selecting conditions and materials for specific process streams.

Lawrence Berkeley Laboratory

New Study Detects Toxicity in San Francisco Bay

Scientists at Lawrence Berkeley Laboratory (LBL) have recently completed a complex analysis of toxicity in the San Francisco Bay. The year-long project includes the first comprehensive study of the biological effects of effluent (outflow of waste) discharged into the bay's marshes. Only about five percent of the bay's original marshes remain, and almost all are affected by effluent from the 43 municipal wastewater plants and the 19 large industries that discharge into the bay.

Toxic effects were discovered in four of the five marshes studied. The most toxic conditions observed — widespread death of fish and decreased reproduction of other test species — were at the Hayward Shoreline marsh.

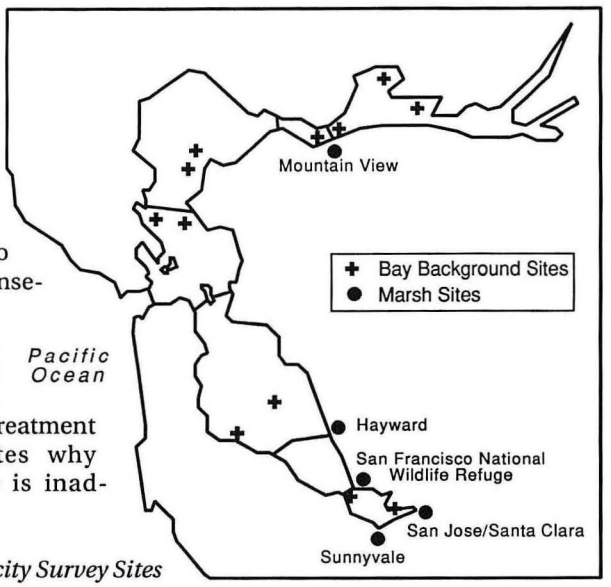
LBL Applied Science Division scientists Susan Anderson and John Harte, who is also a University of California at Berkeley professor, led the San Francisco Bay Project research team, which included Research Associates Erika Hoffman and David Steward.

Minnows exposed to marsh water often died. Depending on which site within the marsh was sampled, death rates ranged up to 100 percent. Water fleas had 100 percent mortality in water from one Hayward marsh site. Sea urchin fertility decreased at rates ranging from 18 to 98 percent.

LBL researchers caution that their marsh studies were limited to assaying conditions during a short period of time. Additionally, they note that contaminants often settle and concentrate in muddy sediments, and their assays did not evaluate the toxicity of sediments.

LBL's San Francisco Bay Project represents a new approach to ecological risk assessment.

"I maintain that it is preferable to first ascertain whether there is a risk to aquatic life, and then to figure out what is causing toxicity," Anderson says. "The alternative, which is the standard way of doing business, is to perform chemical tests to determine concentrations of toxicants, and then to debate the biological consequences of these levels. The toxicity observed in the Hayward marsh, which receives effluent from a plant that complies with treatment standards, demonstrates why chemical testing alone is inadequate."



San Francisco Bay Toxicity Survey Sites

Stanford Linear Accelerator Center

1990 Nobel Prize in Physics: The Discovery of Quarks at SLAC

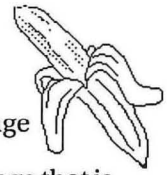
The recent award of the Nobel Prize in physics to Professor Richard Taylor of Stanford Linear Accelerator Center and Professors Henry Kendall and Jerome Friedman of MIT recognizes the pioneering series of experiments that were done at SLAC in the late 60's and early 70's. The program at SLAC continues to pursue the same general goals as these earliest SLAC experiments; in fact, some of the equipment from these experiments is still in use today and still providing new information.

The aim of the research at SLAC, which is a special purpose laboratory devoted to high energy physics, is to understand the fundamental structure of matter. We all know about molecules and atoms and the fact that each isotope of each element can be described by the number of neutrons and protons in the nucleus. However, the work of Friedman, Kendall and Taylor and their collaborators made it clear that there is a yet finer scale of structure within the protons and neutrons themselves. In a sense, their experiment was a repeat of the classic experiment by which Rutherford, in 1911, recognized the existence of the atomic nucleus. Rutherford's collaborators, Geiger and Marsden, observed that when alpha-particles (helium nuclei coming from a radioactive source) were allowed to hit a thin foil, many would go right through but, a small fraction would collide with something dense enough to cause them to bounce back in the direction from which they had arrived. This indicated small dense regions within the foil — the atomic nuclei.

Friedman, Kendall and Taylor saw something similar when looking at high energy electrons colliding with protons (i.e., with the nuclei of hydrogen atoms) and later also with neutrons in deuterium and heavier atoms. The pattern of scattered electrons could only be understood if the electrons were bouncing off a few tiny dense objects inside the proton or neutron. These objects are now called quarks. Not just protons and neutrons, but also about 150 other particles that have been observed in high energy experiments, are now understood in terms of their quark constituents, just as we understand the many elements in terms of their neutron and proton and electron constituents. The experiment that won the 1990 Nobel Prize in Physics for Friedman, Kendall and Taylor was a key step towards this quark picture of matter.

"Hands-on" Activity

The Big Banana Peel



I. Topic Area
Estimating, measuring and generalizing.

II. Introductory Statement
In this investigation the students will determine what percentages of a banana is edible. By sampling several bananas, the students will develop a formula relating the edible part to the total mass of the banana.

III. Math Skills
A. Finding mass
B. Using ratios
C. Finding percentages
D. Graphing
E. Writing a formula
F. Averaging

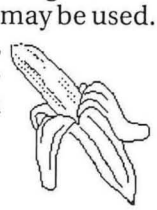
IV. Science Processes
A. Measuring
B. Recording data
C. Interpreting data
D. Generalizing

V. Materials (Per class)
a supply of bananas
scales with masses
activity sheets

VI. Key Question
"What part of a banana is edible?"

VII. Background Information
A. This may be the students' first experience in writing a formula. If so, the development of a formula needs to be discussed. In this case, the edible part of a banana (E in the formula) is to be expressed as a fraction or percentage of the total mass of the banana (T in the formula). Thus, if one-half of the banana is edible, the formula would be E=1/2T. Most bananas will come very close to fitting the formula E=.65T or E=2/3T.

B. If desired, the average or the median percentage may be used. If either term is used, introduce the students to the term being employed.



VIII. Management suggestions
A. Before students begin, have them predict and record the edible percentage of a banana.
B. Students may work in groups of five with each member of each group having one banana and actually carrying out all of the activities. The members in a group would then pool their information.
C. Estimated time: one or two 45 minute periods.

IX. What the Students Will Do
A. Predict the percentage of a banana that is edible.
B. Measure the mass of the unpeeled and peeled banana and record the results.
C. Find the ratio of the edible part to the total mass.
D. Find the percentage that is edible.
E. Graph the percentage that is edible.
F. Graph the results of other members of the group.
G. Write the formula for the edible portion.

X. Extension
This may lead to finding edible portions of other foods such as fruits, steaks, etc. The cost per kilogram or gram of the edible portion could be computed.

The activity for this issue was suplied by the
AIMS Education Foundation
P.O. Box 7766
Fresno, CA 93747

Ask the Scientist

How serious is global warming? What time frame should we worry about?

Teachers at John Swett Elementary were asked to submit questions for this issue.

There is a diversity of opinion on how serious global warming is, but a majority of scientists think that it is going to be extremely important. The science involved in global warming is very complex and that is why there are great uncertainties.

It is known for certain that CO_2 and other greenhouse gases raise the temperature of the earth. What is not known is how big a feedback occurs as a result of oceans, clouds and ice melting. Most scientific evidence is that positive increases further the temperature increase that would occur naturally.

Unless we change very significantly in our energy efficiency and the types of energy sources we use, the problem is likely to become very serious in 50 to 100 years and become increasingly serious thereafter. In that time frame, we will move to temperature regimes that we have not experienced on earth in millions of years. It's not only a concern for higher temperature; rainfall, droughts and other fluctuations in weather and variations in sea levels will affect coastal regions throughout the world. More serious consequences would result in 100 to 150 years.

However, one need not be so gloomy because it is possible to increase energy efficiency and change our sources of fuel significantly and thus delay or stop global warming.

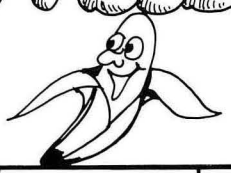
Answer courtesy of Mark Levine, Lawrence Berkeley Laboratory staff scientist.

NAME _____

THE BIG BANANA PEEL!

USE 5 BANANAS TO FIND THE ANSWER

What Part of a Banana is EDIBLE?

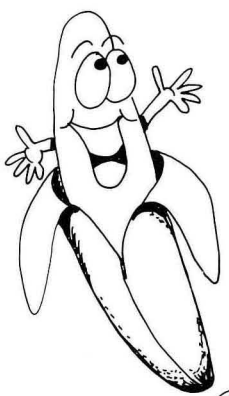


FIRST.... Complete the Table.

	TOTAL MASS IN GRAMS	MASS OF PEELING (g)	MASS OF EDIBLE PART (g)	RATIO OF $\frac{\text{EDIBLE (g)}}{\text{TOTAL (g)}}$	PERCENT OF BANANA THAT IS EDIBLE
BANANA A					
BANANA B					
BANANA C					
BANANA D					
BANANA E					
SUM					
AVERAGE					

NEXT.... CONSTRUCT A BAR GRAPH SHOWING THE PER CENT OF EACH BANANA THAT IS EDIBLE.

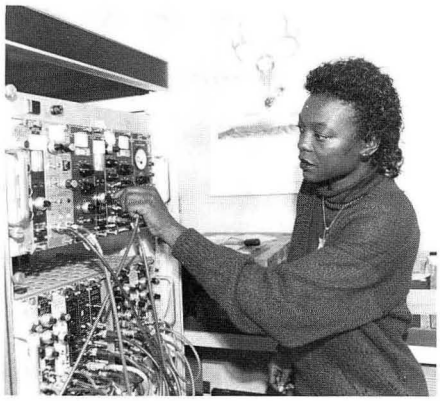
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
BANANA A											
BANANA B											
BANANA C											
BANANA D											
BANANA E											
AVERAGE											



FINALLY... WRITE A FORMULA TO SHOW THE AMOUNT OF THE EDIBLE PORTION. LET E STAND FOR EDIBLE AND T FOR THE TOTAL: E = T

Teachers Talk

About Teacher Programs



Beth Napier

McClymonds High
Physical Science

Program: TRAC
Teacher Research Associates Program

Program Description:

TRAC is a U.S. Department of Energy sponsored program in which middle and high school teachers work for eight weeks at a national laboratory. While serving as members of research teams, program participants update their scientific knowledge and learn to use the latest scientific instrumentation. Beth Napier worked at Lawrence Berkeley Laboratory in the Nuclear Science Division where she assisted in research involving the 88" Cyclotron. TRAC participants also hear internationally renowned scientists discuss current research, as well as national education and science policy developments.

Participant Comments:

"It was exciting to work with research scientists and to see the 88" Cyclotron, which is so important in the history of science. I have a sense of personal pride knowing that work that I did will be involved in the next mission to Mars. I also found it exciting to see my mentor scientist listed in Who's Who. I am looking forward to using what I learned in my classroom and exposing the students to something new."

Mary Prophet

John Swett Elementary
Grades 3-4

Program:
Integrated Curriculum Institute for Oakland Teachers, K-6
Math Consortium

Program Description:

This six week program met four days a week at King Estates Junior High. In the morning, lectures were presented by instructors from Holy Names College, covering various concepts in mathematics and science. During the afternoon, participants, working in groups of four, learned ways to bring those concepts to students at their particular grade levels. This involved "hands-on" experiences with such materials as: Project AIMS, Project WILD, and Project Learning Tree.

Participant Comments:

"Outstanding! This program really turned around my math teaching. I really appreciated extending my own knowledge of math concepts through the morning lectures as well as getting ways to implement those concepts. Working in cooperative learning style groups helped to point out the benefits and problems entailed in these types of learning situations in the classroom. I regularly refer back to the two binders of materials from the sessions, and am sure I will continue to do so. I recommend it highly to anyone."

Next Issue:

Summer Program Information

How, when and where to apply for summer teacher programs.

Erma Wilson

Cox Elementary
1st Grade

Program: Project HOPES
Summer Technology Institute

Program Description:

A four-week program in which teachers learn to develop lesson plans for "hands-on" activities. A different topic is presented each week, such as: The Ecosystem, The Blood, Magnetism. Each week, on Monday, a laboratory scientist presents a lecture on the topic and distributes hand-outs. On Tuesday, each group (assigned by grade level) develops a lesson plan around the lecture topic and appropriate for their grade level. On Wednesday, the participants try out their lesson plan on a different grade-level group, who then critique it. On Thursday, the groups present their lesson to a summer school classroom. Later, participants are sent a book that includes all of the lesson plans done by all of the groups.

Participant Comments:

"A great experience. Really makes you want to carry over what you have learned to your classroom – to bring 'real-world' experiences into the school. There was a lot of sharing among teachers, lots of 'hands-on', lots of freedom to explore your own ideas. The Lab personnel were very supportive in getting the materials you needed to present your lessons. They even provided a continental breakfast and lunch!"

Gloria Jones

Cox Elementary School
5th Grade
OUSD Elementary School
Teacher of the Year 1990-91

Program: BAMP

Bay Area Math Project

Program Description:

BAMP runs for four weeks in the summer and is held at St. Mary's High School in Berkeley. It is sponsored by the Lawrence Hall of Science and involves 35 teachers from elementary through high school with an emphasis on "hands-on" mathematics education. Morning lectures are given by prominent speakers in the field of math education. The teachers then meet in groups (elementary, middle & high school) and discuss ways to include math in their curriculum.

Participant Comments:

"It was a wonderful experience. I met a lot of teachers from other schools and we have kept in contact. I have used a lot of the methods and materials in my classroom to make learning math more fun and a bit easier."

Adrienne Allen

King Estates
Math - Grades 7-8

Project: STRETCH

Student and Teachers Raising Expectations to Challenging Horizons

Project Description:

Project STRETCH is a middle grades effort which includes a six-week summer school institute at Frick Junior High. It is sponsored by the OUSD and The Edna McConnell Clark Foundation. During the summer, students from different schools within the city who did not pass the proficiency exam in math, were tutored by other students. (Note: Approximately 80% of the students did pass the proficiency exam after participating in the project.)

Participant Comments:

"Very helpful in that the peer tutors really responded to each other. At first, the 8th graders helping 9th graders seemed awkward, but that quickly changed. Eventually, they all wanted to help each other and became more interested in the subject matter as a result."

It's your turn to talk! Please help us make this newsletter responsive to your needs!

Fill out the form below & Return to: Eileen Engel
1 Cyclotron Road
MS 90/1070
Berkeley, CA 94720

Susan Cristancho

Claremont Middle School
General Science - 7th Grade

Program: Science Enrichment Collaborative

Interface Institute

Program Description:

These professional development seminars, sponsored by the Interface Institute and funded by The Edna McConnell Clark Foundation, meet one Saturday a month at Roosevelt Junior High. Teachers brainstorm ideas for writing curriculum units based on the new Science Framework. Speakers are invited in from the community, industry, environmental agencies and school administration.

Instructor Comments:

"It is an opportunity for Oakland Junior High School teachers to share ideas and goals to improve science education in the schools. We work on creating innovative, 'hands-on' curriculum units that will be appealing and make learning fun, particularly for those students with a low level of motivation to learn science."

Types of activities you'd like to see: (Or send us your favorite 'hands-on' science activity):

Science questions you'd like answered in "Ask the Scientist":

Types of research you'd most like to learn more about:

Publication Information

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Department of Energy
Laboratories are equal opportunity
employers.

Reminders:

Mini Conference - March 19 - Oakland Tech

Workshops, sessions and exhibits concerning science and mathematics.

Colloquium - March 14 - Lawrence Hall of Science

Dr. Mina Bissell - Cell Differentiation and Cancer

Call Eileen Engel at 486-5719 for details.

BASTEC Participants

Oakland Unified School District

Department Of Energy National Laboratories

- Lawrence Berkeley Laboratory
- Lawrence Livermore National Laboratory
- Sandia National Laboratories, Livermore
- Stanford Linear Accelerator Center

Lawrence Hall of Science

Colleges and Universities

- CSU Hayward
- Holy Names College
- Laney College
- Mills College
- Samuel Merritt College
- UC Berkeley/MESA

Other Organizations

- Alameda County Soviet Exchange Studies
- Chabot Science Center
- Interface Institute
- National Organization of Black Chemists and Chemical Engineers
- East Bay Computer Using Educators
- African Scientific Institute
- USDA Forest Service
- East Bay Consortium
- American Association of University Women
- Edna McConnell Clark Foundation - STRETCH

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