SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION

Urgent Notice:
The 1998 ISTA Convention has been changed!
New Place: Rosemont Convention Center
New Dates: October 16-17, 1998

WINTER 1997

SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 23, Number 4, 1997

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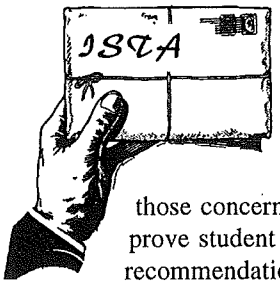
ISTA NEWS



WINTER PRESIDENT'S LETTER

As I write this (in early December), ISBE staff are developing a proposal to present to the Illinois State Board of Education later this month. The proposal will describe actions that those concerned about Illinois education should take to improve student achievement in mathematics and science. The recommendations will be based on Illinois results from the Third International Mathematics and Science Study (TIMSS). TIMSS data have generated concern that Illinois and US students are not achieving as they should. An Illinois task force, of which I was a member, analyzed the test results of Illinois 13-year-olds, which showed Illinois students lagging their international counterparts. The task force reported their findings to the State Board in September. If all goes as expected, the State Board eventually will approve funding to carry out recommendations included in that report. Very likely a lot of money will be targeted for professional development for Illinois teachers.

This example is still another case of well-intentioned reformers deciding what teachers should do to become better at their craft. In the months ahead, Illinois professional developers (and I am one) likely will create study materials, workshops, courses, and teacher networks designed to enhance mathematics and science teaching. Teachers will be offered incentives to participate. A lot of money and time will be invested in project activities. Project evaluators will assess the activities and report their findings. Some, many, or perhaps all participants will change the ways that they teach mathematics and science. Even if this project ultimately increases student achievement, it will be an example of the wrong way to structure professional development.

The mistake that those of us engaged in professional development make is that we assume we know what teachers need. We often do not know. The mistake that teachers make is that they do not articulate their needs to, and demand services from, professional development providers. This circumstance permits others to set the change agenda. What we need instead is a way for teachers to identify areas for professional growth and a structure that encourages teachers to request assistance from professional development providers.

At the ISTA Leadership Conference in Peoria, I saw a remarkable set of tools that teachers can use to identify their needs. Arizona teachers in the Mesa Systemic Initiative created self-assessment rubrics on ten teacher skills known to increase student achievement in mathematics and science. Using the rubrics, teachers assess their skills in assessment, classroom management, collaboration, cooperative learning, higher order thinking, and five other skills. After teachers complete the self-assessments, school teams compile the results, and professional developers use the data to provide appropriate teacher enhancement opportunities.

I believe that professional development is an area in which teachers should take charge of their profession. I believe that Illinois teachers should use the Mesa rubrics or similar tools to assess their skills and identify areas for personal growth. Further, I believe that Illinois teachers should articulate these needs to resource providers who can provide teachers with professional growth opportunities. Clearly, this structure requires responsible actions from teachers, resource providers, and professional developers. As your president, I am committed to helping you and other science teachers gain access to the professional development that you need. I am also committed to developing structures that respect the significance of teachers. Please contact me if you would like more information about the self-assessment rubrics.

Douglas Dirks
President, ISTA

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LETTER FROM THE EDITOR
WINTER 1997

This year's ISTA convention is over, and the dust is still settling. I believe this was certainly one of our better conventions, both with regard to the preconference on staff development and to the regular conference on Friday and Saturday. If you missed either, you missed quite a lot. Kudos to everyone involved with the planning and delivery of this year's convention! (At the risk of omitting someone, I'll not mention names here, but they can be found on the preconference and convention programs.) Your efforts are to be commended.

While at various sessions of the conference, I came across two items worth noting and repeating to ISTA members. The first comes from a book I saw which discussed science teaching. Following are some notable points made by the author. The text mentioned that, "No subject arouses more genuine enthusiasm for school work than science, or affords better means of training children to think profitably and to express their thoughts well." The text went on to state that science should be taught daily, and that avoiding cramming too much into a single lesson is important. The successful science teacher should also take care in the preparation of lessons, testing them ahead of time before student use. Whenever possible, students should be involved in the doing of science rather than simply observing, since observing alone is not the equivalent to the doing. Students should come into the closest contact possible with the phenomena being studied. A science lesson (or experiment or activity) may need to be performed more than once. Further, reading about science should not be mistaken for doing science, and -- although important -- reading should not be considered a substitute for science in the school day. All this sounds pretty familiar, right? The issues addressed in the text certainly are timely and have been repeated in various venues, including the National Science Education Standards and AAAS Benchmarks. You may be thinking that this is "old news." In fact, you're right. The text to which I am referring was written by Dr. G. P. Phenix in No. XVI of the "Guides for Science Teaching" (D.C. Heath & Company, Boston) -- in 1894.

The second item was part of the preconference presentation by Dr. Norm Lederman of Oregon State University. Among other things, Dr. Lederman addressed the national trend and issues surrounding calls for the "reforming of education." One of his illustrations, although humorous, deserves some thought. The piece is entitled, "A Horse Story."

"Common advice from knowledgeable horse trainers includes the adage, 'If the horse you're riding dies, get off.' Seems simple enough, yet in the education business we don't always follow that advice. Instead, we choose from an array of other alternatives which include: (1) Buying a stronger whip, (2) Trying a new bit or bridle, (3) Switching riders, (4) Moving the horse to a new location, (5) Riding the horse for longer periods of time, (6) Saying things like 'this is the way we've always ridden the horse,' (7) Appointing a committee to study the horse, (8) Arranging to visit other sites where they ride dead horses more efficiently, (9) Increasing the standards for riding dead horses, (10) Creating a test for measuring our riding ability, (11) Comparing how we're riding now with how we did ten or twenty years ago, (12) Complaining about the state of horses these days, (13) Coming up with new styles of riding, (14) Blaming the horse's parents (the problem is often in the breeding), and (15) Tightening the cinch."

Is the science education "horse" dead or just lethargic? How can we improve our "riding skills," and those of our students, in the best possible manner? How important is it to us to take heed of the "old news" from 1894 and apply it today? Surely, simply testing more, moving to "new and improved" types of schools largely developed from political whims rather than educational wisdom, continuing to study the same old way of doing things rather than forging ahead and seeking more effective methodologies and strategies, blaming others without taking some responsibility ourselves, etc., etc., are not the paths we should be going down.

All in all, where do we want "reform" in science education to go? And down what paths do we want it to get there? Who do we want making the critical decisions in the reform process? Our ISTA president, Doug Dirks, had the answer to each question -- and we are it. WE are the ones who should be determining where science education goes and how it gets to where its going. WE should take charge and demand, not request, to have a major voice in decision making at not only the local level, but definitely at the state level -- and for some of us at the national level as well. For too long, we as science education professionals have allowed non-educators and politicians to determine what we are to do and how to do it. If we are indeed professionals, we must step forward, step up, and take control. As an organization ISTA, can serve us well by helping us find out, stand up, and work to control our own destinies in science education. The same can be said for NSTA. The tools and the help are available for the work ahead of us if we choose to use them.

When you find out about non-educators or politicians starting on their same old grind about education in general and science education in particular, stand up to them and correct them. Tell them, from the grass roots, what we want, what we need, and what we expect. Each voice is important in this process. The more voices we have, the stronger the chorus -- and the more likely the current "decision makers" will begin to listen. Thus far, our voices have been whispers. Let's raise our voices, individually and collectively, and begin doing it now. We cannot rely on someone else to do it for us. The responsibility must be ours.

Kevin Finson
Editor, SPECTRUM

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NSTA LEGISLATIVE UPDATE CONGRATULATIONS!!

As predicted the education appropriations bill was passed--in the House on Friday (352-65) and in the Senate on Saturday (91-4). The vote preserves the Eisenhower Professional Development program along with many other Department of Education activities as the targeted programs they were designed to be.

The Eisenhower program in FY 1998 will receive $335 million, up from $310 million last year. (The first $250 million is earmarked for science and math teachers.)

Title I was funded at $8 billion (up from $7.8 billion last year); Educational Technology at $584 million (up from $305 million); IDEA at $4.8 billion (up from $4 billion); Charter Schools at $80 million (up from $51 million); and Goals 2000 at $465 million (down from $476 million). Voluntary national tests in reading and math (for now at least) were not funded.

So... CONGRATULATIONS!! to EVERYONE who spoke out to their senators and representatives by letter, phone, FAX, and e-mail. YOU were definitely heard!

And CONGRATULATIONS to everyone who forwarded these updates to others, so that they, in turn, could speak out and be heard. Without the outcry from teachers across the country against the block grant proposal and for professional development and other targeted programs, the outcome might have been different. We salute you! Thank you VERY MUCH for all your efforts!

To join the free NSTA Legislative Update list, send an e-mail to ann.wild@nsta.org. Please give your NAME, STATE, E-MAIL ADDRESS, and HOME ZIP CODE. The NSTA update is sent every few weeks when Congress is in session. We hope you will forward these updates to others via listservs and individual e-mail.

"AN ISTA REQUEST"

One of the items under review by the ISTA Board is the membership year cycle. Under current ISTA policy the membership year begins September 1, and ends August 30, each year. While the percentage of ISTA members who renew their memberships by the deadline date of August 30, is high, there remains a significant number of members who allow their active status to lapse by not renewing by the deadline date.

Inactive members risk missing issues of the "Spectrum" with its timely information about such topics as the State Science Standards, TIMSS, revised teacher licensure and certification standards, different curricular and assessment approaches, and interesting science activities to name just a few.

If you have not renewed your membership for the 1997 - 1998 school year, please take a few minutes to fill out the membership form on the back of this issue and enclose a check made out to ISTA. By renewing your membership now, you will help ISTA save money used to send individual membership reminders in January and you will not miss the next issue of the "Spectrum".

The Illinois Science Teachers Association is only as strong as its membership. ISTA remains dedicated to the improvement of science education at all levels and values your contributions to the profession.

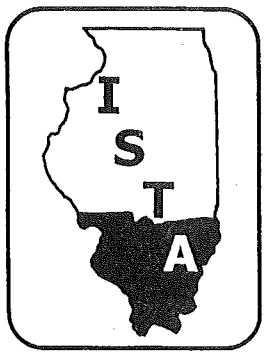
Sincerely,

Ray

Raymond J. Dagenais
Membership Chair

NASTS IN ILLINOIS

Illinois Science Teachers Association members have a special opportunity to attend the 13th Annual STS Conference for the National Association of Science, Technology, and Society (NASTS). This year's conference will be held at the Holiday Inn Select in Naperville, Illinois on March 5 - 7, 1998. The theme is, "Democracy in the Information Age." The conference will feature interactive concurrent sessions, assembly meetings with lunch provided, and keynote presentations by, Daryl Chubin, Acting Assistant Director for Social and Behavioral Sciences, White House Office of Science and Technology; Richard E. Sclove, Executive Director of the Loka Institute and author of Democracy and Technology; Suzanne Brainard, Director, Women in Engineering, Affiliate Associate Professor of Technical Communication and of Women Studies, University of Washington; and, Diann Musial, Professor College of Education, Northern Illinois University and Research Specialist, Illinois Mathematics and Science Academy. A strand of the concurrent sessions will immerse participants in a study of specific aspects of Democracy in the Information Age. Early registration deadline is January 15, 1998. For more information and a registration form, contact, Grace Newby NASTS Office Coordinator Science Education Center 765 Van Allen Hall The University of Iowa Iowa City, IA 52242-1478 email: grace-newby@uiowa.edu



Illinois Science Teachers Association and SIUC Proudly Present

Science in the South

The 2nd Regional Conference on Science Education

Friday, March 13, 1998

Name:_____

Address:_____City_____State_____Zip_____-_____

School/Institution:_____

Grade Level:_____Position:_____

Phone: Home (_____)_____Work (_____)_____

Registration Fee (Check one)
❑$60 Conference and ISTA Membership
❑$35 Conference only.

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Card Number_____Expiration Date_____

Authorized Signature_____

Please return this form by March 6, 1998, to help us plan the meeting. Lunch will NOT be guaranteed for registrations received after March 6, 1998. Please Return Registration Form and Check to:

2nd Annual Science In The South Conference
Division of Continuing Education
Mail Code 6705
SIUC, Washington Square Building C
Carbondale, IL 62901-6705 FAX: (618) 453-5680

"Plugging into the Future"
1998 Annual Meeting of Illinois Science Teachers Association
October 16-17, 1998
Rosemont Convention Center
Rosemont, Illinois
CALL FOR PRESENTATIONS
DEADLINE FOR SUBMISSION: APRIL 1, 1998

NOTE CHANGE OF DATES + PLACE!!

PLEASE COMPLETE A FORM FOR EACH PARTICIPANT (You may duplicate this form).
I can be available for o Friday's program o Saturday's program o either day

PLEASE PRINT OR TYPE AND FILL OUT COMPLETE FORM

Name	Day phone
Affiliation (School or Organization)	Home phone
Address of above organization	Home address
City, State, Zip Code	City, State, Zip Code
e-mail and/or FAX	

Title of presentation (10 word maximum) _____
Program description as you wish to appear in the program book (25 word maximum)

_____

_____

_____

_____

DUE TO LIMITED SPACE, PRESENTATIONS MUST BE LIMITED TO 50 MINUTES.

I. Type of Session	II. Intended Audience	III. SubjectArea
o hands-on workshop	o preschool	o earth and space science
o demonstration	o elementary	o chemistry
o lecture	o middle/jr.high	o physics
o other	o high school	o biology
	o college	o ecology/environment
	o teacher preparation	o science/tech/society
	o general	o technology
	o other	

IV. Equipment Required o overhead projector o slide proiector
Note: We are prepared to furnish only overhead, screen, and slide projector. Other equipment, including computers, needs to be furnished by presenters. If you need any special arrangements or equipment, including internet connection, contact Diana Dummitt ASAP at 217-244-0173, e-mail ddummitt@uiuc.edu

V. How many participants can you accommodate at your session?
o 30-50 o 51-80 o 81-150

PLEASE ATTACH A ONE PAGE ABSTRACT OF YOUR PROPOSED PRESENTATION.
As a professional, nonprofit organization, the Association is unable to reimburse participants for travel or other conference expenses. ALL PARTICIPANTS INCLUDING PRESENTERS, ARE REQUIRED TO REGISTER FOR THE CONFERENCE. This form is not for commercial or non-commercial exhibits. It is only for educators!
All Presentations are required to conform with the NSTA safety guidelines.

Signature_____ Date_____

SEND OR FAX SIGNED FORM AND ABSTRACT TO:
LINDA O'CONNOR, REGIONAL OFFICE OF EDUCATION, 421 NORTH COUNTY FARM ROAD, WHEATON, IL 60187, FAX 630-668-3537

THANKS TO ALL OUR EXHIBIT HALL PARTICIPANTS AND GENEROUS DONORS OF DOOR PRIZES!

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Holt, Rinehart and Winston, Inc.
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Illinois State 4-H Office
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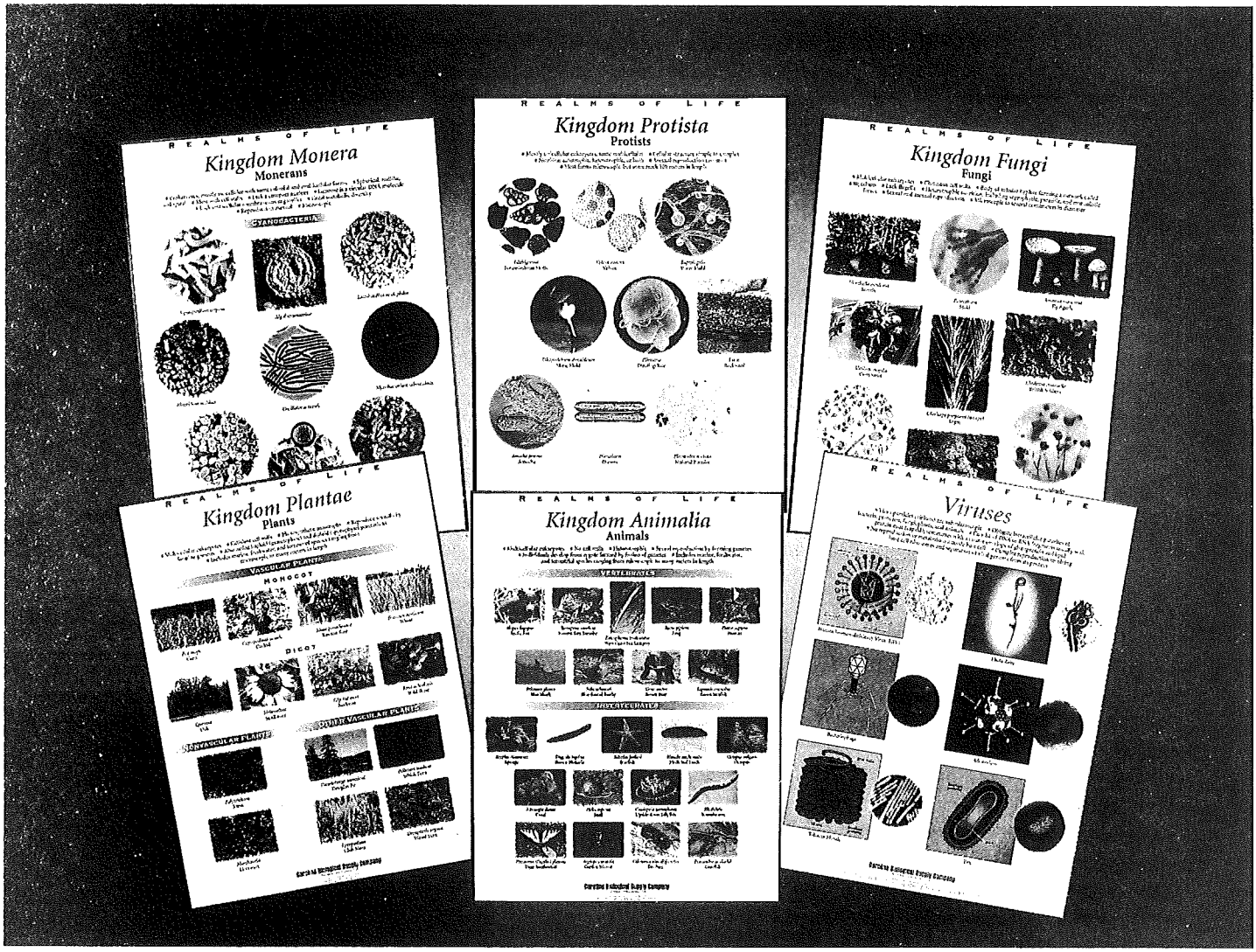

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Home page
Http://www.siue.edu/OSME/river/river.html

NATIONAL RIVER CLEANUP WEEK MAY 9-16, 1998 KNOXVILLE, TN

America Outdoors announces the dates for the 1998 National River Cleanup Week. During the 1997 effort, a record-breaking 38,265 volunteers participated in over 501 cleanups of shorelines and rivers. Federal partners, including the USDA Forest Service, the Bureau of Land Management, the National Park Service, and the Bureau of Reclamation, joined forces with outfitters, local clubs, service organizations and other groups during National River Cleanup Week '97 to clean over 8,506 total miles of shoreline. Since its inception in 1992, over 215,000 volunteers have participated in 3,156 cleanups covering 55,306 miles of American waterways. "The purpose of National River Cleanup Week is to demonstrate the importance of clean waterways and to encourage constituencies to preserve a community's streams, rivers and lakes," said David Brown, Executive Director of America Outdoors and National Coordinator of the event. "A cleanup creates an alliance between public and private groups that becomes a source of positive community action for restoration of compromised waterways," according to Rebecca Wodder, President of American Rivers and Co-coordinator of the '97 event. Anyone interested in organizing a cleanup effort in their area is encouraged to call for a registration form from America Outdoors at 423-558-3595 or register online at www.americaoutdoors.org. Registering for a cleanup is free. Cleanups registered prior to April 1, and conducted during the official week, are eligible for receive free trash bags, cleanup kits and safety tips. A video, Organizing a Successful River Cleanup, is also available for $10.95 with all proceeds benefiting National River Cleanup Week. America Outdoors is a national association of professional outfitters and serves as national coordinator of National River Cleanup Week. American Rivers is the nation's leading river conservation organization and served as the national co-coordinator of the '97 event.

National River Cleanup Week traditionally occurs during the second or third week of May each year. It was originally conceived in 1991 by America Outdoors® in response to a recognition that America's streams and rivers were in need of cleaning due to the careless disposal of trash and other debris. The importance of clean waterways is virtually self-evident. The neglect of America's waterways has, in recent years, not only become an issue of aesthetics in outdoor recreation, but a matter of clean water safety. Improperly discarded waste contributes to contaminated drinking water and affects all manner of wildlife. Entire ecosystems can be disrupted by illegal dumping which, eventually, may lead to the virtual death of a waterway. Improperly discarded trash and debris inevitability ends up in the watersheds of many rivers and streams. Unchecked, much of this trash and debris channels into the waterways and collects along the banks thus compounding the problem.

Since the first cleanup event in 1992, 127,000 volunteers have participated in over 2,000 cleanups covering 36,000 miles of waterways. Cleanups are typically organized by civic clubs, outfitters, agencies, recreation clubs or environmental groups. Each year, America Outdoors® provides cleanup kits, safety guidelines, support materials and trash bags to local cleanups registering an event during the designated week. Registration of an event for National River Cleanup Week is free of charge. Local organizers are responsible for organizing and executing their local events. In addition to locally organized clean ups, the associate national coordinators and federal agencies promote cleanups among their members and constituencies.

A freshman at Eagle Rock Junior High won first prize at the Greater Idaho Falls Science Fair, April 26. He was attempting to show how conditioned we have become to the alarmists practicing junk science and spreading fear of everything in our environment. In his project he urged people to sign a petition demanding strict control or total elimination of the chemical "dihydrogen monoxide." And for plenty of good reasons, since it can

1. cause excessive sweating and vomiting
2. it is a major component in acid rain
3. it can cause severe burns in its gaseous state
4. accidental inhalation can kill you
5. it contributes to erosion
6. it decreases effectiveness of automobile brakes
7. it has been found in tumors of terminal cancer patients

He asked 50 people if they supported a ban of the chemical. Forty-three said yes, six were undecided, and only one knew that the chemical was water. The title of his prize winning project was, "How Gullible Are We?" He feels the conclusion is obvious.

Bob Johnson
Communications Engineers Week - Chicago

1998 NATIONAL ENGINEERS WEEK FACT SHEET

What: National Engineers Week is celebrated each year at the time of George Washington's birthday. Our nation's first president was a military engineer and a land surveyor.

When: George Washington's birthday is on Sunday, February 22 (observed Monday, February 17) and National Engineers Week 1998 takes place February 22-28.

Who: Washington's agricultural, military and land-surveying skills led to his acquiring the title of our nation's first engineer. As a general, he issued an order on June 9, 1778, calling for engineers and engineering education, which is considered to the beginning of a U.S. Engineer School. He directed a growing society toward technical advancements, invention and education.

Where: National Engineers Week is celebrated across the country through activities such as:
• Discover "E": Engineers visit K-12 classrooms to talk with students about what engineers do and show practical applications of math, science and engineering.
• National Engineers Week Future City Competition: Engineer-volunteers help seventh and eighth grade students design and build computer generated cities of the 21st century. Winners of local contests compete in Washington during National Engineers Week.

Why: The purpose of National Engineers Week is to increase the public's awareness and appreciation of the engineering profession. During the Week, engineers participate in a variety of activities to help create an interest in engineering, math and science.

National Engineers Week planning kits are available now. To receive a packet, write to National Engineers Week, PO Box 1020, Sewickley, PA 15143, or e-mail to: eweekorders@abdintl.com
For information on National Engineers Week contact Colleen Coyne at TEL: 703-684-2854 o visit the National Engineers Week WEBSITE at www.EWEEK.org
For the Chicagoland program contact James McLean at 312-368-3745

Chicagoland Engineers Week Celebration: Student Outreach & E-Week Activities

Future City Competition:
School teams of 7th and 8th grades create their city in the year 2010 including transportation, housing, energy, police and other key components. Regional judging is January 17, 1998 at the University of Illinois at Chicago. The event is open to the public. The winning team goes on to the national contest in Washington DC. Contact Don Wittmer 312-930-9119

Dupage Area Engineers' Week:
Three day program, February 26, 27, 28 includes presentation on topical engineering subjects. Hands-on exhibits and displays by local engineering societies.
Contact IIT/Rice Campus at 630-682-6008

Essay/Poster Competition:
Students in grades 3 through 8 write a 250 word essay and design a poster depicting an engineer and engineering achievement which has made an impact on their life.
Contact Deb Zroka at 773-935-6376.

Discover 'E' Program:
Engineers go into schools to lecture on engineering achievements and careers in the field of science and technology. Contact ISPE at 312-332-0107.

IIT Bridge Design Competition:
High school physics students design a bridge to withstand the high loading using the least material. Judging scheduled for Tuesday, February 24th at IIT. Contact George Krupa at 312-648-9900.

MATHCOUNTS:
7th and 8th grade students prompt a lively exchange of basic arithmetic skills, math logic, probability and statistics, linear algebra and polynomials through competition. The program is sponsored by NSPE/ISPE. The contest is scheduled for Saturday, February 7th.
Contact Allan Gdalman at 312-666-3535.

Engineers Week Displays:
Exhibits of engineering achievements will be on display at the James R. Thompson Center, Chicago locations in late January. Contact Rupert Graham at 312-454-1161.

Washington Awards Banquet:
Wednesday, February 25th. Chicago engineering community presents one of the engineering's prized honors. Contact WSE office at 312-913-1730.

ENGINEERS WEEK LUNCHEON:
On February 27, the year's largest gathering of engineers of all disciplines gather under one roof. Keynote address by a prominent leader in the engineering profession. Recognition of achievements of exceptional science students including finalists in the Future City Competition.
Contact David Powell at 800-843-5410.

For additional information on Chicagoland Engineers Week activities visit the following WEBSITES:
http://www.eosinc.com/ispe/default.htm
http://www.mcs.net/~isasce;
http://www.iit.edu/~swe-chi

Sally Shaffer
Indiana Area J.H.S.
Reprinted from *PSTA Exchange*
Fall 1997

IDENTIFYING THE "TYPE OF THINKER" YOUR STUDENTS ARE

One of the major goals as a science educator is to provide experiences to our students to develop their thinking and problem solving skills. Following is a checklist for you and your students to identify and to check their progress in skill development. Note: These characteristics are **not** based on the mental ability of the student.

Characteristics of "Formal" Thinkers

1. Uses a "plan of attack" for solving any problem.
2. Offers a full explanation.
3. Hypothesizes and "tires out" ideas and solutions before choosing the most likely.
4. Goes beyond the "given" to test our options.
5. Considers multiple causes and effects.
6. Analyzes problems, solutions, relationships, etc.
7. Shows confidence in solutions proposed.
8. Uses personal experience to support solutions but is also able to move "outside" that personal experience.
9. Generalizes to impose meaning over disparate events.

Characteristics of "Concrete" Thinkers

1. Lacks a systematic "plan of attack" in problem solving.
2. Sees only a limited number of options to any problem.
3. Hesitates to "try out" ideas. Frequently answers in one or two word answers.
4. Ignores or does not understand inferential information.
5. Responses are often logical but deal only in the present.
6. Relates ideas from own experiences and offers them as evidence; these ideas often distract from the solution.
7. Finds difficulty hypothesizing or imagining events outside the present.
8. Recognizes some abstract concepts (like goodness) but cannot explain them.

Characteristics of "Transitional" Thinkers

1. Shows sporadic "flashes of insight".
2. Demonstrates both concrete and formal characteristics.

POSSIBLE PRODUCTS FOR ASSESSMENT TASK

Is your school district into performance assessment? Are you stuck for ideas of assessment tasks that can be used to evaluate a unit of study or specific concepts. Here is a list of ideas that may help you.

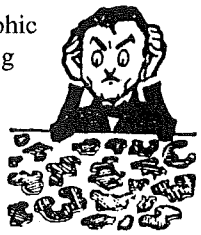
Written

- advertisement
- book report/review
- crossword puzzle
- experiment record
- game
- lab report
- magazine article
- memo
- proposal
- research report
- biography
- brochure
- editorial
- essay
- journal
- letter
- log/diary
- poem
- questionnaire
- script/play

Oral

- audio tape
- dramatization
- interview
- oral report
- poetry reading
- skit
- song
- teach a lesson
- debate
- discussion
- newscast
- play
- rap

Visual



- advertisement
- banner/bumper sticker
- collection
- construction/model
- data table
- diagram
- display
- filmstrip/slide show
- graph
- poster/postcard
- scrapbook
- cartoon
- collage
- computer graphic
- design/drawing
- diorama
- videotape
- map
- photograph
- sculpture
- storyboard

Trisha Schmirler
The ZPG Reporter
September 1997

TEN RULES FOR A QUALITY COMMUNITY

In keeping with the theme of improving our living environment we present an adaptation of Pulitzer Prize-winning author Thomas Hylton's "Ten Rules for a quality Community." Hylton developed these guidelines hoping to influence the development of his home state, Pennsylvania. He studied the comprehensive development plans of states such as Washington, Vermont, and Kentucky, which include provisions to limit urban sprawl and return their cities to community-centered living. These rules are applicable anywhere in the United States, combining environmentally sound ideas with the best of traditional and modern lifestyles.

1. A SENSE OF PLACE

Clearly define the boundaries of communities, no matter what their size. Do not allow them to sprawl into the countryside and spoil natural areas and beautiful vistas. Fight the loss of America's shared natural heritage with well-planned development, perhaps adopting the British idea of Greenbelts, where cities and towns are surrounded by a circle to pristine, undeveloped land from five to twenty miles wide.

2. HUMAN SCALE

Build communities which are sized for pedestrians. Three-lined sidewalks in town where houses and stores are close together and close to the street can bring a sense of warmth to a community, encouraging people to walk and interact with one another. We will not be able to walk everywhere and streets should remain accessible to cars, but even buildings that most people must drive to can be attractively built near where we live and work to allow some pedestrian access.

3. SELF-CONTAINED NEIGHBORHOODS

Modern zoning laws strictly separate commercial and residential areas, forcing people to drive almost everywhere. Let neighborhoods again be pedestrian places where people can live, shop, work, and attend school and religious services. Schools in close-knit cities will be smaller, allowing children to walk safely to school and encouraging good student-teacher ratios. Communities will be more secure because of a constant, daily round of activity. A ratio of two workplaces to every three dwellings guarantees convenient jobs for many residents.

4. DIVERSITY
Communities should provide housing areas that integrate all income levels, age groups, and ethnicities present in the local population. An attractive mix of large homes, small homes and apartments in the same neighborhood can achieve a beautiful living environment without degrading property values, as shown in places like Montgomery County, Maryland. Elderly residents are an especially important part of a neighborhood, informally providing responsible adult supervision of neighborhood children and actively participating in community life.

5. TRANSIT-FRIENDLY DESIGN
Transportation is essential to modern life, and should not be inaccessible to anyone. Buses and trains are more energy-efficient and less polluting than cars. They also require less space to operate. It is imperative that cities and even small towns be designed with public transportation in mind, planning that can also be conducive to pedestrian traffic, as the "sidewalk suburbs" south of Pittsburgh, Pennsylvania demonstrate.

6. TREES
Trees are an inexpensive and important part of community improvement. Beyond their obvious aesthetic value, trees help reduce air-conditioning costs in the summer and provide windbreaks in the winter. Their natural processes remove excess carbon dioxide from the air and filter out pollutants, lessening global warming. One shade tree per every five parking spaces would cool parking lots considerably, as well as improving their appearance.

7. ALLEYS AND PARKING LOTS TO THE REAR
The beauty of a city's streets and neighborhoods depends to a large extent on their accessibility to both pedestrian and automobile traffic. Accessibility is hampered by streetside driveways and parking lots, which are often unattractive as well. Creating alleys and rear parking would not only give a sense of vehicle security, but would also make streets more appealing. Rear garages might also provide residents with extra income from garage apartments, and alleys could provide convenient pedestrian shortcuts from street to street.

8. HUMANE ARCHITECTURE
Harmonize buildings with their natural surroundings. Replace cold, monolithic architectural styles with inviting buildings that don't block out the sky. Preserve historical buildings; make them useful parts of a community and renovate them as a testimony to our pride in our American heritage.

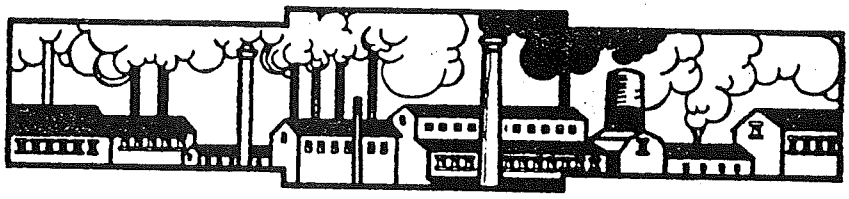
9. OUTDOOR ROOMS
The comforting sense of enclosure that we find in a cozy room also can and should be found outdoors in public areas. Beloved sites such as Harvard Yard and Rockefeller Center are treasured examples of this outdoor enclosure. These are defined public areas where people can meet and socialize; homes and other buildings are aligned close together to create the feeling of a room, without sacrificing family privacy that can be achieved in spacious, walled back yards.

10. MAINTENANCE AND SAFETY
Maintenance differentiates an attractive area from a run-down one; it also often differentiates a safe, healthy community from a slum. A community that polices itself in regards to maintenance demonstrates that it cares about how people life within its borders. Support of public order by residents and the judiciary is essential to keep neighborhoods beautiful. Encouragement of financial assistance for home maintenance will insure that those who lack the funds can also live in a well-kept environment.

For more information on community-centered development strategies, contact:
- The Center of Excellence for Sustainable Development at the Department of Energy; 1(800)363-3732 or www.sustainable.doe.gov
- The Planning Commissioner's Journal "Sprawl Resource Guide" at www.plannersweb.com
- The Sustainable Communities Network at www.sustainable.org/
- The Center for a New American Dream at www.newdream.org

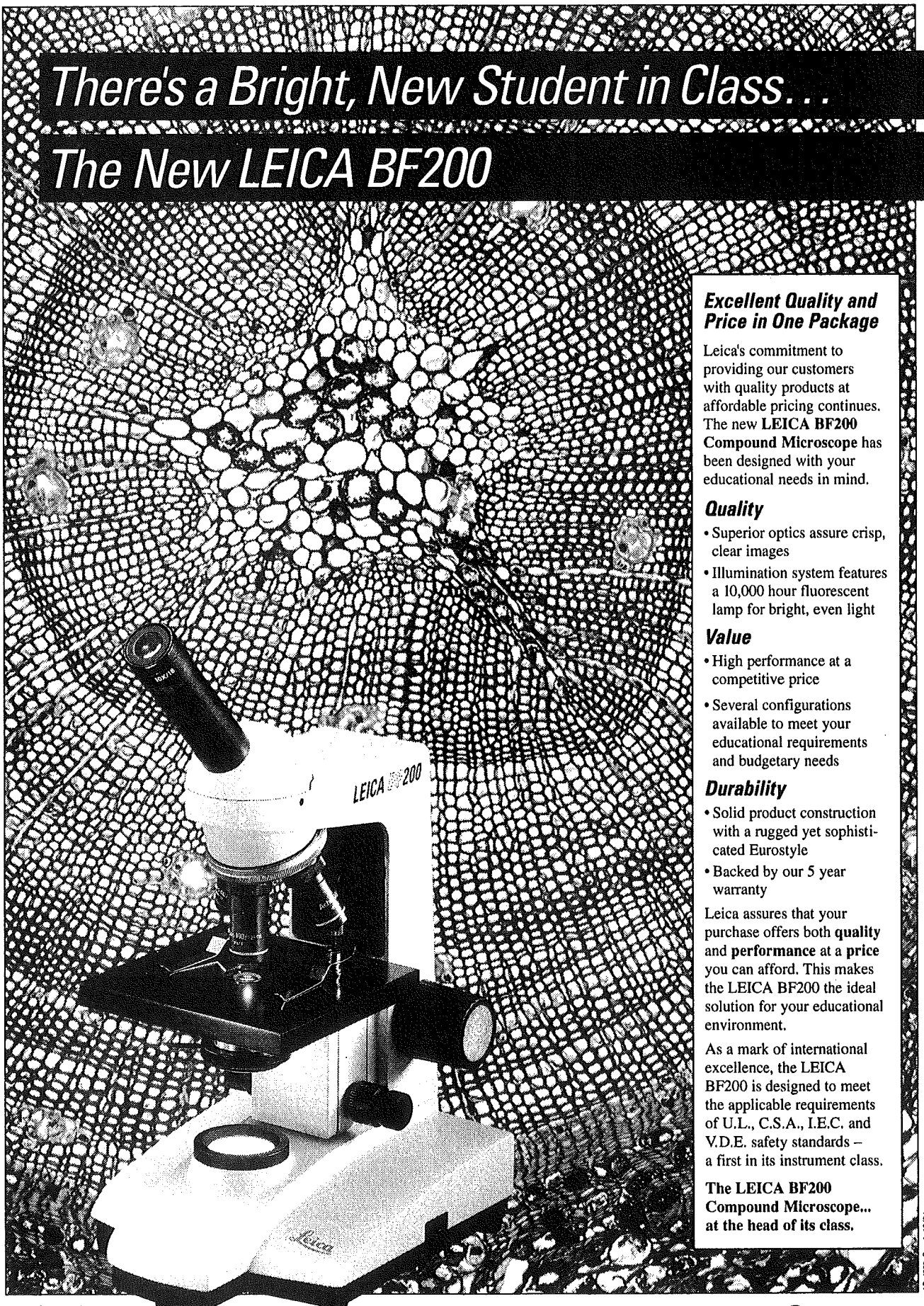
For information regarding tax issues and sustainability:
- Americans for a Sustainable Economy. Contact: Dawn Erlandson (202) 234-9665

Further reading:
- Phillip Langdon, *A Better Place to Live* (N.Y.: 1995)
- Thomas Hylton, *Save Our Land, Save Our Towns: A Plan for Pennsylvania* (Harrisburg, PA: 1995).



There's a Bright, New Student in Class...

The New LEICA BF200



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COMPUTER SPECTRUM

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Urbana, IL 61801
karliner@uiuc.edu

SCIENCE WEBSITES

http://pdg.lbl.gov/cpep.html
Particle and Nuclear Physics Education Resources from CPEP (high school and college level)
Includes an interactive "walk through" Particle Physics in terms that everyone understands. Quarks are really quite simple.

http://www.mste.uiuc.edu/
UIUC Mathematics, Science and Technology Education MSTE
Extensive list of resources and programs compiled by MSTE

http://www.ncsa.uiuc.edu/Cyberia/Expo/main.html
UIUC NCSA Science for the Millenium
One of the best virtual science museums. All levels, from laymen to current research. This site won numerous Web awards. Great exhibits, very good writing.

http://www.exploratorium.edu/
San Francisco Exploratorium
Exploratorium is one of the wonders of San Francisco. A hands-on science museum which is constantly growing, with a dynamic program for teachers at all levels.

http://w3.aces.uiuc.edu/aim/scicity
Science City : Science and Math Resources for All Ages
This is, to my knowledge, the most comprehensive list of science and math resources with links to EVERYTHING.

REPORT ON TECHNOLOGY IN THE SCHOOLS

A report in Education Week magazine based on survey data collected by Market Data Retrieval on 55,000 public schools nationwide says that about 18% of those schools met its criteria for being considered a "high-technology school": Internet access, a computer network system, and a better-than-national average ratio of students to computers and CD-ROM drives." The states with the best averages were Alaska, Minnesota, Nebraska, North Dakota, and Wyoming. The study concluded, however, that was very little research available on how computers and other kinds of technology are actually being used by students, and what effect, if any, this technology is having on student achievement.

Greg Simmons
California Classroom Science

COOL SCIENCE WEB SITES

Jet Propulsion Laboratories
http://www.jpl.nasa.gov
An obvious must-visit site with Mars photos you haven't seen on TV as well as the most up-to-date information on Mars' geology and atmospheric conditions. You can also find out about future JPL endeavors such as the Cassini mission to Saturn and its moons.

Wildflowers in Bloom
http://aggie-horticulture.tamu.edu/wildseed
This beautiful site provides stunning wildflower photos in addition to useful information about the habitat, size, color, and other characteristics of wildflowers from all over the United States.

Access Excellence
http://www.gene.com/ae/index.html
A good-looking site with tons of content for the science education professional, resources include late-breaking science news, activities and project exchanges, as well as ongoing discussions on ethics, methods, and the future of classroom science.

The Butterfly Zone
http://www.butterflies.com
This elegant, beautiful site is wroth viewing even if you are not into butterflies, and with instructions on how to start your own butterfly garden and a guide to butterfly types, habitats, and diet there is enough content to interest the afficianado. For more hard entomological resources try http://www.ent.iastate.edu/List.

Nye Labs
http://nyelabs.kcts.org
While this site could never keep up with the energy and humor of the wonderful show *Bill Nye the Science Guy* it does provide plenty of fun things for kids to do, in addition to providing access to summaries of the TV episodes. These summaries give instructions on how to do some of the experiments from the show.

Education Index
http://educationindex.com/education_resources.html
Another resource rich site, the Education Index provides links to all areas of education. Specific to the interests of science education professionals would be the General Science, Physics, Chemistry and the Biology/Life Science areas.

Kevin Dando
kdando@pbs.org
Public Broadcasting Service
1320 Braddock Place
Alexandria, VA 22314-1698
(703) 739-5073

PBS TEACHER CONNEX OFFERS ONE-STOP ACCESS TO ONLINE RESOURCES FOR THE K-12 CLASSROOM

PBS has completed the relaunch of a comprehensive online service designed to help K-12 teachers use PBS's award-winning television and online programming *in the classroom. PBS Teacher Connex*® (http://www.pbs.org/tconnex), a teacher-focused section of PBS ONLINE®, is a storehouse of information about PBS programming with uses in the K-12 curriculum, as well as associated teacher resources and off-air recording rights.

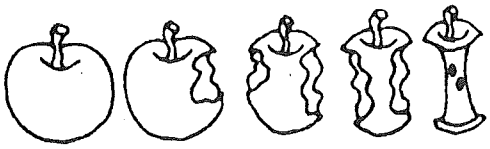
According to two surveys conducted by *Cable in the Classroom*, PBS is the top television service used by the nation's teachers and school librarians. *PBS Teacher Connex* also showcases the education services offered by local PBS member stations by providing links to them, and lists the numerous areas of PBS ONLINE as well as other Web sites that can help teachers bolster their classroom resources.

"Our goal...is to aggregate all the materials that will help teachers use PBS programming in their classrooms, and...encourage the use of our programming *beyond* the broadcast," said Kate Santhuff, managing editor of PBS *Teacher Connex*. "We already have thousands of teachers visiting PBS ONLINE each month, and now we're providing them a place where they can get everything at once, regardless of the curriculum or grade level."

Among the *Teacher Connex*® features are:

- "TV for Teachers," a monthly national schedule of programs with extended videotaping rights, including links to local public television station airtimes;
- Program listings organized by curriculum area;
- "Teaching Tools" for using technology in the classroom;
- "Teacher Talk," an interactive discussion center with a monthly focus on a specific educational issue; and
- "Feature of the Month," which highlights key PBS programs and their value in teaching core academic subjects.

The *Teacher Connex* Online "Feature of the Month" is furnished monthly by the Corporation for Public Broadcasting's *Teachers' Digest*, a publication available as part of a $15 per school-year subscription to the print version of *Teacher Connex*. *CPB Teachers' Digest* provides practical teaching ideas and strategies written by teachers.



AskERIC: http://ericir.syr.edu - This site contains about 1/30th of the federally funded AskERIC Clearinghouse, organized into three main areas: Questions & Answers, Vitual Library, au~d Research and Development. Q&A is similar to the library reference desk of old, but all answers provided come from online reference materials. The virtual library includes lesson plans, archives of education-related listservs, internet guides, and more. R&D includes several experimental information delivery techniques and technologies. Another way to start your AskERIC journey is to visit http://www.aspensys.com/eric/. Some find that things are explained and organized in a much friendlier way.

Science Online: http://science-mag.aaas.org/science - Fomnore than 100 years, Science magazine has reported on the very latest in scientific research and policy each week. The world's largest circulation general scientific publication now reaches even more readers through its ambitious online version. A number of articles on scientific breakthroughs, written by joumalists, help to educate the general public, but the primary thrust of the magazine is toward the working scientist. The full text of *Science,* combined with hyperlinks and several other features unique to the online version, allows researchers instant access to technical reports on current research in their field. Everything is searchable and archived back to June 1995.

NABT Past President Gordon E. Uno has recently completed a new publication, *Handbook on Teaching Undergraduate ~Science Courses: A Survival Training Manual.* He intends to distribute the 160-page handbook at his upcoming workshops and is interested in readership response.

Uno, Professor of Botany at the University of Oklahoma, believes his manual would be of use to graduate students as well as young, inexperienced faculty (and perhaps experienced faculty as well!). Members may purchase a copy @ $5 to cover shipping, handling and other charges related to the project. Checks should be made out to Gordon E. Uno at the University of Oklahoma, Department of Botany & Microbiology, Norman, Oklahoma 73019-0245. Include your name and address for shipping purposes.

Uno intends to establish a computer bulletin board on the World Wide Web to encourage the development of a network of biology instructors who can exchange questions and ideas, as well as support each other in their teaching. Interested members should sent their e-mail addresses to Uno (at unobotany@ou.edu) as well as their thoughts on such a system and what information they would like to see included. Once the bulletin board is up and running, he will contact those who expressed an interest.

The American Society for Microbiology's Board of Education and Training offers a wide variety of resources for students, teachers, scientists and members of under-represented groups. Among these resources are the Science Education Network, a database of scientists who have identified themselves as willing to participate in outreach activities involving precollege students and faculty, and Microbial Discovery Workshops, summer workshops that feature curricula using microbes to stimulate interest in science. For a complete listing, visit the web pages at asmusa.org/edusrc/edul.htm. If you do not have access to the Intemet, fax your request to (202) 942-9329.

Reformulated Gasoline - Driving to Cleaner Air. Cleaner burning fuels mean healthier air. A proven way to reduce ozone pollution is by using cleaner buming gasolines, often called reformulated gasoline (RFG). For more information on this important issue including legislative, health, product safety, research studies, auto performance or environmental (air/water) issues, all 1-800-GO-TO-RFG.

Things We Can Learn From a Cow and a Worm - a colorful educational poster with activities that cattle and earthworms play in our environment and natural recycling. 5th and 6th grade teachers may obtain a free copy of the poster by sending a letter written on school stationery to: National Cattlemen's Beef Association, Education Department, 444 No. Michigan Ave., Chicago, IL 60611.

Transforming Ideas for Teaching and Learning Science Education, by the U.S. Department of Education, contains 10 expanded ideas that can enhance your science classroom. Free. Write to the U.S. Dept. of Education, OERI Educational Infonmation, 555 New Jersey Ave., NW, Washington, DC 20208. Publication # 065-000-00599-9.

World Resources Institute's Environmental Education Site features innovative teaching materials, background information on sustainable development and related topics, and news about the field of environmental education. http://www.wri.org/wri/enved/

"Everything You Need to Know about Caffeine." This comprehensive brochure, with an updated look, includes the latest science-based information on caffeine and health. "Everything You Need to Know about Caffeine" addresses topics such as sensitivity, caffeine consumption during pregnancy, breast disease, osteoporosis and misconceptions about addiction. The brochure also includes "Caffeine Quick Facts," and "Historical Notes" about caffeine consumption.
"Everything You Need to Know About Caffeine," was favorably reviewed by the American Academy of Family Physicians Foundation and is part of the IFIC Foundation's "Everything You Need to Know About..." brochure series.
To order one free copy, contact the IFIC Foundation, 1100 Connecticut Ave., N.W., Suite 430, Washington, DC 20036.

(http://volcano.und.nodak.edu) is a homepage dedicated to increase **understanding of volcanoes on Earth** and beyond. It is part of NASA's Public Use of Earth and Space Science Data Program and has been selected as one of the top 5% of all WWW homepages. Three volcanologists have answered over 1500 diverse questions through "Ask a Volcanologist"; "Volcano Lessons" provide background information for teachers and each topic is complemented with a series of teaching suggestions and activities that can be printed and used in the classroom and progress from grades K-3 to 9-12. Other pages are "What's Erupting Now","Volcanoes of the World" and "Volcanic National Parks" which takes uses to virtual trips to Hawaii and Mt. St. Helens.

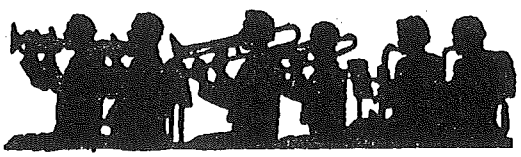
http://www.scri.fsu.edu/~dennisUCMS/sf/sf.html If you need help on a project, this **"Cyberspace Middle School"** site is a good place to start. Here you can get practical hints for finding and doing a project, a few topic ideas, and a list of resources (books and other Web sites) that can help you get on your way. But most important, you can also ask specific questions about your project. A moderator will answer your questions - usually within three days!

http://www.stemnet.nf.ca/~jbarron/scifair.html Stuck for a **project idea?** This site has an extensive list of research questions, sorted by grade level and science area (e.g., physics. chemistry, environment, etc.).

http://pen.kl2.va.us/~jkeith/bmssf.shtml Take a peek at **Battlefield Middle School's Science Fair Page** for more project ideas. The experiments are organized by topic or hy keyword in alphabetical order. Instead of questions, they list science statements you can use as hypotheses for science projects. (For example, "Plants that 'listen' to country music will grow better than those 'hearing' a mix of music.")

http://www.exploratorium.edu/publications/Hands-On_Science/Hands-On_Science.html The Exploratorium museum in San Francisco, Califonnia, brought together a group of middle and high school science teachers to write the *Science Snackbook,* a book filled with hands-on activities. This site gives you a sampling of those activities, which you could tune into cool science projects.

http://ericir.syr.edu/Projects/Newton -or- http://nyelabs.kcts.org -or- http://www.nbn.com:80/youcan Have you ever watched *Newton's Apple, Bill Nye, the ~Science Guy,* or *Beaiman's World,* those cool **educational science shows** on TV? They have terrific activities you could probably use for your science project. Check out their Web sites for great science information and experiments.



Don't Let a Good Thing Go to Waste can help you. This environmental education program - a five-lesson series geared toward grades two through five - helps students make the connection between the trash they generate and the solid waste challenges our country faces. Its interactive, interdisciplinary activities enable students to discover that they can make a difference by practicing the 3R's: reduce, reuse, recycle. The Plastic Bag Association will provide the program free-ofcharge to elementary educators. To request the program contact the Plastic Bag Infonmation Clearinghouse at 1-800438-5856.

The Science of HIV video will air on Discovery Channel's "Assignment Discovery" in the fall of 1997. Cost of the curriculum package is $39.95 plus postage and handling. Teachers can order a copy by contacting NSTA at (800) 722NSTA. Or, write to NSTA, 1840 Wilson Boulevard, Arlington, VA 22201.

Write for their *Resource List* from the Sugar Association, 1 101-lSth Street NW #600, Washington, DC 20005.

Learning by Accident (vol.1, The Laboratory Safety Workshop, 1997, 100 pages) is the first in a series of compiled, anecdotal accounts of laboratory accidents. This informative and educational publication chronicles 500 actual laboratory accidents in an organized, accessible style. Heading topics include accident summaries for chemicals, equipment, materials, and environment in a broad scope of settings, including academic biology and chemistry, hospital, industrial and government research facilities.

The easy to locate information is presented alphabetically by topic, cross-referenced by entry and fully indexed. In addition to a full spectrum of chemical hazards, individual entries are often precautionary advice. Examples are: remedies to medical injury, proper technique and handling of volatile material, preventive behavioral modification, and adequate communication such as distinct labeling and pre-exposure instruction.

This collection of close call and accident reports by academic and industrial professionals is a necessary addition to all science labs. Along with its value as a teaching tool and precautionary guide for accident prevention, *Learning by Accident is* excellent insurance toward reducing liability, negligence and possible litigation in the science laboratory, as well as daily life.

For information about LSW or on ordering or distributing *Learning by Accident* contact: The Laboratory Workshop, 192 Worcester Road, Natick, MA 01760-2252; Tel. (508) 6471900; Fax: (508) 647-0062; E-mail: Labsafe@aol.com

Teaching AP courses next year? Here are some exceptional web sites for Science Education & Career Resources.

Biology:

www.hhmi/lectures/hiband/start.html Beyond Bio 10 l: The Transformation of Undergraduate Biology Education, a lively colorful new report from the Howard Hughes Medical Institute.

irma.od.nih.gov Office of Science Education NIH. a Web site for students, teachers. and all others who want to learn ahout the process and progress of biomedical research.

golgi.harvard.edu/biopages/edures.html World-Wide Web Virtual Library of Instructional Resources in Biology, has lists of resources which are designed for teaching biology.

Chemistry:
www.anachem.umu.se/eks/pointers.html Chemistry Teaching Resources, has links to resources such as courses, curriculum material, demos and experiments, and more.

www.chemsite.com/ The World of Chemishy, has links to sites with science jobs.

www.chem.ucla.edu/~dehNCChome.html Younger Chemists Committee Homepage, a career related Weh page for recent college graduates.

Physics:
www.physics.mcgill.ca:8081/physicsservices/physics_education.html Physics Around the World includes links to educational resources in physics, math. computational science, astronomy, etc.

Earth Science:
www-sci.Iib.uci.eduISEP/earth.html Frank Potter's Science Gems-Earth Science, devoted to resources for teaching earth science, over 2,000 Web resources.

Women:
www2.nas.edu/wise The new Web site for the National Research Council's Women in Space group.

www.awis.org The Association for women in Science, has links to resources for women in science including fellowship and grant info.

nimrod.mit.edu/depts/humanities/internetresources/womens-studies/womens/tech.html Ada project Tapping Internet Resources for Women in Computing. A list of a variety of Web resources for women in science.

General:
schmidel.com/teaching.htm BioChemNet, a resource directory for biology and chemistry teachers.

www2.nas.edu/bsi A new NAS project entitled Beyond Discovery: The Path to Human Benefit.

"Introducing the Worcester Polytechnic Institute 5th7th Grade STS Modules." Published February 26, 1997. Available port paid to teachers for $19.00. Order from Professor John M. Wilkes, Dept. of Social Science and Policy Studies, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609-2280; Tel. (508) 831-5578; FAX (508) 831-5896; e-mail: jmwilkes~wpi.edu

The ***Journal of Chemical Education*** is available for $30 by writing Journal of Chemical Education, Subscription/Book Order Department, P.O. Box 606, Vineland, NJ 08360; or Tel. 1-800-691-9846. Also, join the Division of Chemical Education (CHED). For $10/year you receive CHED News and help support Committees, Task Forces, publications, activities, and meetings. Contact: M. Larry Peck, Treasurer, CHED, Department of Chemistry, Texas A & M University, College Station. TX 77843.

Science Web Sites
Nuclear Science Sites:
American Nuclear Society: www.ans.org

American Nuclear Science Teachers Ass'n: www.acuri.com/snta.html

Lawrence Hall of Science: www.lhs.berkeley.edu

Los Alamos Nat' l Lab Educ. Projects: www.education.lans.gove/

Society of Nuclear Medicine: www.snm.org/

Chernobyl, Penn State U.: iderl6.psu.edu/remenuc/users/chernobyl/

Chernobyl, Nuclear Energy Agency: www.nea. fr/html/rp/chernobyl/chernobyl/chernobyl.html

International Atomic Energy Agency: www.iaea.or.at/

World Health Org. (food irradiation): www.who.ch/

Integral Fast Reactor: neutrino.nuc.berkeley.edu/ifr.html

Uranium Info Center of Australia: www.uic.com.au/

Uranium Institute of London: www.uilondon.org/

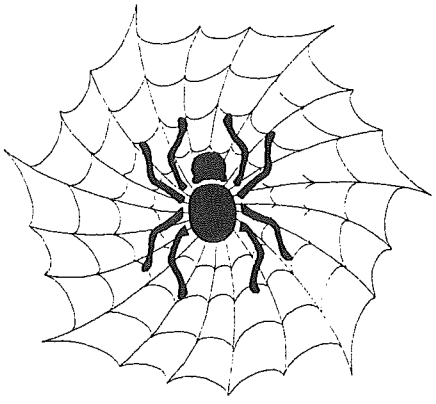
Health Physics Societ: www.usii.net/hps/

Table of the Nuclides: www.dne.bnl.gov/CoN/index.html

Nuke Handheld Database: nuke.handheld.com/

Nuclear Energy Institute: www.nei.org

Fermi National Accelerator Lab: www.fnal.gov/



Call for Sessions

Do you have teaching ideas that you'd like to share with your fellow teachers? Why not present these ideas at an NSTA convention?

To submit a proposal, download a proposal form from the NSTA web site at http://www.nsta.org/conv/call.shtml

You may also have proposal forms automatically faxed to you using NSTA's Fax on Demand service. Call 1-888-400-NSTA (6762) and select:

Form number 480 for the Boston National Convention Session Proposal Form,
Form number 481 for the Seattle Convention Session Proposal Form,
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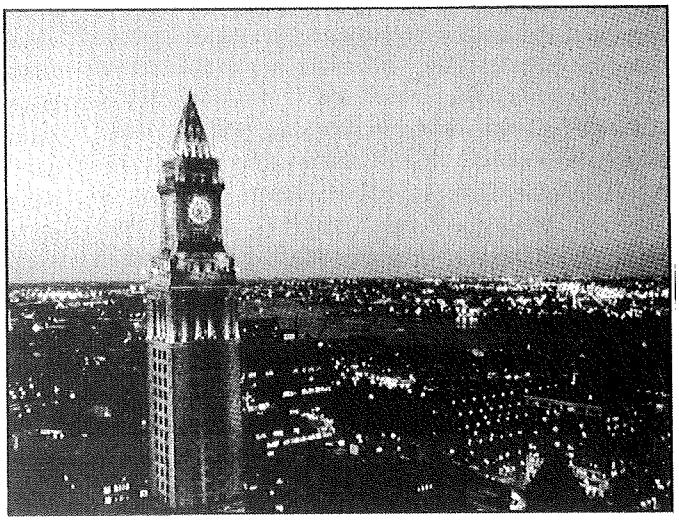

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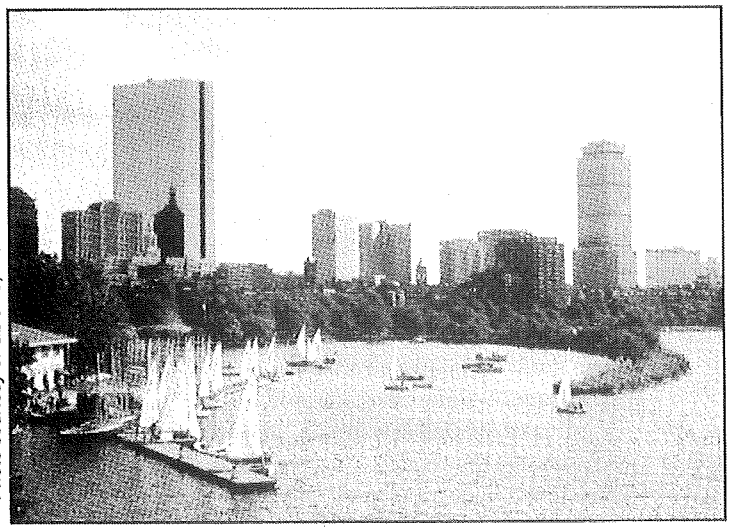

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ARTICLES

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THE ROLE OF TEACHING AND LEARNING IN SYSTEMIC REFORM: A FOCUS ON PROFESSIONAL DEVELOPMENT

The purpose of systemic reform is to improve student learning, which cannot be accomplished without excellent teaching. It is not a surprise, then, that professional development plays a critical role in the success of systemic reform, as it directly influences the quality of teaching and learning in science and mathematics classrooms. This paper draws on my experiences in designing and conducting evaluations of professional development in the context of systemic initiatives at local and state levels, in providing technical assistance to professional developers, and in capturing the experiences of seasoned professional developers in a book on best practice. In the paper I sketch briefly (1) what I believe we know about the role of professional development in systemic reform and (2) what we still need to learn.

What We Know

1. It is a long distance from the policy level to the student, and professional development is on the way.

In my new role as Director of Professional Development and Outreach for K12, at the National Research Council's Center for Science, Mathematics, and Engineering Education, I have the task of overseeing the Center's efforts to "disseminate" the *National Science Education Standards* (National Research Council, 1996). It is a constant source of amazement how many people think that you can literally give the book to teachers and expect them to use the *Standards* in their teaching. These standards are a product of a national consensus; the many sets of standards developed at other levels of the system (e.g., by states and districts) similarly result from broad consensus. Their intention has never been to be "implemented" directly, but to guide a system's design for what educators expect of and how they work with students.

Bybee (1996) describes a schema for system change that applies equally well for mathematics reform as it does for science reform; it includes changes in *purpose, policies, programs, and practices.* According to this schema, *purposes* relate to the general agreement on the need for science and mathematics literacy for all; standards are the *policies* that guide education towards those purposes. But in order to move to students, *programs* need to influence *practice,* which is the only way that students will have different and better opportunities to learn. This is where professional development enters the picture. Professional development is one of the critical links in this chain, one that can take *purposes* and *policies* and influence student learning through its impact on teaching.

We have learned that there is a great distance between systems and students. Although there are many routes that may be chosen (e.g., through new assessment, curriculum, or instructional *programs),* professional development is a required stop along the route. For students to reach the goals to which the system aspires, teacher learning and change are essential.

2. Investment in people as the primary agents of change is critical.

Many proponents of systemic reform concentrate on the need to change policies at the state and local levels. Their vision came in part from the California experience of the 1980s and early 1990s, when the state began to enact a vision that put into place the critical elements of state frameworks, assessments, curriculum adoption criteria, and professional development (Honig, 1990). As other states enact this policy-level focus, they would do well to examine the California situation carefully, as it has evolved. At this point, many of these critical elements are either lost (i.e., the state assessment) or being threatened (e.g., some of the state frameworks). Policies are as good as the politics that helps them get established -- they may have a shelf-life only as long as a current administration.

What is encouraging in California is that the teachers and other educators who have "grown" this reform, not as much from the grassroots but from the developing infrastructure, are keeping the reform alive and well in many locations. The infrastructures are the statewide professional development networks, two of which have been supported through the NSF statewide systemic initiative, the Mathematics Renaissance and the California Science Implementation Network, and others as well, such as the California Subject Matter Projects. The investment in people through professional development that has been made by these projects has created a strong fabric that is resistant to change, people whose teaching can never return to prereform practices, and who can articulate what is important and why. In evaluating the California statewide systemic initiative, we have seen what we call "inside-out" systemic reform, i.e., changes in the system that result because people are changing and are influencing the structures, procedures, and, in some cases, the policies, that guide teaching and learning (Aquarelli & Mumme, 1996). Of the several hundred schools and thousands of teachers who have been touched by the two SSI networks, we have hundreds of examples of network teachers and administrators taking on new leadership

roles within buildings and districts (e.g., teachers becoming principals and curriculum supervisors, principals and teacher leaders becoming assistant superintendent), in their local and state professional associations, and as members of state and local committees whose role it is to make curriculum, assessment, and instructional decisions. We have documented dozens of instances of these mathematics and science initiatives influencing changes in other content areas in schools and districts, the nature of professional development offered by county offices and higher education institutions, and teacher preparation programs, both on campus and in clinical settings. Most interesting, perhaps, is the statewide influence of these professional development networks on assessment and standards development. For example, when CLAS, the new performance assessment system, was canceled by the governor in 1995, a collaborative of districts facilitated by science professional developers was determined to have the kinds of testing program for students that CLAS had offered. Through their collaboration, the CLAS test was revised for use in districts and schools last fall and an NSF-funded project begun at the same time to develop similar tests for the state and other interested systemic initiatives. Another example is the writing of state mandated science standards, taken on voluntarily by the coalition of state professional development projects, once again determined not to lose the essence of the reforms for which they had worked so hard.

Fullan (1993) emphasizes the importance of all educators being change agents, that it takes people to make change. In a newer article (1996) he "turns systemic reform on its head", arguing for the very people-driven networks that we are seeing stay the course of reform in California. California serves as a warning to those systemic initiatives who have relied heavily on their policy initiatives and neglected the building of strong networks dedicated to professional learning at the individual and school level. They say that it takes a village to raise a child; it takes the people in it to educate the child. As California may have been seen early as a prototype for systemic reform, it may also be a proving ground for how to sustain reform when there is turbulence in the system. That people and their traditional strategies last tenaciously through policy changes has been a curse of many reform initiatives. That people, once changed, can in fact remain changed, may turn this curse into a blessing. Professional development may sustain systemic reform when change at the, system level fails.

3. The professional development needed by systemic reform is not the same kind that supported change initiatives in the past.

The new paradigm for professional development that Dennis Sparks first called to our attention in 1994 is not about one-time, one-teacher-at-a-time, expert-driven workshops or institutes far from the teachers' schools and classrooms. Professional development for systemic reform is larger in (1) scale (i.e., it serves more people in a wide variety of roles), (2) scope (i.e., it pays attention to more elements of the system, e.g., curriculum, assessment), and (3) duration (i.e., it is intensive and extends over time). It has many of the characteristics of effectiveness identified through research and in the practice of experienced professional developers, such as collaborative work, expertise derived from research as well as expert practice, an emphasis on content understanding, and continuous evaluation (see a synthesis of the national standards related to professional development by Loucks-Horsley, Stiles, and Hewson, 1996). Further, like teaching, professional development is dynamic Rather than selecting from an established set of models to support professional learning, professional developers who successfully design initiatives in the interest of systemic reform use a decision-making process that involves identifying their goals, understanding their context, and creating a unique combination of specific learning strategies that is tailored to their initiatives. A design model and 16 strategies derived from best practice in professional development design have been articulated by the National Institute for 'Science Education's Professional Development Project (Loucks-Horsley, Hew son, Love, & Stiles, in press).

4. A strong infrastructure and deliberately developed capacity for change are needed to support the people and change the paradigm.

For educators in large numbers to learn about, try out, and maintain changes in their practice requires a support system with a shared vision of teaching and learning, such as those visions articulated for mathematics and science in the national standards (NCTM, 1989; NRC, 1996), but with greater attention to creating shared image, of what the vision looks like in practice -- in the classroom interactions of teachers and students, in instructional materials, in student work and assessments. The support system is staffed by people whose job it is to introduce, facilitate, and support change in the direction of the vision. These people have demonstrated skill in teaching young people as well as the abilities to address the learning needs of adults and build professional networks, both inside and outside of schools, to support ongoing learning (Lieberman & McLaughlin, 1992). They have a keen knowledge of the change process and how to work with people at different stages of change (Hall & Hord, 1987); skills in communication, problem solving, decision making, team building, and time and task management (Fullan, 1991); and the ability to use pressure and support appropriately (Louis & Miles, 1989).

Effective infrastructures build capacity for ongoing change at the local level through design and use of a variety of professional development strategies that help teachers change their practice, through support of collaborative work inside of schools to support individual change and design and implement programs of study, and through building capacity for leadership in various members of the school and community (Friel & Bright, 1997).

5. Professional development must pay careful attention to content knowledge.

With a renewed focus on concept development as a valued outcome of science and mathematics education, teachers are no longer able to "cover" for lack of preparation in the area they teach (which assignment is usually not their choice). Shulman's (1987) work in defining and explicating the term "pedagogical content knowledge" has added a new and critical dimension to professional development. Whereas generic professional development (e.g., learning generic teaching skills such as cooperative learning, effective instruction, and questioning techniques), was a hallmark of the 1980s, we have learned the keen importance of teachers knowing how to teach particular content -- understanding the conceptions students are likely to hold about certain mathematics and science concepts, what students of a certain age are developmentally able to learn, and what examples, analogies, and representations help them learn it. Such knowledge is difficult to learn in preservice education, and is often the province of the experienced expert teacher (Shulman, 1987). This need for learning from a master teacher underlies the use and success of mentor and advising teacher programs (Shulman & Colbert, 1990).

6. Instructional materials can play a critical role in teacher as well as curriculum change.

Most educators think of teaching and curriculum as two different components of the system, but we are quickly learning the power of materials to help teachers learn (Loucks-Horsley et al., in press; Friel & Bright, 1997). Materials developed to teach students important concepts and skills represented in national standards, with teaching strategies that address a constructivist view of learning, help teachers try out new behaviors and experience for themselves what new forms of teaching look and feel like. In particular, searchers can see how these approaches work with students. Two professional development strategies use curriculum materials to support teacher learning (Loucks-Horsley et al., in press). The first is curriculum implementation, in which a set of instructional materials is selected, teachers learn how to use them, try out the materials, reflect on their experiences, and are supported over time to refine their use. The second is curriculum replacement (Burns, 1995), in which teachers try out a unit that embodies new teaching perspectives and strategies, and document and discuss their experiences in order to "try on" new ways of helping students learn. Both strategies promise to influence both how teachers teach and the materials they use to do so.

7. Professional development and organizational development must be inseparable.

The largest professional association devoted to staff development, the National Staff Development Council, defines professional development as involving both individual and organizational development This is because we know that individuals are unlikely to sustain what they learn when their organization does not support them to do so. It is one reason why the "last wave of reform" in science education, which provided opportunities for individual teachers to attend summer institutes away from their schools and districts, fell far short of its potential to change teaching and learning in substantial ways. For teachers to change what they do with their students, the organizations within which they work must change, in two ways. First, their schools and districts must support teachers' changes (e.g., provide materials support and time for collaborative planning and reflection, focus teacher evaluations on the changes). Second, the organizations must themselves become learning organizations, valuing experimentation and collaboration, encouraging deep examination and analysis of teaching and learning, and creating opportunities for extending and enhancing practice (Serge, 1990; Shanker, 1990). Such schools, described by Rosenholtz (1989) as "learning enriched" are characterized by high levels of student as well as adult learning. Without organization development, individual teachers arc unlikely to sustain their learning; with it, not only do teachers learn, but their students do so as well.

What We Need to Know

Professional development is a field in which "definitive research" on what is effective does not exist (Frechling et al., 1995). Like teaching, it is too complex to understand by asking simple questions, it is highly influenced by factors out of control of either the professional developer or the researcher, and its success depends greatly upon the goals and context, which are idiosyncratic to a given situation. The ideas discussed above capture what I believe we know; they have come from a combination of research, literature, and the "wisdom of practice". In each case, we have some evidence, but we need closer study, some more existence proofs (i.e., examples of where and how these things work) to increase our certainty. As works-in-progress, professional development efforts lend themselves to examination. While much can be learned from them to further the education community's understanding of how different factors interact, including the people, the context, and the passage of time, they themselves can benefit from ongoing reflection and feedback. Such examination holds great promise for increasing our understanding of the role of professional development in systemic reform.

As we examine current initiatives, here are some questions I think are important to ask:

1. How can we move from understanding how individual teachers learn and how to help them, to how to support the growth of millions of teachers?

Mathematics educators, in particular, have become very expert at understanding how teachers learn and what can help them (Ball, 1996). Science educators, on the other hand, have increased our understanding about what system components

are needed to improve the potential of success for change (St. John et al., 1994). The issue of scaling up, however, is still perplexing, as articulated well by Elmore (1996). We need to learn from the many systemic efforts currently underway, what mechanisms, strategies, and system elements make learning possible for such magnitude as all teachers in the nation.

2. What are some ways of using scarce resources well, so that teachers have equitable access and opportunity to learn?

It is widely acknowledged that, for teachers to make the changes envisioned in national and state standards, many hours, and so, resources, must be devoted to their learning. Yet by any metric, there are not enough resources available to provide every teacher in this country the opportunities they need. Professional development initiatives could benefit from understanding the effects and trade-offs involved in selecting different strategies, such as teacher leadership cadres, demonstration sites, and regional professional development centers. What resources actually go to professional development and in what various ways have they been focused? What are some examples of leveraging resources and how might they work in different settings? What are the relative advantages and disadvantages of large-scale, less intense strategies, and those that go deep with fewer people? How can leadership development, assessments, and instructional materials broaden the reach and impact of professional development?

3. How do professional developers select among different strategies, what combinations seem to work in what situations, and are particular strategies more useful for particular purposes?

In our current book, we have identified 16 strategies and suggested that they can serve different purposes (Loucks-Horsley et al., 1997). Are there guides to selecting and combining various professional learning strategies?

4. What outcomes can be expected to result from professional development programs, and how can they best be assessed?

This relatively straight-forward question is fraught with pitfalls and subject to a multitude of responses. The demand on educators for accountability dictates that professional development must have something to show for itself beyond participant satisfaction. Yet there are many well regarded arguments for why professional development cannot and should not be examined for its impact on some critical outcomes, e.g., student learning (Hein, 1997). Is this a political question, or can researchers shed some light on the plausibility of drawing relationships between a professional development opportunity and such variables as student learning or teacher behavior change?

5. How can professional development contribute to greater coherence in the educational system?

The recent and ongoing releases of data from the Third International Mathematics and Science Study point to the critical importance of coherence in our approaches and support for teaching and learning. With either no helm or too many, teachers are forced to teach too many things superficially with minimal time for reflection and improvement of their approaches to help students think and learn more deeply. How can professional development help not only teachers, but educators with broader decision-making responsibilities, focus and make critical choices that will ultimately benefit students?

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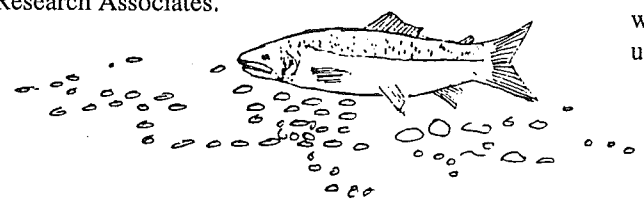

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ILLINOIS SCIENCE LEARNING STANDARDS ROUNDTABLE: QUESTIONS AND RESPONSES

Illinois Science Teacher Association members had the opportunity to reflect upon and respond to some questions about the recently adopted Illinois Science Learning Standards at the 1997 ISTA Convention. As a service to its membership ISTA sponsored a session where participants heard an overview of the Standards and, working either individually or with a small group of colleagues, provided responses to four questions. These questions and participants' responses are provided below.

Question: What do you know about the Illinois Academic Standards? What do you need to know?

Responses: I know they exist. I needed to see them. Now I have them. How will they be assessed?

I have been led to believe that there was no collaboration between the science standards writers and social studies standards writers. How can we write and accomplish a goal related to science, technology and society if we do not involve social studies teachers?

Know: I know what they say. Learned today that the benchmarks are in development. Need to know: How do they relate to IGAP, Prairie State Exam, etc. How stable? How long until we change again? How are they going to be used? Teachers need to know the meaning of some benchmarks.

Question: What do you believe will be the impact of the Standards on your instruction?

Responses: How do you test for inquiry? Need to see the assessment. Validate what we do. Assist teachers/schools in identifying serious gaps or redundancy/duplication in existing curriculum.

Truthfully, probably not much. The assessment may impact the curriculum, but until we see the assessment we will not change what we are doing.

The standards will impact the selection of new materials. The teaching of technological design.

More inquiry-based instruction, constructivism, and integrated teaching methods.

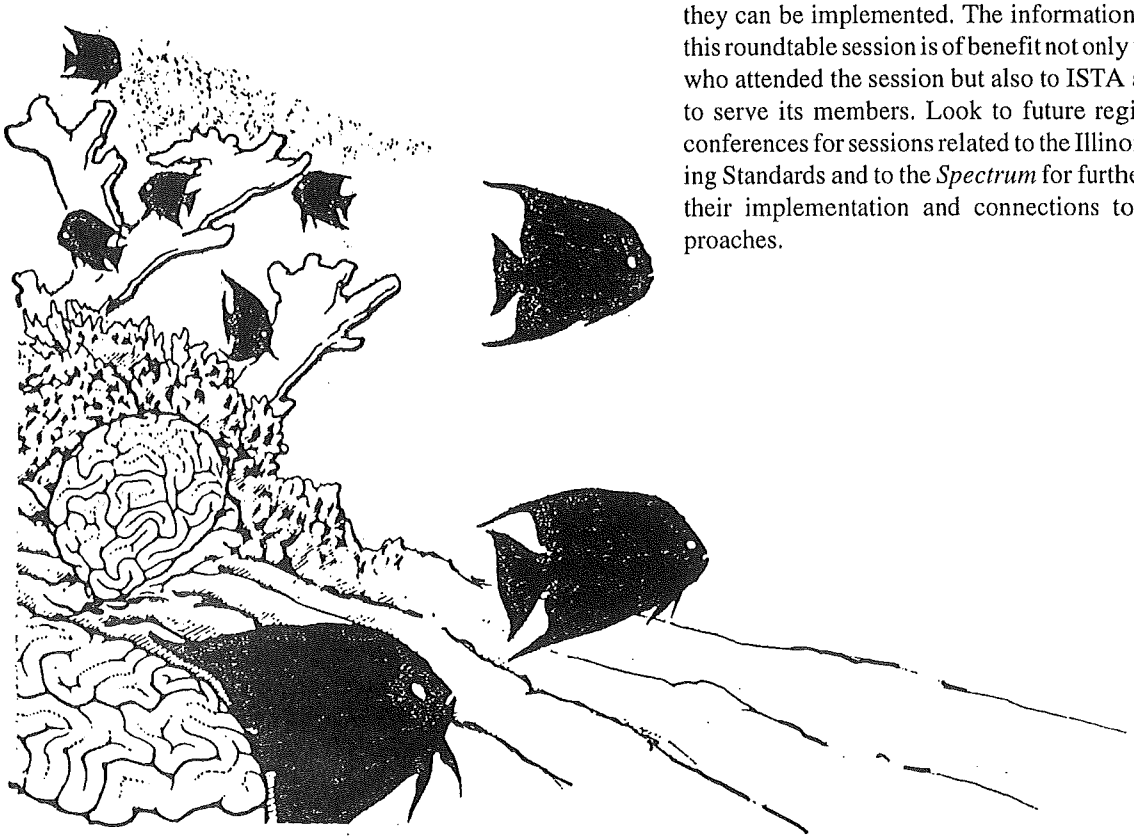
This will depend on how they are used. It may depend on whether the school adopts the standards and whether they are used to develop the IGAP and other tests.

Question: What are you planning to do to implement the Standards in your school / classroom / district?

Responses: We are developing curriculum on the national standards so it sounds like the Illinois standards will also fit.
1) Review existing math and science curricula. 2) Align curriculum with standards.
Align curriculum, align local assessment, provide workshop opportunities on standards.
I have shared them with my fellow teachers.
We have adopted the science standards at the high school level since our local goals-standards were so similar.

Question: What can ISTA do to help facilitate your implementation of the Standards?

Responses: Need to educate all teachers on the standards. Offer workshops with practical examples of how they impact not only content but teaching methods.
Encourage additional staff development opportunities.
Make sure the assessment lines up with the standards. Drop late high school benchmarks from the assessment.
Keep us informed how it all fits together, IGAP, standards Prairie State Exam, etc. Host workshops, meetings, etc. in local areas in order for teachers to share etc.
Provide more information to teachers.
Regional meetings to discuss implementation of these standards! Give districts examples of how they could be implemented.



The participants wrote their responses on worksheets which were collected and read to the large group. A lively and worthwhile dialogue ensued. As can be seen from the responses, participants were aware of the standards and were interested in how they were going to be used, especially in terms of assessment. They wondered about the meaning of some benchmarks and about the integration of social science into the science standards. Respondents recognized the value of the standards in validating curricula and identifying areas of weakness in programs of study. Such information could lead to a changing emphasis on the teaching of scientific inquiry and technological design, integrated curricula and constructivist approaches, and the selection of teaching materials. There was a fundamental understanding that the way in which assessment was connected to the standards would impact the seriousness with which the standards would be viewed. Now that the state standards have been adopted, people see how they have been derived from the national standards, and how they agree with previously established local standards. School systems appear to be more comfortable investing time into aligning curricula with them. This work is beginning to be shared among teachers.

Suggestions to ISTA in regard to influencing further work related to the standards included concerns about the late high school benchmarks and the alignment of assessment with the standards. There appears to be widespread recognition of the importance of professional development in sharing information about the standards themselves and the ways they can be implemented. The information gathered during this roundtable session is of benefit not only to the individuals who attended the session but also to ISTA as it makes plans to serve its members. Look to future regional and annual conferences for sessions related to the Illinois Science Learning Standards and to the *Spectrum* for further information on their implementation and connections to assessment approaches.

MINI IDEAS

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Reprinted from NCSTA TEACHING NOTES

FINDING THE PERCENTAGE OF SUGAR IN GUM

Introduction

This is an activity that I have used for several years with my high school classes, but that can also be used with classes of all levels. It affords students a chance to integrate science and math skills, to ask their own questions and to understand some sources of errors in experiments.

I have used this as an introduction to ideas such as percentages and moles. In my classes, we usually do this activity before we begin our study of the mole and mole calculations, which include things such as the % composition of a compound. An advantage to this activity is that is relatively inexpensive and requires a minimum of supplies.

Materials

Gum (bubble gum and other sugar containing gums are best). You may want to test some sugar-free gum as well. A balance sensitive to .01 grams - in a pinch a scale good to .1 grams can be used with little loss of the "big picture."

Background

To a first approximation the mass of a piece of gum can be considered to be due to gum (which is the material that does not dissolve in out mouths) and sugar, which does. The mass of colorings and flavorings is very small and is ignored in this activity. As a person chews the gum, the sugars dissolve in his/her mouth and the mass of the gum decreases. If the gum is allowed to dry thoroughly, the mass of the sugar in the gum can be determined.

Procedure

1. Have each student obtain a piece of gum (I try to have a wide range, to allow discussion of variances).

2. Weigh the empty wrapper and then weigh the gum on the wrapper (this allows for some discussion of proper weighing techniques). Subtract the weight of the empty wrapper from the second weighing to get the weight of a piece of gum.

3. Chew the gum for about 15 minutes. When it tastes like newspaper, chew it an additional minute or two to be sure that you have dissolved all of the sugar.

4. Place the gum back on the wrapper and let it dry for at least 48 hours. It helps not to wrap the gum up, but merely to let it sit on the wrapper.

5. Reweigh the gum and wrapper. Subtract the weight of the wrapper and you have weight of the gum minus sugar. the difference between the original and final weights of the gum is the weight of the sugar that was originally in the gum.

6. Determine the mass lost due to chewing (which is almost all due to sugar that dissolved in saliva).

7. Calculate the % of the gum's mass that was due to sugar.

Comments

Most students find this a painless (at least until the visit to the dentist) way to learn about percentages. What is interesting is just how close the package information a simple lab such as this can come.

Most packages contain information on the mass of a piece of gum and the mass of the sugar in the gum. This allows the determination of a "theoretical" % sugar to which the "experimental" value can be compared. In my class we also calculate a % error. For example, if, according to the packing label a piece of gum has a mass of 3 grams, and the sugars in the gum weigh 2 grams, then the theoretical % sugar is (2/3) x 100% or 67%. Do not confuse this calculation with the package label which tells the % of a daily requirement/ recommendation.

I usually have my students look up several of the ingredients in the gum. I let them use the Merck Index, and any on-line materials or other reference books. Many of them are surprised by the number of uses a single chemical can have.

As a class project, we then record the final results obtained for each piece of gum. We note the range of values obtained and try to discuss reasons why (Does it matter how long the gum was chewed? how does it matter? What would happen if the gum didn't dry thoroughly? Are all sticks of gum identical? What were the limitations to out measurements and how could we have improved on this?). Data can be graphed and displayed in a variety of forms.

I also use this to let students figure out a way to design their own experiment to figure out a % composition (such as the % water in a fruit or vegetable).

One of the nice things about this activity is the ease with which it can be done and the generally high quality of the results. Percent errors are usually less than 5%. While students are doing their labs (chewing) they can be researching and discussing the sources of error in the experiment and ways to improve on the design of the experiment, or researching some of the components of the gum.

Additional questions for discussion and how they might relate to other topics:
Why does the sugar dissolve? - (solubility, polarity, solubility graphs
What happens if we try this with a gum sweetened with an artificial sweetener?
Could we use another method to extract (remove) the sugar? (try hot or cold water)?
How can we be sure that all of the moisture from saliva has evaporated? (would repeated weighings
over a three or four day period help?)
What would have happened to our results if the moisture from the saliva had not all evaporated?

Sally DeRoo
Dexter, MI
Reprinted from Idea Exchange NMLSTA Newsletter

PURE WHITE CLAY, WOOD GLOO, AND PLAY CLAY

Pure White Clay

This clay can be painted with any type of paint and it will dry at room temperature.
Procedure:
1. Mix 1/4 cup corn starch, 1/2 cup baking soda and 1/4 cup + 3 tablespoons water in a sauce pan and cook over medium heat, stirring constantly. Cook until clay thickens to the consistency of mashed potatoes.
2. Remove from the pan and turn it out onto a plate or into a large bowl. Cover with a damp cloth or paper towels.
3. When cool, knead 4 or 5 minutes. Kneading makes the clay more pliable.
4. Shape clay, then allow to dry at room temperature.
To make a larger batch, use 1 cup corn starch, 2 cups baking soda, and 1 1/2 cups water.

Wood Gloo

This stuff is great as it reacts well to forming, stretching, and keeps for a long time. This is another example of cross-linking the chains of a polymer (glue) with Borax.
Procedure:
1. Mix 2 tablespoons Borax into 1 cup of water. Mix well.
2. Pour 1/4 cup wood glue (Elmer's Wood Glue, liquid) into a container. Gradually add borax solution while mixing with fingers until "goo" starts to gel.
3. When jelled, form into a ball and store in closed container.

Play Clay

Food coloring may be added for variety.
Procedure:
1. Mix 3/4 cup flour, 1/2 cup salt, 1 1/2 teaspoon Alum, 1 1/2 teaspoon salad oil, and 1/2 cup boiling water into a large bowl.
2. Stir together. Knead "dough" until smooth. Store in closed container in refrigerator.

REACTIONS

Nuclear Sciences
Reprinted from *Reactions*
555 N. Kensington Ave.
La Grange Park, IL 60526

RADIOACTIVE LUNCH: CONTRIBUTION OF POTASSIUM-40 IN FOODS AND CARBON-14 TO OUR ANNUAL INTERNAL RADIATION EXPOSURE

Challenge: How much radioactivity are you eating everyday at lunch?
Purpose:
To investigate potassium-40 eaten in our food as a contributor to our average annual internal radiation exposure. To also examine the contribution of carbon-14 to our internal radiation exposure.
Materials:
Potassium Content and Potassium-40 Activity in Some Select Foods Chart — Swoope Journal
Metric (or pound) scale for body weights

Many foods that we eat every day contribute to the internal exposure to radiation we receive. These foods are not irradiated foods. They are naturally radioactive.

Two common elements (carbon and potassium) contain naturally occurring radioactive isotopes. Whenever there's carbon, there's carbon-14. Wherever potassium is found, potassium-40 is always found. These elements are essential and necessary for a proper diet and continued good health. These two elements are also found in most of the foods we eat and cannot be avoided.

Potassium-40 is a beta emitter, releases a beta particle, as it transforms into a stable calcium-40 atom. Potassium-40 has a half life of about 1 billion years and has been present since the formation of the earth. Potassium-40 enters the food chain through its uptake by plants from the soil. Potassium-40 contributes about 18 millirem to our average internal radiation dose.

Potassium's chief function is to control cardiac function and muscle and nerve irritability. The dietary intake of potassium must be adequate to maintain electrolyte balance in the body.

1. The radioactive potassium-40 in your body disintegrates at about 60 disintegrations per second per kilogram of body weight (60d/sec/kg).

a. Have the students record their weights in kilograms (kg). If a scale is not available, the students will have to estimate their weights. Pounds can be converted to kg (e.g, weight in pounds /2.2kg/LB = weight in kg)

b. How many d/sec are you giving off for a person your weight? (e.g., Weight in kg x 60 d/see/kg = d sec from your body)

2. Our body weight is about 23% carbon, which we get from from the food we eat. Part of the carbon is always radioactive carbon-14. Each kg of your body weight gives off about 52 d/sec/g of body weight.

a. How much of your body weight is made of carbon? (e.g., Body weight in kg x 0.23 = amount of carbon in kg)

b. What is your disintegration rate for carbon-14? (e.g., kg of carbon in body x 277 d/sec/kg = d/see due to carbon from your body).

3. What is the combined d/sec from your body due to potassium-40 and carbon-14?

4. Because of this amount of internal radiation, should you eliminate potassium and carbon from your diet? Would this be a good idea? Why or why not?

COMMON USES FOR SOME RADIOACTIVE ISOTOPES

Americium-241
- Used in many smoke detectors for homes and businesses
- Ensures uniform thickness in rolling processes like steel and paper production
- Helps determine where oil wells should be drilled

Calcium 47
- Important aid to biomedical researchers studying the cell function and bone formation in mammals

Californium 252
- Used to inspect airline luggage
- Used to gauge the moisture content of soil in road construction and building industries
- Used to measure the moisture of materials stored in silos

Carbon-14
- Helps in research to ensure that potential new drugs are metabolized without forming harmful by-products

Cesium 137
- Used to treat cancers
- Used to measure correct patient dosages of radioactive pharmaceuticals used to measure and control the liquid flow in oil pipelines
- Ensures the right fill level for packages of food, drugs and other products (The products in these packages do not become radioactive)

Cobalt-57
- Used in nuclear medicine to help physicians interpret diagnosis scans of patients' organs, and to diagnose pernicious anemia

Cobalt-60
- Used to sterilize surgical instruments
- Improves the safety and reliability of industrial fuel oil burners
- Preserves poultry, fruits and spices

Copper-67
- When injected into monoclonal antibodies into a cancer patient, helps the antibodies bind to and destroy the tumor

Iodine-131
- Used to diagnose and treat thyroid disorders (Former President George Bush and Mrs. Bush were both successfully treated for Grave's disease, a thyroid disease, with radioactive iodine.)

Krypton-85
- Used in indicator lights in appliances like clothes dryers, washers, stereos and coffee makers

Plutonium
- Has safely powered 20 NASA spacecraft since 1972

Strontium-85
- Used to study bone formation and metabolism

Technetium-99
- The most widely used radioactive isotope for diagnostic studies in nuclear medicine. Different chemical forms are used for brain, bone, liver, spleen and kidney imaging and also for blood flow studies.

Tritium
- Used for life science and drug metabolism studies to ensure the safety of potential new drugs
- Used in self-luminous aircraft and commercial exit signs
- For luminous dials, gauges and wrist watches
- Used in the production of luminous paint

Uranium-234
- Used in dental fixtures like crowns and dentures to provide a natural color and brightness

Uranium-235
- Fuel for nuclear power plants and naval propulsion systems
- Used to produce flourescent glassware, a variety of colored glazes and wall tiles

Harry Manos
Schurr High School
820 N. Wilcox Avenue
Montebello, CA 90640
manos_harry@montebello.k12.ca.us

CONTOUR MODELING: A STUDENT ACTIVITY IN GEOSCIENCE

Many students have problems looking at a two-dimensional drawing and visualizing the three-dimensional object it represents. This problem is particularly true with contour maps of mountains, oceans and valleys. Lines are all bunched up or pinched together in one place but spread apart in others. What does it all mean? In general, contour lines that are close together represent steeper slopes. Lines that are farther apart represent more gentle slopes.

There is a way to help students visualize the concept of contour lines by having them make three-dimensional models represented by such lines. For my ninth grade Science 1-2 classes, where we teach an earth science and geology component, I devised such an activity that can be completed in two or three class periods. The cost is low, since all that is required is paper, some pieces of cardboard, scissors, rulers, marking pens, pencils and glue.

Day 1. On this day I place the contour lines shown in Figure 1 on the overhead projector. (You can make an overhead transparency directly from Master 1 for your own use.) Explain that the contour lines shown are of a "small" mountain and that you are going to show how the side view of the mountain looks by using the grid at the bottom of the figure. That is, it will show what the mountain would look like if you were to cut away the mountain along line A-B.

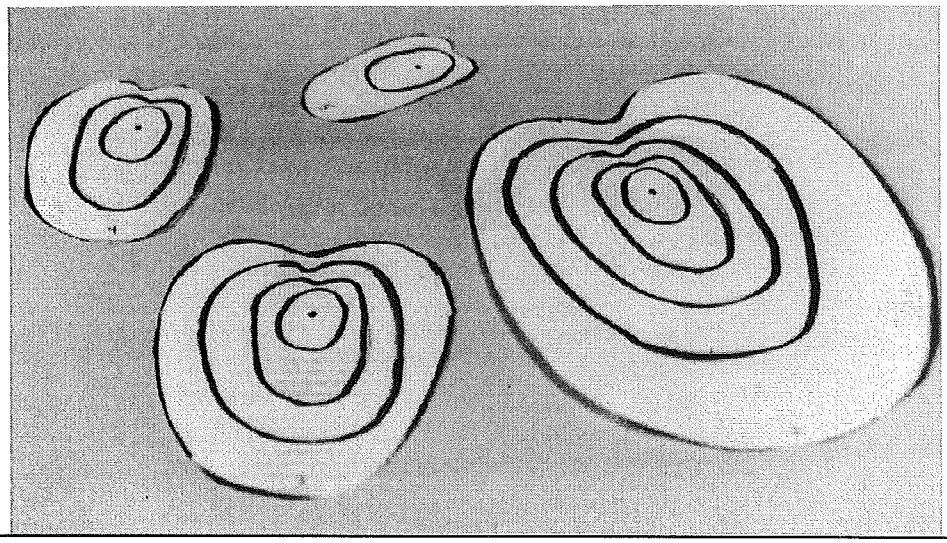
To accomplish this, you construct parallel, vertical lines from each point where the line A-B crosses a contour line to the grid below. That is, starting at the left of the contour-line diagram, draw a line from the point where the line crosses the first contour line (representing an elevation of 20 feet) straight down to the grid and the horizontal line labeled "20." Make a dot on the grid where that vertical line touches the horizontal line labeled "20." Continue drawing vertical lines as you progress from left to right along line A-B. (See Figures 2 and 3 for clarification.) You will end up with a set of eight dots marked on the grid.

To complete the drawing, connect the dots with a smooth curve representing the mountain, Notice that the contour lines represent 20-foot intervals. The top of the mountain (between the two dots representing 80 feet) will in reality not likely be a flat surface, so take the liberty of drawing a curve there. However, note that it will be below the 100-foot mark since there is no contour line representing 100 feet. (See figure 4) It should be obvious that, as you lead the students through this activity, there are ample opportunities to draw them into the discussion, especially when it comes to representing the top of the mountain.

When the drawing is completed, the students will see two views of the mountain, one from the top and one from a side-view cut along line A-B. But what does the whole mountain look like?

Distribute copies of the contour diagram shown in Master 2. Students are then directed to carefully cut around the outermost (largest) contour, which represents an elevation of 20 feet. These become templates around which the students trace lines on pieces of thick cardboard (cardboard box thickness). These contour diagrams are then carefully cut from the cardboard. Each student is directed to cut the second contour (the contour line representing 40 feet) out of the original contour 20 diagram. This new outline will then be used to create cardboard contours representing 40 feet. This process is continued, working from the largest to the smallest contour diagram.

Photo 1



Remembering that the contours represent 20-foot intervals, each cardboard thickness will represent 10 feet of elevation. This means that the students need to cut two cardboard sections for each contour.

Students must carefully cut the cardboard to exactly match the template outline, following the smoothness of the contour lines. Since the cardboard is difficult to cut, students may have to make short cutting strokes with the innermost part of the scissors.

This is usually as much as my students can accomplish in a single class period. I have them write their names on everything they have done and place their sections and cuts into low-cut, flat boxes that one can often find in markets and liquor stores - they are ideal for this type of collection and storage.

Day 2. I begin this period by having the students finish cutting the contour sections out of cardboard. Each student will have two pieces per contour, each exactly corresponding to the drawings they began with on the first. (See photo 2.)

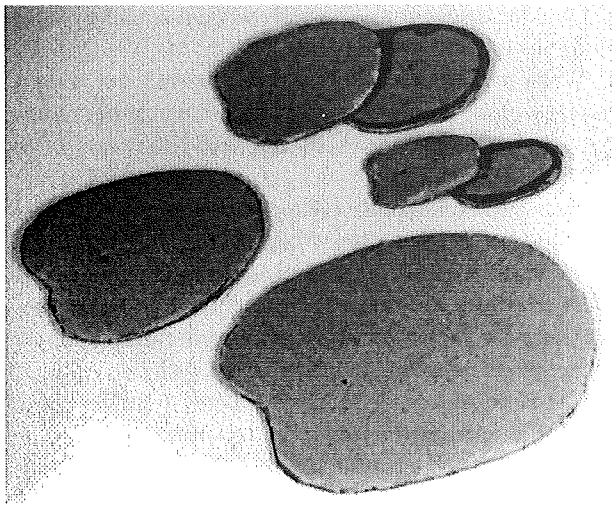


Photo 2

Students are now directed to stack the pieces exactly as they appear on the drawing and glue them together. As mentioned above, since each cardboard represents 10 feet, the pieces need to be glued in pairs to provide the 20-foot elevation per contour. Notice that the model is not symmetrical because the top piece is slightly rotated. When finished, the model should be mounted onto a larger square piece of cardboard on which the students can write their names and record information. (See photo 3.)

The students now have a three-dimensional model of the mountain that only a day ago was a flat bunch of curved lines. I have students use the model to show (a) where there are steep cliffs that may be hazardous for hiking, (b) a route for hiking representing the easiest path; that is, a gentle slope with no cliffs, and (c) a place where erosion has likely occurred, possibly a wash, and where one would avoid in the event of rain. (See photo 4.)

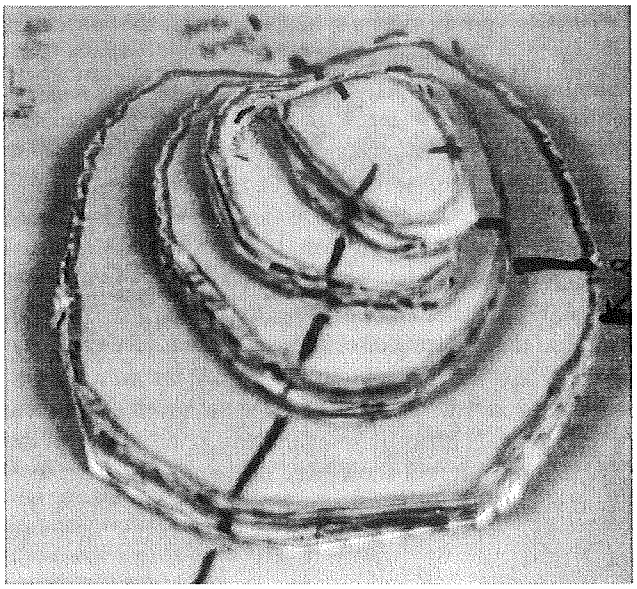


Photo 3

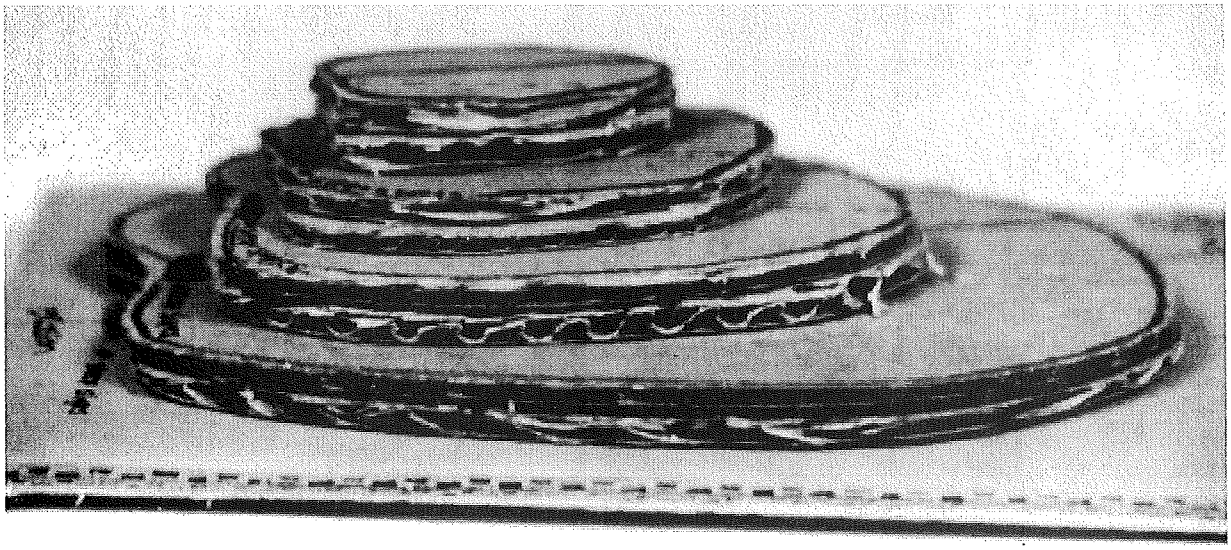


Photo 4

If students outline each contour level with a black felt-tip marker, as shown in the photos, a view from directly overhead will appear the same as the contour map on paper. Looking at the side view will give a view similar to the one drawn on the grid. Placing several models side by side on a table will represent a mountain range, both from above and from the side. (How can these be used to represent a large canyon, like the Grand Canyon?)

This finishes the second day of the activity. Depending on the general ability of the class and the time you have available, the above two-day activity can be spread over three days. Day one would be limited to the discussion of the overhead transparency and the teacher would explain how to cut the contour lines and trace them onto cardboard. Day two would be for drawing and cutting templates. Day three would be for assembly and the identification of features.

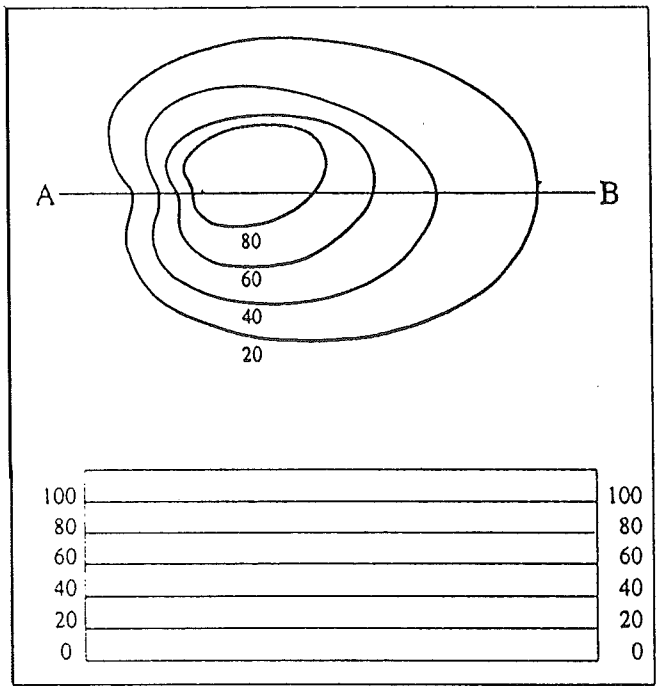


Figure 1

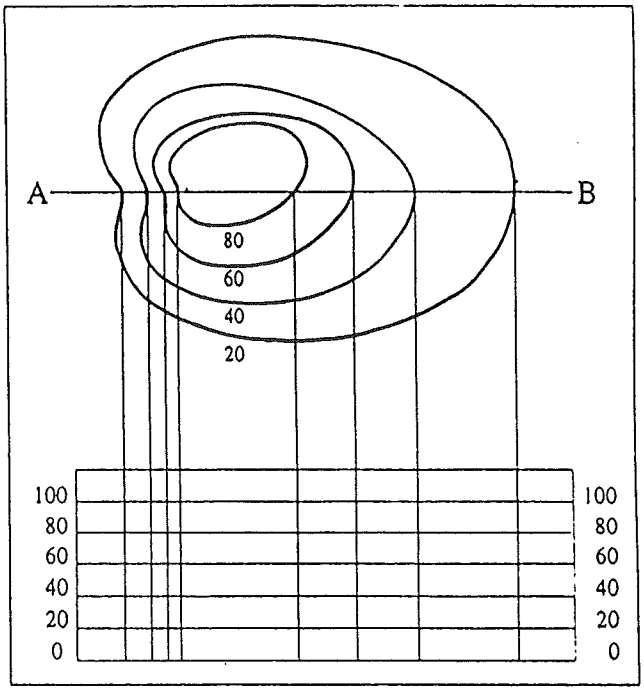


Figure 2

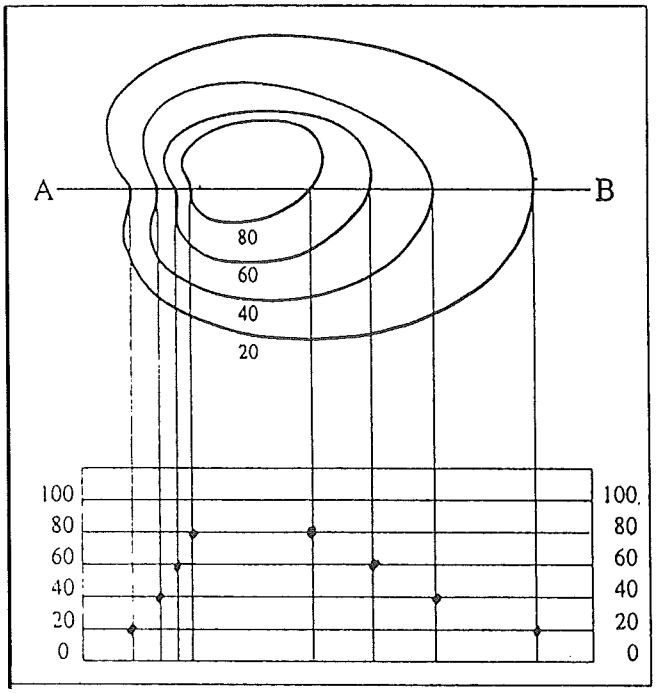


Figure 3

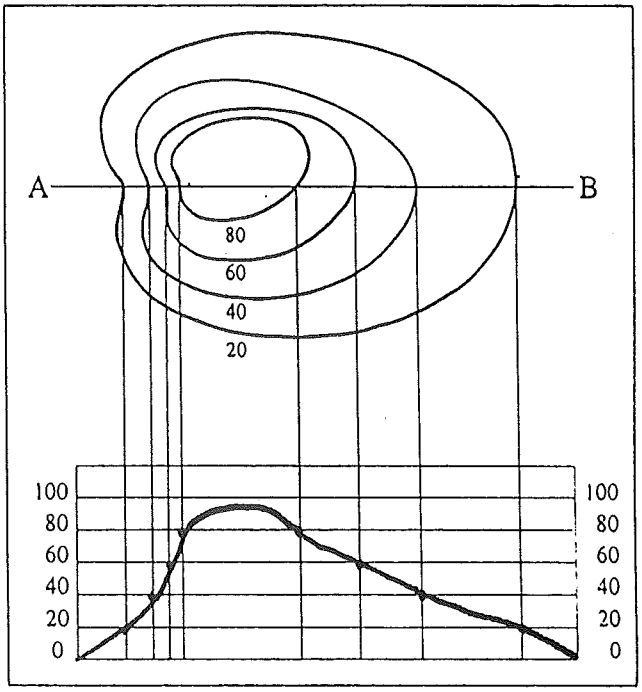


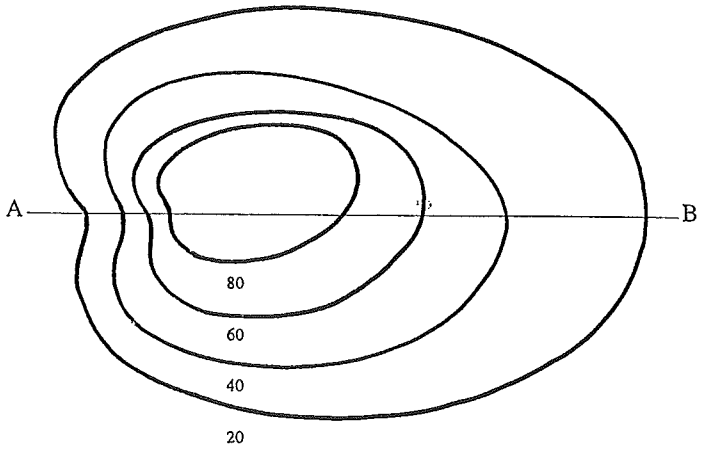
Figure 4

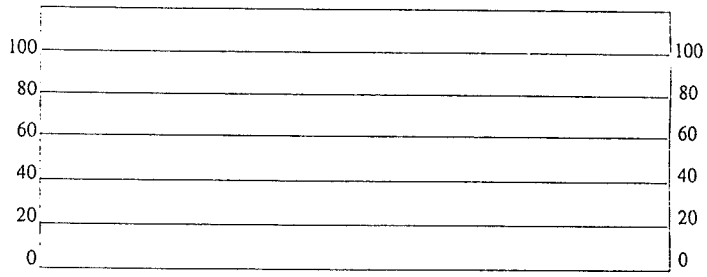
There are many other activities that may be generated from this type of modeling. If clay is available, the cardboard models can be covered and the stair steps filled in. The smooth surface will give a much more realistic and accurate representation of what the mountain really looks like. If different-colored cardboard is used for the layers, a cork borer can be used to take core samples of the mountain after it has been assembled. The core samples can be used to date the layers of the mountain by colors. The mountain can be more complicated, and one can make valleys, ocean or lake bottoms, craters, scarps, and so on. In fact, the modeling does not have to be limited to geologic features. One can model buildings, cities, cars, and the like.

Use your imagination and creativity as a teacher to plan an activity that your students will not only enjoy, but will use to gain an understanding of the concept of contour mapping.

CONTOUR

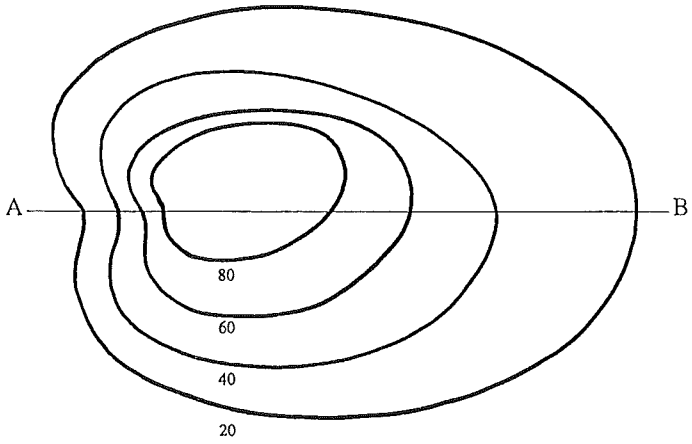
Name _____
Per.____ Date_____





MASTER 1 for Transparencies

CONTOUR TEMPLATES



MASTER 2 for Contour Handouts

K-12 MATH AND SCIENCE TEACHERS!

Are you an outstanding K-12 mathematics or science teacher? Do you implement new, standards-based curricula in your classroom? Do you engage your students in active, hands-on learning? The **Presidential Awards for Excellence in Mathematics and Science Teaching** (PAEMST) Program, run by the National Science Foundation (NSF), is soliciting entries for its 1998 awards cycle. Four teachers from the state of Illinois will be chosen. The Presidential Awards for Excellence in Mathematics and Science Teaching includes.

- a $7,500 National Science Foundation grant to the awardee's school;
- generous educational gifts form private sector and professional organization donors; and
- recognition events in Washington, DC, including awards ceremonies, Presidential Citations, workshops, and meetings with government and education.

The program recognizes teachers from all locations and all underrepresented minority groups. The awards are given in the categories of elementary mathematics, secondary mathematics, and secondary science.

To apply, you must complete an application. Brochures were sent to all Illinois public and private elementary and secondary schools. To request an application packet, contact Gwen Pollock, Illinois State Board of Education, 100 N. First Street, Springfield, IL 62777-0001
217-782-2826, FAX 217-785-9210
e-mail [GPOLLOCK@spr6.isbe.state.il.us].
Include Name, grade, school name and address, and school phone number.

The deadline for receipt of all completed application packets is February 27, 1998.

Some past Illinois winners (photos top to bottom of page):

Janet Kathleen Bakewell, Varna Grade School, Varna

Jannean Marie Muehlfeld, William Holliday Elementary School, Fairview Heights

Carolyn T. Phillips, Dallas Community Elementary, Dallas City

OPPORTUNITIES

ZPG Population Education Program
1400 16th Street, NW, Suite 320
Washington, DC 20036

The POP-TV Essay Contest

To mark the importance of world population reaching six billion people in early 1999, Zero Population Growth invites students in grades 9-12 to write a plot for an episode of a current television show featuring the birth of the six billionth person!

Students . . .

- will combine research and creativity in this fun writing project!
- will learn more about the potential for television to inform as well as entertain!
- can win $500 (1st prize) or $250 (2nd prize)! ($1,500 in all! Separate categories for 9th-10th grade and 11th-12th grades)

Teachers . . .

- will stimulate student interest in research and creative writing with this innovative writing project!
- will discover interdisciplinary activities that meet standards in language arts, social studies and science!

The POP-TV Essay Contest is. . .

a writing contest sponsored by Zero Population Growth to celebrate its 30th anniversary, and to mark the importance of world population reaching six billion in early 1999. High school students are asked to write an original plot description for an episode of a current television show featuring the birth of the six billionth person. The show can be any currently running drama or comedy show (and not just those featuring aliens!). All entries should be 1,500 words or less, and must be received at our office by MARCH 1, 1998!

Judges include . . .

Professional screenwriters and leaders from the fields of media, education and population.

Prizes are . . .

$500 each for two first-place winners, one for grades 9-10 and one for grades 11-12

$250 each for two second-place winners, one for grades 9-10 and one for grades 11-12

Zero Population Growth is a national, non-profit membership organization founded in 1968 which works to educate the public about the need to bring human population into a sustainable balance with the environment and the Earth's resources. ZPG's Population Education Program provides quality teaching materials and training workshops for K-12 teachers nationwide.

ATTENTION PHYSICS TEACHERS

Constructing Physics Understanding in a Computer - Supported Learning Environment
Columbia, Missouri
June 22 - July 3, 1998

The Southwestern Bell Science Education Center at the University of Missouri-Columbia will be sponsoring a summer program for high school physics teachers. The Constructing Physics Understanding in a Computer - Supported Learning Environment (CPU) is a funded project by the National Science Foundation. The CPU Project developed at San Diego State University, designed an innovative set of materials that combine software components for physics simulations with a constructionist orientation. The CPU project materials are compatible with the Missouri Science Framework and National Science Education Standards.

During the summer of 1998, a two-week workshop will be conducted on the University of Missouri campus with a one week follow-up workshop during the summer 1999. The focus of the workshops will be to introduce participating physics teachers to the CPU materials. The project staff have received extensive training by the CPU development staff and were selected to conduct these workshops.

Project staff includes Dennis Nickelson and Ron Frederick, master physics teachers at Jefferson City and Columbia schools respectively and Lloyd Barrow of the University of Missouri. All three have extensive experience working with science teachers. Both Ron and Dennis are Physics Resource Teacher Agents sponsored by a grant to the American Association of Physics Teachers. Currently, Lloyd serves as the elected research director of the National Science Teachers Association. Collectively they have conducted more than 400 sessions on varying science topics for teachers.

The focus of the 1998 summer program will be

- Use of computer and simulators
- CPU instructional strategies
- Light and color
- Current electricity
- Underpinnings

During the 1998-99 school year, participants will field test at least one of the CPU units and submit a report of their field test. During the summer 1999 follow-up, participants will share their experiences, refine their skills in using CPU pedagogy and materials, and become acquainted with other CPU units.

Funding sources will be solicited to provide this intensive program tuition free with room and board. Applicants must be within a 250 mile radius of Columbia, MO.

If you desire more information contact Lloyd H. Barrow Southwestern Bell Science Education Center, 109 Townsend Hall, University of Missouri, Columbia, MO 65211, e-mail cilhb@showme.missouri.edu

PLAN-IT EARTH TAKES TEACHERS OUT OF CLASSROOM, INTO ENVIRONMENT

High school teachers from around the state came forward this summer and forged a new compact with their students, one in which they will not only be learning science, but doing it. Leading the way from the classroom and into the field, nearly 200 teachers from different high schools throughout Illinois participated in PLAN-IT EARTH (Pairing Resources, Trends, and Habitats), a new teacher training initiative developed in partnership with the Illinois Department of Natural Resources, the Illinois State Board of Education, and the National Science Foundation. The project offered training in field-based monitoring protocols designed to document the health of a range of natural ecosystems. curricular materials for classroom activity modules were developed to extend and supplement the monitoring exercises.

Enthusiasm for the program is high. "Outstanding! Meaningful application of science! These descriptions echoed from all the teachers of the PLAN-IT EARTH project as they expressed their exhilaration with both the training and the possibilities of being involved in the program," says Dr. Marylin Lisowski, coordinator of PLAN-IT EARTH project and a Professor of Education at Eastern Illinois University.

Instructional Institutes were offered in June and July throughout the state. Six regional offerings engaged highly skilled and energetic science teachers in both field and classroom activities that centered on Illinois ecosystems.

PLAN-IT EARTH serves as the teacher-training component of EcoWatch, a volunteer environmental monitoring program developed by the Illinois Department of Natural Resources. EcoWatch programs allow volunteers to assist in the collection of scientific data on a variety of natural ecosystems. Stream ecosystems are monitored through the Illinois RiverWatch network, the first EcoWatch program to be implemented. ForestWatch, which focuses on forest and woodland ecosystems, is the second being instituted. WetlandWatch, PrairieWatch, SoilWatch, and UrbanWatch programs will also be introduced. EcoWatch programs provide the Department of Natural Resources with comprehensive environmental information to supplement professional scientific databases. The project is part of a long-term, statewide effort to measure the health of Illinois ecosystems. Once trained, participants are expected to involve their students in field-based monitoring projects during the following school year by collecting volunteer data for the Critical Trends Assessment Project.

With the launching of PLAN-IT EARTH, students and teachers alike will now be able to encounter the unknown armed with the proper scientific tools and methods necsesary to work and study in the living laboratory of the Illinois environment.

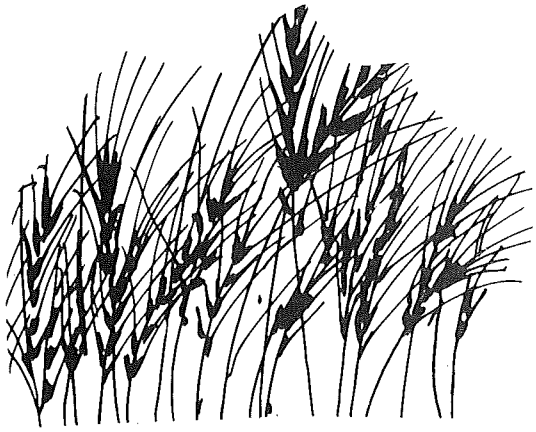
For additional information, contact
Dr. Marylin Lisowski
600 Lincoln Ave.
Charleston, IL 61920-3099
217-581-5728 phone
217-581-2518 fax
e-mail: cfmfl@eiu.edu
website: http://dnr.state.il.us/nredu/plan-it/planlay.htm

TUFTS UNIVERSITY

Deadline: February 1

The Wright Center is inviting applications for its year long fellowship in residency for secondary teachers of science. This fellowship offers teachers time to pursue projects related to their fields while in residence at Tufts University in Medford, MA. A $35.000 salary plus benefits through Tufts University and a moving stipend are part of the package. The dates of the fellowship are September 1, 1998-June 30, 1999.

For applications contact: Ronnee Yashon, Educational Coordinator, Wright Center for Science Education, Tufts University, 4 Colby St., Medford, MA 02155.
617-628-5000 x5394,
email: ryashon@emerald.tufts.edu. fax: 617-627-3995
Or consult our web page for more information at:
http://www.tufts.edu/as/wright_center/index.html.



SUMMER SCIENCE IN ENGLAND

The University of North Carolina at Asheville (UNCA) conducts a four week summer comparative science education program through the cooperation of the College of Education of the University of Bath, England, From June 30 to July 28, 1998. U.S. science teachers can visit English classrooms that are still in session and attend lectures on the historical development of the British Education system and on global environmental problems. Field trips to areas of special educational interest and participation in seminars related to international science education issues are also part of this program.

Any person who is or has been involved with science education, K-12, is eligible. The $1,950 fee covers tuition and housing, which will be on the University of Bath campus.

Spouses an/or independent adolescent child of the participant also may attend, at a cost of $975.

For more information and to receive a brochure, contact Dr. Gary Miller, UNCA, One University Heights, Asheville, NC 28804-3299 (704)232-5184 (days), and (704)891-9595 (evenings). The registration deadline is April 15, 1998. Applications will be accepted until the course is filled.

KTCA
Twin Cities Public Television
172 East Fourth Street
Saint Paul, Minnesota 55101

Newton's Apple, public television's premier family science show, is looking for middle school science teachers to field test portions of a new collection of multimedia science units. Field testing will run from February through early April 1998. Each field test site will have four weeks to complete the test. Actual testing could be complete in less than one week.

The field test involves classroom use of a single unit from the *Newton's Apple Multimedia Collection.* Each unit has three hands-on activities that integrate video clips from the *Newton's Apple* television program. The product development team wants teacher input to help make the product highly user friendly.

Topics include physics, health/life science, earth science, and sports physics. Teachers who successfully complete the field test will have their names listed in the credits of the published product. They will also receive a one-hour *Newton's Apple* video, a copy of *Newton's Apple Multimedia Collection* after it is published, and teachers' guide containing hands-on activities.

Interested science teachers in grades 6-9 are encouraged to contact David Heath, Curriculum Development Manager, at *Newton's Apple* as soon as possible.

1999 ILLINOIS COAL CALENDAR CONTEST

Earn dollars and "sense" from your words and pictures about Illinois Coal! 5th and 6th graders in Illinois have a great opportunity to learn mor about our state's most abundant energy resource, COAL, while competing for $50 prizes in the tenth coal art and essay contest sponsored by the Illinois Department of Commerce and Community Affairs' Office of Coal Development and marketing. The contest is designed to highlight the heritage and importance of Illinois coal and coal mining. Home room teachers of winning students ill receive maps of the coal industry in Illinois and classroom copies of the 1999 calendar in which the winning artworks and essays are displayed.

Entry Requirements

Entries should express, in art or essay, the impact of coal on everyday life in Illinois communities. Artwork and/or essays with completed forms must be received no later than **March 6, 1998.** Each classroom that submits at least one entry will receive a complimentary calendar.

For more information, contact:
DCCA Office of Coal Development and Marketing
Attn: Coal Calendar Contest
325 West Adams Street, 3rd Floor
Springfield, IL 62704-1892
217-782-6370.

ADLER KICKS OFF A NEW VOLUNTEER INTERPRETER PROGRAM

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- Become a personal tour guide to exhibits and distant galaxies while dazzling visitors with scientific tales and cosmology.
- Spark visitors' interests through story-telling, scientific demonstrations, and craft activities.
- Only 8 hours each month is needed to invest in the invaluable experience!
- You will meet new and interesting people, receive training in facilitating group activities, discounts in the Cafe and gift shop, and many more benefits!

For more information, call Hannah Katz, Assistant Volunteer Coordinator, at 312-322-0514 or e-mail Hannah_Katz@orbit.adler.uchicago.edu

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During each special week, scientists and engineers form Johnson Space Center provide special sessions that allow students to see some of "the real stuff". From a real Mars meteorite to robots arms, students will have a chance to experience the future!

February 9-13 - Roberts in Space Week
Want to work a robotic arm? Now's your chance during this exceptional week of "hands-on" robotic equipment and materials.

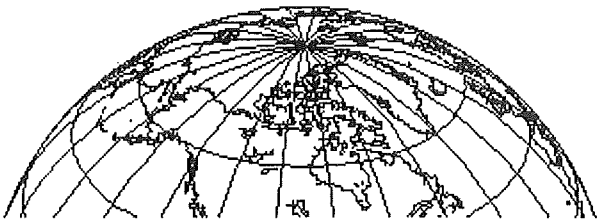
February 16-20 - Careers in Space Week
Find out what lies ahead for the future of the space program and for your students during this week.

March 23-27 - We Have Liftoff!
What do Newton's Laws and space travel have in common? Come during this week and learn about rocketry, propulsion, and physics of space flight.

April 6-10 - Living in Space Week
What happens to the human body and mind during prolonged periods of weightlessness? Come during this week and find out!

April 20-24 - Spinoffs Week
Prepare to be amazed at all the way the space program benefits our everyday lives.

MEETINGS AND WORKSHOPS



Exploring Your Options

WYSE Summer Programs

Session I—June 14-26, 1998
Session II—July 12-24, 1998

Sponsored by the College of Engineering
University of Illinois at Urbana-Champaign

Worldwide Youth in Science and Engineering
Tomorrow's Careers in Science and Engineering

Lectures/Labs
Professors from each engineering department will explain all aspects of study and work in their fields. Many departments schedule demonstrations and hands-on labs to complement their presentations.

Opportunities
Through personal visits and projects, students will explore their interests in engineering. They will also be given an opportunity to sharpen their skills in computer-aided design and drafting (CADD).

Career Project
All participants will use the internet to explore careers of interest.

Teamwork
Participants will work in teams for both athletic activities and project design.

Round Table Discussions
Round table sessions will allow participants to sample the experiences of undergraduate engineering students and professional engineers.

Financial Aid
Financial aid is available based on need.

Minority Scholarships
African American, Latino, and Native American students can apply for the MITE (Minority Introduction To Engineering) scholarships which cover the full cost of the program.

Staff
The administrative staff of the program includes a director and at least four full-time counselors. The academic staff is made up of faculty members and undergraduate and graduate students of the university.

Supplies
All necessary supplies for the program will be issued on the first day of class.

Expenses
The program fee is $450. This fee covers tuition, supplies, room and board, and scheduled activities.

Insurance
Participants will be covered by accident insurance during the course of the program. Coverage will provide benefits, up to the policy maximum, for necessary medical treatment of accidental injury.

Housing and Recreation
Participants will live and take their meals in a university-approved residence hall. Recreational facilities of the university are open to all participants. A modest fee is required for some activities.

Concluding Banquet
Parents, family members, and friends are invited to attend the closing banquet, held on Friday at noon, at their own expense.

Procedure for Applying
Call 1-800-843-5410, e-mail d-powell@uiuc.edu, or mail this form to WYSE (be sure to attach the proper postage). We will send you an application form within five working days. You may also use our web site at:
http://www.engr.uiuc.edu/WYSE/

Application Deadline
Session I - May 15
Session II - June 1
David L. Powell
University of Illinois at Urbana-Champaign
WYSE
207 Engineering Hall
1308 West Green Street
Urbana, IL 61801-2982
1-800-843-5410
d-powell@uiuc.edu

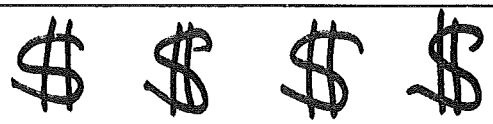
WYSE
Worldwide Youth in Science and Engineering

Illinois State University
Campus Box 5560
Normal, IL 61790-5560
309-438-2610 or e-mail: tshayne@rs6000.cmp.ilstu.edu

THE CONNECTIONS PROJECT

The Connections Project at Illinois State University has announced dates for ***Connections '98 Conferences*** to be held at the Pheasant Run Resort in St. Charles, April 21-22, 1998, and the Crowne Plaza in Springfield, June 11-12, 1998. These conferences are designed to assist postsecondary, secondary, elementary and university educators, and business and industry representatives who are planning and implementing Education-to-Careers and Tech Prep programs. These conferences are sponsored by the Illinois State Board of Education, the Illinois Community College Board, and Illinois State University.

Participants will have the opportunity to attend a variety of break-out sessions showcasing Education-to-Careers innovations presented by educators from Illinois and throughout the United States. Exemplary curriculum designs, instructional methods, career guidance processes and administrative strategies will be highlighted. Confirmed keynote speaker Mary Fisher will present for the St. Charles conference on April 22, 1998. For registration information contact the Connections Project at 309/438-2610.



LOOKING FOR A BARGAIN?

The Fisher Science Education warehouse has an area filled with overstocks and discontinued items for science teachers.

Biology: microscopes, microvideo systems, models, incubators, desktop sterilizers and W Trans-illuminators

Physics: power supplies, Wheatstone bridges, Helium-Neon lasers, meters and light boxes **Chemistry**: electronic and mechanical balances, safety videotapes, bioreactors and molecular models **Furniture**: student service centers for four students

Quantities of some items may be limited, so act now for the best selection. For your copy of the current list of *almost 2000 items all at bargain prices,* call or write:

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AWARDS AND RECOGNITION

Dr. David M. Collard
School of Chemistry and Biochemistry
Georgia Institute of Technology
Atlanta, GA 30332-0400
(404) 894-4026

1998 POLYMER TEACHING AWARD

The Polymer Education Committee (POLYED) of the American Chemical Society (a joint committee of the Polymer Chemistry Division, Inc., and the Division of Polymeric Materials: Science and Engineering) has announced details of the 1998 Award for Excellence in Polymer Education by a High School or Junior High Science Teacher. The award is sponsored by the Dow Chemical Company Foundation.

This award recognizes the efforts of high school and junior high school teachers who help students meet the challenges and responsibilities of living in a technological age and who encourage students to consider careers in science and engineering. Awards are based on the applicants' innovative use of classroom and laboratory activities to promote understanding of polymer chemistry and its role in the everyday lives of students, and the applicants' outreach activities to encourage other teachers to explore polymers with their students.

POLYED will recognize the national award winner at an American Chemical Society national conference. Award winners receive a travel grant to attend national chemistry and teacher conferences, a plaque, a cash prize, and a set teaching materials for use in the classroom. Applications for the 1998 award are available from Kathy Wingate, School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, Georgia 30332-0400, and will be accepted until **April 1, 1998.**

ISTA Members Win 1997 Award for Excellence in Polymer Education

Mara Paich Grujanac and Elyse Futterman
Bernard Zell Anshe Emet Day School, Chicago, Illinois

Mara Paich Grujanac and Elyse Futterman (AKA "Dr. Monomer" and "Dr. Polymer" in their science classroom) have introduced a hands-on polymer unit into their 6th through 8th grade classes. A number of independent polymer-related activities have been developed which they teach over a ten day period. They have participated in ISTA and NSTA conventions and a DuPont-sponsored teachers workshop. Congratulations!

Carl Koch
Riverside/Brookfield High School
First Avenue and Ridgewood Road
Riverside IL 60546

NABT AWARDS AVAILABLE

Outstanding Biology Teacher Award

Each year this program recognizes an outstanding biology teacher who has at least three years teaching experience. OBTA recipients receive binoculars form the award sponsor, Prentice-Hall, biology equipment from Leica, and are honored at the National convention. The nomination deadline is February 1, 1998.

NABT Middle School TEaching Award

The winner receives a Power Macintosh computer from the award sponsor, Apple Computer, Inc., a recognition plaque at the NABT National Convention, and a one-year complimentary NABT membership. The nomination deadline is March 15, 1998.

Award for Excellence Equity

Sponsored by Science Kit and Boreal Laboratories and NABT's Role and Status of Women in Biology Education Section, the Award for Excellence in Encouraging Equity recognizes efforts by biology educators to encourage, promote, and strive for equity in the educational community. The award includes a plaque and honorarium. The nomination deadline is March 15, 1998.

Honorary Membership

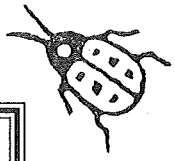
Lifetime membership awarded to individuals who have achieved distinction in teaching research, or service in the biological sciences. The nomination deadline is May 1, 1998.

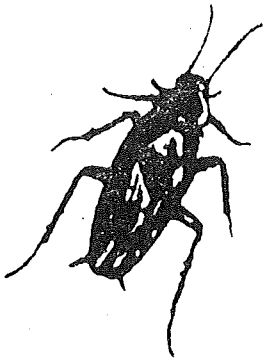
Distinguished Service Award

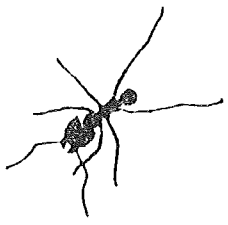
Established in 1988 to commemorate the 50th anniversary of NABT. Nominees should be nationally recognized scientists who have made major contributions to biology education. The nomination deadline is May 1, 1998.

Other awards offered by NABT include Outstanding New Biology Teacher Award (Deadline March 15, 1998), NABT Biotechnology Teaching Award (Deadline March 15, 1998), Two-Year College Biology Teaching Award (Deadline March 15, 1998), and Four-Year College Biology Teaching Award (Deadline March 15, 1998).

Information regarding the application process for any of the NABT awards is available from the National Association of Biology Teachers (800-406-0775) or from Carl Koch, Regional Coordinator at 708-442-7500 or e-mail AECKoch@aol.com







STATE BIOLOGY TEACHER WINS NATIONAL BIOLOGY AWARD

Last month **Illinois biology teacher Ruth Gleicher** was recognized for her creative approaches to teaching when she received the **National Association of Biology Teachers' Outstanding New Biology Teacher Award** at a ceremony during the annual NABT Convention in Minneapolis.

Gleicher teaches required biology and AP biology at Niles West High School, as well as AP biology at Ida Crown Jewish Academy in Chicago.

Ruth is the first teacher from our state to win this award. We congratulate her on this achievement and would encourage other new teachers to consider applying for this award. Congratulations, Ruth!

THE *Nature* OF *Chicago*

A COMPREHENSIVE GUIDE TO NATURAL SITES IN AND AROUND THE CITY

Isabel S. Abrams

Imagine yourself strolling down a Native American trail in Chicago, or visiting prairies, wetlands, and dunes like the ones that once spread along Lake Michigan's southern shore. Take a downtown tour that reveals how and why Chicago's skyscrapers depend on ancient coral animals, or visit parks and schools that show why Chicago is called "City in a Garden."

If you are a natural history buff, *The Nature of Chicago* will tell you where to look for ancient lakeshores, native forests, bogs, fens, the remnants of glaciers, and more. If you love to play out of doors, you will find new places to fish, swim, canoe, hike, toboggan, or watch the sun set. Wildlife sanctuaries, zoos, arboretums, the aquarium, nature museums, and nature preserves—all are included here, with travel directions and tips for getting the most from every site. A calendar of outdoor events and a listing of nature-friendly organizations are included.

Author Isabel S. Abrams, science writer and cofounder of Caretakers of the Environment International, shows adults and children how to get up close and personal with nature in this friendly, informative guide. Discover a new side of Chicago—the wild side!

272 pages, 6 x 9
15 b & w photos, 1 map
paper, $14.95 1-55652-312-2
CHICAGO REVIEW PRESS

EDUCATIONAL MATERIALS

THE WILD SIDE OF CHICAGO URBAN ADVENTURES TO EXPLORE CHICAGO'S NATURAL TREASURES

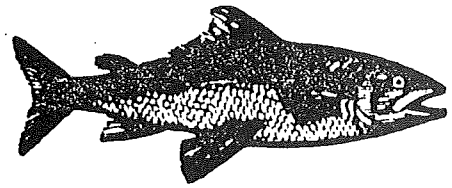
Chicago is a wilder place than you think! At first glance, Chicago appears to be a bustling metropolis with little in the way of natural beauty and wonder. However, a walk on Chicago's wild side reveals pristine landscapes, untamed plants and animals, and secluded retreats where greenery reigns.

The Nature of Chicago: A Comprehensive Guide to Natural Sites In and Around the City (Chicago Review Press, $14.95) by **Isabel S. Abrahms** is a unique guidebook with an ecological perspective to discovering Chicago's natural treasures, many often obscured or hidden by the urban environment. Whether the goal is exploring a wetland area or mountain-biking a hilly park, touring the Lake Michigan dunes, star-gazing or skiing, celebrating Earth Day, or having close encounters with the native and exotic beasts, The Nature of Chicago tells where, when, how and why to do it.

For all who love the out-of-doors, The Nature of Chicago offers new destinations to explore and new ways to appreciate old favorites, from pocket-size prairies and gardens in downtown corners to the lake, parks, and nature preserves both inside and outside our city. Natural history buffs will learn where to look for Native American trails, ancient lakeshores, wildlife sanctuaries, and museums with nature exhibits.

The Nature of Chicago invites the reader to experience many diverse urban adventures such as:

- Exploring native forests, pristine prairies, and secluded waterways
- Tracking down bird and wildlife sanctuaries, zoos, arboreta, nature museums, and preserves
- Enjoying new spots to fish, canoe, hike, jog, toboggan, or watch the sun set
- Learning how our lake, dunes, and rivers were formed, and how people, plants, animals, ancient seas, and more have shaped and now share our city



The Nature of Chicago also includes complete travel directions, tips for getting the most from every site, and information on Chicago's nature-friendly events and organizations. So, get wild and experience a new side of Chicago! **Isabel Abrams** is the cofounder and director of communications for Caretakers of the Environment International. She has been a science editor and features writer for *Science Challenge*, *Current Energy and Ecology*, and *Current Health 2*. She lives in Wilmette, Illinois.

Title: The Nature of Chicago
Subtitle: A Comprehensive Guide to Natural Sites In and Around the City
Author: Isabel S. Abrams
Regional, 272 pages, 7 x 10
30 b & w photos, ~ maps
Paper, $14.95 1-55652-312-2
Publication Date: July 1997
Publisher: Chicago Review Press
Contact: Kathy Mirkin, 312-337-0747

Available at bookstores nationally and through Independent Publishers Group, 814 N. Franklin St., Chicago, IL 60610. Toll free number for orders only: 1-800-8884741.

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Phone: 719 531-5550
Fax: 719 531-9104

A NEW AREA OF BIOLOGY: RNA SCIENCE A NEW BSCS PROGRAM FOR UNDERGRADUATE BIOLOGY

WHAT: Under support from the National Science Foundation, BSCS and the Eccles Institute of Human Genetics, University of Utah, will collaborate on an eighteenmonth project to develop instructional materials on advances in RNA science. This program, tentatively titled The *RNA World and Its Role in Biology,* will be designed for undergraduate biology courses, and will highlight the growing importance of RNA science in modern biology, including its application to health and disease and to the likely role of RNA in the origin of life and later molecular evolution. The module will promote improvement in undergraduate education by focusing on major concepts related to information molecules and by providing well-tested, inquiry-based instruction.

WHY: The study of DNA has come to dominate many approaches to the study of genetics, evolution, the origin of life, and health and disease. Fundamental questions remain unanswered, however. How, for example, were the first copies of DNA produced? In modern cells, DNA is assembled by protein enzymes, yet the production of proteins depends on DNA-encoded genes: How did that cycle of function originate? The answers to those intriguing questions, and to a host of questions about current health-related issues, may lie within recent discoveries about the modern and ancient roles of a related molecule, RNA. BSCS's new program, *The RNA World and Its Role in Biology,* will explore the new advances in RNA science.

WHEN: We expect that *The RNA World and Its Role in Biology* will be available in early 1999. In the interim, BSCS's semiannual newsletter, *BSCS: The Natural Selection,* will carry periodic updates on the project. If you are not receiving the newsletter currently, contact BSCS to have your name added to the newsletter database. We also will provide information about the program on BSCS's Web page: www.bscs.org.

HOW: *How can I become involved?* Curriculum development at BSCS includes the direct involvement of practicing scientists and teaching faculty, extensive field testing, and the external review for scientific accuracy at critical stages of development. BSCS is looking for college faculty to field test the experimental version of this program in early 1998, if interested, contact BSCS, Attn: RNA Science.

WHO: BSCS is a nonprofit, educational research and development institution committed to providing leadership in science education through the development and implementation of innovative programs that are designed to promote change in content and pedagogy. The BSCS was established in 1958 by a grant from the National Science Foundation to the education committee of the American Institute of Biological Sciences. For nearly forty years, BSCS has served as an advocate for learners and for exemplary science teaching.

Waste Policy Center
J. Winston Porter, President
211 Loudoun Street, S.W.
Leesburg, VA 20175-2718
Phone: 703-777-9800
FAX: 703-777-3733
e-mail: Porterwpc@aol.com

TRASH FACTS IV

...facts and figures about solid waste and recycling

Trash Facts IV is a vestpocket booklet packed with useful information on the U.S. solid waste situation. It provides an instant reference on a key environmental subject for teachers and middle to upper-level students.

Summaries are included of the components of trash, key waste regulations, and the nation's recycling, landfilling, and incineration systems.

The booklet notes that the nation reaches a 27.3% recycling rate in 1996. It also outlines other recent improvements in trash management, including stringent landfill and incinerator regulations as well as reduction in the weights of many products and packages. Also, the nation's year-to-year increase in trash generation is now less than the rate of population growth.

Trash Facts IV was authored by Dr. J. Winston Porter, president of the Waste Policy Center in Leesburg, Virginia and a former EPA assistant administrator. In 1988, he set EPA's successful goal of recycling at least 25 percent of the nation's trash.

Copies of *Trash Facts IV* can be purchased from the above address. Prices are $3.00 each for 1-19 booklets, $1.00 each for 20-99, and $0.35 each for 100 or more.

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"Another Great *Demo-A-Day* Book From Flinn!"

This new physical science demonstration book containing nearly 200 demos is a *must* for your classroom. Developed and written by experienced teachers, each activity is designed in an easy-touse, concise format. Topics include:

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- Magnetism
- And much, much more!

A Demo A Day for Physical Science (catalog number AP9305) is available from Flinn Scientific for $35.95. Now, you'll have more than enough demos for every day of the year! **Teachers only** should contact Flinn Scientific for additional information.

Boston University School of Education
605 Commonwealth Avenue
Boston, MA 02215

NEW FROM MICROCOSMOS!

The Microcosmos Discovery Window: A Micro-life Growth Chamber

The Microcosmos Discovery Window is a sturdy vertical chamber designed to help your students from elementary school through college levels access and experiment with the world of microorganisms. Durable, thick Plexiglas allows soil-based microbial populations to be seen en masse. A wide range of inquiry-centered activities which can connect to many life science curriculum themes can be structured by you, the guiding teacher. A wide base to the unit not only provides needed classroom stability, but invites more reflective and investigatory learning by accommodating journals while viewing.

Microbes throughout the curriculum?! Why?

We are finally beginning to recognize that the most common life on the planet can no longer can be the most ignored in our classrooms or in our society. We depend upon bacteria, fungi, protists and other microbes every day for food and drink. Most antibiotics are derived from microbes like molds and filamentous bacteria. Limestone are important earth deposits of calcium and carbon, which are used in many of our buildings dating back to the Pyramids of Egypt; they are actually the remnants of microbial shells (tests) such as foraminifera and coccoliths, for example. Even the very oxygen we breathe is mainly the result of photosynthesizing cyanobacteria and micro-algae in the seas.

The vast realm of micro life is dominating the news today in profound ways. Recently, Antarctic Martian meteorite remnants indicated organic structures that may be ancient, non-earth microorganisms. Molecular biologists have further confirmed the existence of a totally new form of life, Archaea. Found in mostly high heat and salt zones, these microorganisms are in many ways more like plants, animals, and protists than bacteria! Researchers have also found massive regions of bacteria as much as two miles underground and evidence suggests that life well below the surface may be one of the dominating ecosystems on earth. New discoveries about the microbially-based deep sea vents -- one of the great biology finds of the century -- mount monthly. Can we really have any meaningful understanding of our home, the earth, and ourselves without consistent inquiries into the inner space world of micro-life?

How does the Microcosmos Discovery Window work?

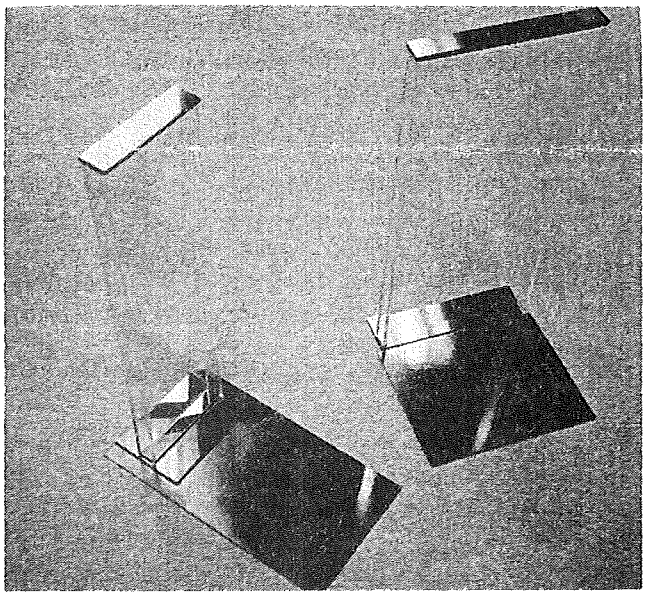
The soil that is deposited by students in the unit contains a wide array of microorganisms. Even at the time of the initial deposit of soil in the unit, there are more life forms in a cubic centimeter of soil than there are people on the planet! Among the microbes are bacteria which use certain wavelengths of light from the sun or an artificial source such as a lamp. These microorganism colonies live in soil habitats to various degrees but are only seen in nature by the most astute observers. By shining a low watt bulb on the Microcosmos Window, pigments that represent the diverse microbial populations gradually appear. After several weeks, the brownish mud cylinder has evolved to a spectacularly colored collage of ever-changing microbial populations. The eggs, newspaper pieces, and other materials, which are added to the soil prior to pouring, gives the necessary protein boost and enhanced food source to promote growth more quickly.

The upper portions of the Window -- the few millimeters nearest the surface water -- contain mostly microbial eukaryotes (eukarya) and are represented by blue-green pigments. This is the narrow zone of oxygen, while most of the remainder of the window has thriving bacterial life without oxygen (anaerobic). These anaerobic organisms use and exchange sulfur-based compounds to obtain their energy. The Window is, therefore, not only an important "slice of life" of the planet and its history in that it mirrors earth systems, but it allows for close-up examination of the most dominant life -- microbial masses.

How do you create a living window?

The actual pouring of the muds as well as its "permanent" classroom station must be in a well ventilated area. A hood, outdoors, or adjacent to opened windows with some cross ventilation are necessary. This allows any hydrogen sulfide or other microbially-produced gases to not become concentrated in one area. Although after a few days any odors will greatly diminish, it is best to leave the unit in a well-ventilated area.

Preferably with your students, collect soil or mud from any habitat. River bank, pond bottom and marsh soils are among the best. The unit is best assembled directly in the classroom or laboratory. In a large container, for every gallon or so of mud (minus any stones), mix in 1-2 uncooked eggs, including the ground up shells. Stir (with a rubber glove if you'd like!) and add about a quarter sheet of shredded newspaper page to the mix. Stir and if necessary add very small increments of water to keep the soil/mud loose enough to thickly pour. "Filling" the larger of our two Windows may take 2-3 gallons of mud. You have the option of adding a tight wad of paper after a couple of inches of mud has been poured. This wad will gradually be broken down and can be observed over time. Fill to about 2" from the top. Do not tape cover down. It is meant to be loose to allow gas escape/exchange. Once it settles overnight, there will be a water layer at the top. This water layer mimics natural earth conditions and provides an excellent habitat for finding wonderful eukarya microbes through the Microcosmos micro-fishing activity found in our curriculum *Guide.* Have your students describe the assembly process and record detailed observations at this initial point. Place a 40 60 watt incandescent bulb/lamp a foot and to two feet from one of the sides. You can do the same with the other side or leave one side unlit for fascinating comparative observations. Leave the light on at least 8 hours a day, preferably 12 hours or even continuous. If the light is off for long periods, there is no need to start over, for it will resurrect gradually once the light is returned.



Examples of what students can do with the Microcosmos Window

- Monitor the growth of microbes through the keeping of a detailed observation-based journal. Promote specific descriptions 2-3 times/week. Obtain a series of color charts from a paint store or create your own with crayons. Students use the chart to note specific color changes throughout the Window. Students become scientific observers, as they refer to specific shades and color tones. Remember, you need not have students know that there pigments are expected! Also, link the Window to other Microcosmos explorations, such as having ~e students "micro fish" in the upper water section.
- Use transparency film/acetate and mount to the side of the Window periodically and build an ongoing profile of the changes, including eventual pigmented colony growth. A collection of accurate "tracings" can be part of a detailed inquiry-based portfolio. One can even overlap the acetate record and more directly analyze the changes over time
- Use the Window as a "control" and develop a series of low-cost, low-tech microbial city bottles, as described in the Microcosmos curriculum *Guide.* The easily assembled bottles can have experimental variations which the students can develop and explore. For example, one bottle may contain a nail to see if different pigmented colonies evolve. Another may not contain paper or eggs or be kept in the dark, and so on.

• Use two or more Windows and make elaborate and detailed comparisons of the growth. Each of the Windows could contain mud from a distinctly different habitat.

What science themes can be explored through the Window use?

Dozens of themes. For example instead of introducing or exploring photosynthesis -- the basis of survival on the planet - through plants, use the Windows and let the students discover and then ask about what the colors mean. A perfect stimulus for learning and discussion about photosynthesis! Evolution, including re-creating ancient environments; artificial and natural selection; concept of niche and other ecological subthemes; element flow and biochemical reactions; properties and wavelengths of light; diversity of life; and so on. Even mathematics can be integrated. Students can determine the area of a blotch or layer of color and do this over time as part of observations and journal notes. Students can measure the distance of pigments and other changes from the bottom and sides. They can even construct a transparent reference ruler for the edge.

Do I need other materials with the Microcosmos Discovery Window?

You mainly need a low cost light fixture. A funnel with a wide opening would be advised to assist in pouring. You should also obtain the *Microcosmos Curriculum Guide to Exploring Microbial Space* and the supplementary *Inner Space Journeys to Life on Earth,* from Kendall/Hunt (1-800 228-0810, 4050 Westmark Dr., Dubuque, IA, 52004).

What is the cost of the Microcosmos Discovery Window?

There are two models. One is simply wider than the other, although both are the same height and have a wide base. The narrower model (approximately 2' in height, 8" wide and 2" thick), "A," is $49.95. The wider model (12" wide), "B" is $74.95. Shipping and handling is approximately $12 per unit ordered. Please allow =5 weeks for delivery.

The Microcosmos Discovery Window was developed by Mike Cox of Anaerobe Systems, San Jose, California.

ORDER ENC CD-ROMS

This year the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) is issuing three volumes of CD-ROMs (six discs in all). Each volume of ENC CD-ROMs includes Resource Finder, a catalog of mathematics and science curriculum materials.

The first volume (two discs), available now, features the full text and graphics of the NCTM Curriculum and Evaluation Standards for School Mathematics and curriculum frameworks from several states. Other highlights of the first volume include the content of selected Internet sites and ENC publications.

The second volume (two discs) features stories of teachers across the country striving to implement innovative teaching methods in their districts and original research papers by leaders in math and science education.

Ordering free ENC CD-ROMs

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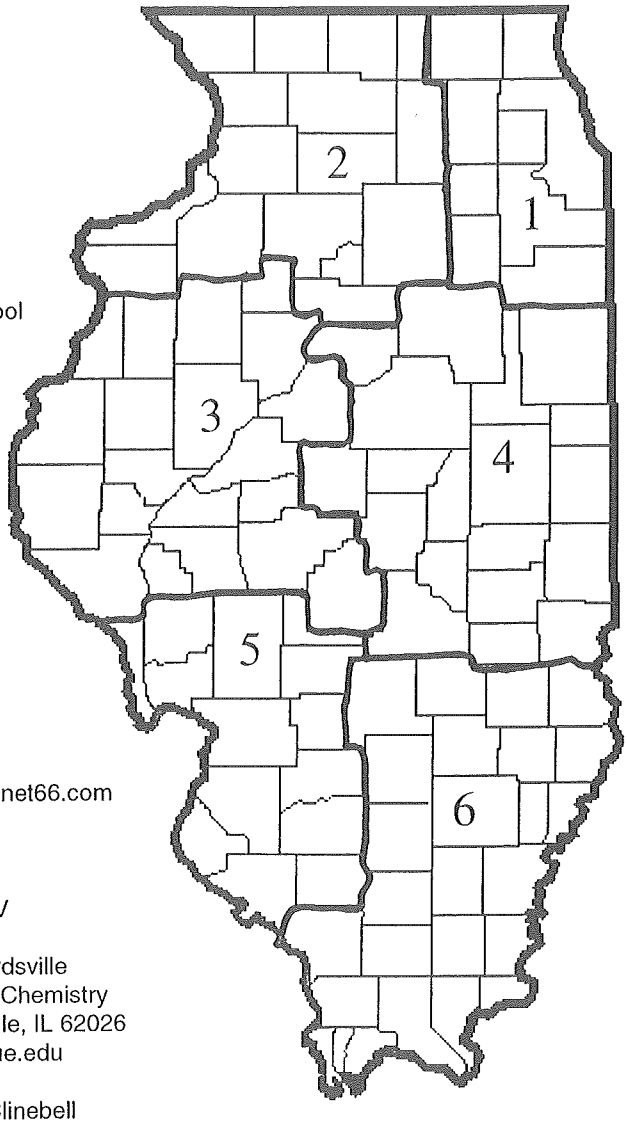

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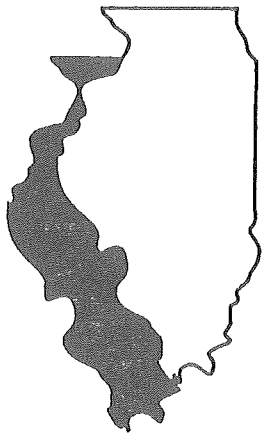

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