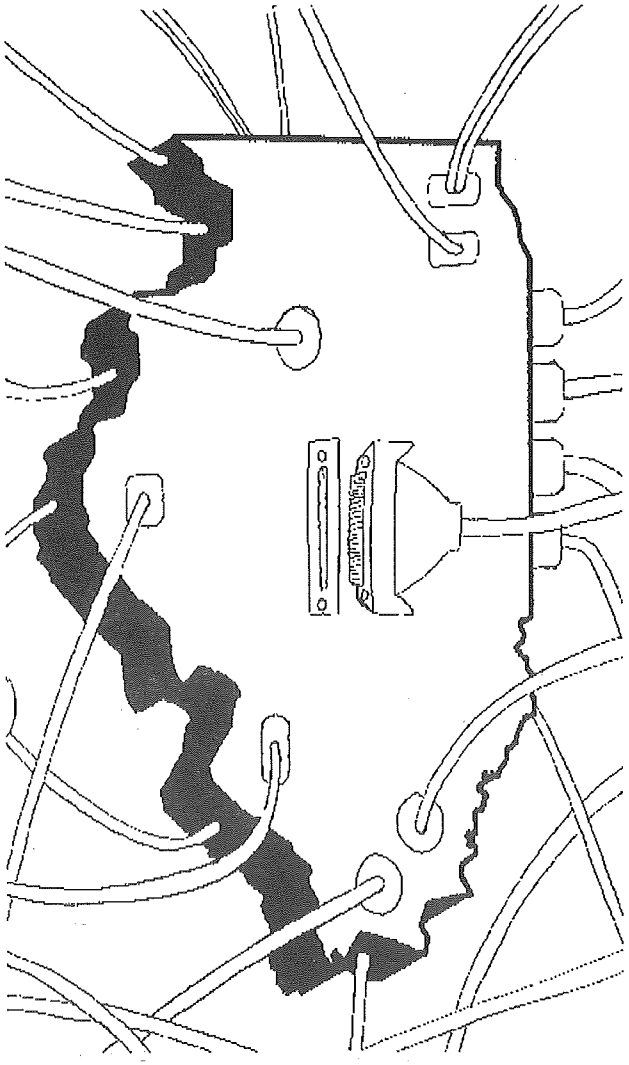
SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION

PLUGGING IN TO THE FUTURE

1998 ANNUAL CONVENTION

ROSEMONT CONVENTION CENTER
ROSEMONT, ILLINOIS
OCTOBER 15-17, 1998



DETAILS INSIDE: REGISTER TODAY!

FALL 1998

SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 24, Number 2, 1998

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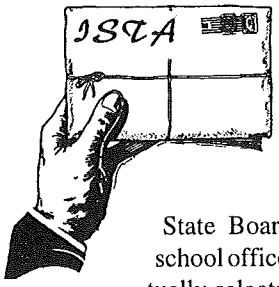
ISTA NEWS

AUGUST PRESIDENT'S LETTER



The revolving door at the Illinois State Board of Education has turned again. As I write, Mr. Spagnolo has announced his departure, and the State Board is seeking a new chief state school officer. Whoever the State Board eventually selects is certain to modify current initiatives, just as Mr. Spagnolo brought change with him. Furthermore, our new superintendent likely will promote new policies and practices for Illinois educators. This continual change is troubling to many of us. We are disheartened by our leaders' inabiltiy to keep Illinois education moving in the same direction for any length of time. We find it difficult to support new leaders, fearing that they will set trends, not direction.

I think our inability in education to stay with one idea for very long is a simple reflection of our American culture. In what may be due to the processes of scientific and technological change, we believe that nothing lasts for long. This belief affects the way that you and I grapple with even very good educational ideas. Because we believe a new idea may go out of vogue, we are reluctant to invest much of ourselves in it. We settle for surface understandings of new instructional practices. We have neither the time nor inclination to achieve a deep understanding of ideas and practices that could make us substantially better at our craft. We have learned to survive in a rapidly changing world by avoiding disciplined behavior and long-term commitments.

I believe that if we are to be successful teachers, we must be counter cultural. We must risk identifying a few good ideas and make long-term commitments to them. In science education, our list should include a commitment to content standards, hands-on learning, critical thinking, cooperative grouping, and performance assessment. We should choose or create an assessment instrument that we will use repeatedly to analyze student achievement. As important as choosing an instrument is using assessment results to improve instruction. We should favor the kind of professional development that engages us in long-term reflection, discussion, and engagement with our colleagues, not the kind that is packaged in workshop-sized bits. Committing to a few good ideas will enable us to study and understand those ideas deeply and to practice them easily, confidently, and effectively.

Your Association board is practicing what I am preaching. Earlier this year, your ISTA board committed to the process of strategic planning—an action that we began at our June board meeting. We are evaluating our preliminary product, and we will refine our work at our meeting in September. By the end of the year, we expect to have a mission statement and a set of goals that will take us well into the next decade. When we are finished, we will publish our work so that you know the few good ideas to which your Association board is committed. Our strategy is to develop and carry out annual action plans, so that each year the Association moves closer to accomplishing its long-term goals. This way ISTA can minimize the difficulties brought about by changing leadership. By committing to a few good ideas, we can accomplish much through diligent and sustained effort. I think it is an idea that also works for individuals. I think it would work in Springfield, too.

Doug Dirks, President

PRE-REGISTER TODAY FOR THE 1998

ISTA ANNUAL CONVENTION

"PLUGGING IN TO THE FUTURE"

ROSEMONT CONVENTION CENTER

DEADLINE FOR PRE-REGISTRATION:

11 SEPTEMBER 1998

ADVANCE REGISTRATION FORM ON PAGE 5 OR CHECK OUT OUR WEB SITE AT http://www.ista-il.org

PLUGGING IN TO THE FUTURE

1998 LEADERSHIP CONFERENCE
THURSDAY OCTOBER 15, 1998
8:00 AM - 3:15 PM
Holiday Inn O'Hare International Hotel

As we move toward the 21st century, what will our science classrooms look like?
What part has science played in the evolution of technology?
How will science be involved with technology and the future?
Where does science fit into space and technology?
How do we need to change our way of thinking and teaching about science education?

To find out the answers to these questions and to enjoy the invaluable fellowship of your colleagues, join us! Mark the Advance Registration Form on page 5.

- **Keynote Speaker: Dr. Jerry Brown, United States Space Foundation**
- **Topic: "Teachers - Developing Leaders for the 21st Century"**
- **Breakout Sessions**

Computer Based Labs in Physics
Scott Bevans, Chris Friedrich, Geneva High School
Bill Kurtis and the New Explorers: Bring Interactive Content to the Wire
Dawn Sury, eld!n
Institute for Learning Science Technology Tales
Chuck Freiberger, Elmhurst Dist. 205
What Should Your Teachers Be Doing with Technology?
David Jakes, Downers Grove North, Howard Knodle, Belvidere High School
Techniques and Resources for Leaders Integrating Technology
Kristin Ciesemier
Fisher LogIT
Margaret Campbell and Roy Pettigrew Fisher Scientific
Free Access to Science Educational Resources on the Internet (ENC)
Kim Roempler

ISTA 1998 ANNUAL CONVENTION
FRIDAY AND SATURDAY
OCTOBER 16-17, 1998
Rosemont Convention Center
and Holiday Inn O'Hare International Hotel

HIGHLIGHTS OF THIS YEAR'S CONVENTION

- **From 8:30 AM Friday until 2:30 PM Saturday, Over 200 exciting workshops and demonstrations designed to motivate and educate are planned.**
- **Special Saturday extended workshops on WET, Illinois Science Olympiad Events, Astronomy, and other courses.**
- **150 exhibitors will fill the Convention Center from 8:00 AM Friday until Noon Saturday.**
- **Dynamic Keynote Speaker Angelo Collins, Vanderbilt University, will speak on "Trends in the Description and Assessment of Effective Science Teaching"**
- **A special appearance Friday by Leonardo Da Vinci, the Epitome of the Renaissance Man**
- **Hear Michael Offutt perform his highly interactive chemistry demonstrations, songs and stories on the stage in the exhibit hall at noon on Friday.**

SPECIAL SOCIAL EVENTS

- **Thursday Evening: Special tour and dinner at the Motorola Museum of Science (4:00 - 8:00 PM). Check box on Form on page 6.**
- **Friday Noon: Recognition Luncheon honoring the outstanding achievements of our members. Check box on Form on page 5.**
- **Join us At The Hop, Holiday Inn's 1950's nightclub, on Friday, October 16, from 4:30 - 7:00 PM.**
- **Enjoy *Defending the Caveman* at the Rosemont Theater, within walking distance of the Holiday Inn. Contact the theater (1-847-671-5100) for ticket information. The box office provides walk up service only. For phone orders: Ticket Master (1-312-902-1500 or 1-312-559-1212).**
- **Complimentary coffee hour each morning.**

EDUCATIONAL TOURS AND PAID WORKSHOPS

You must pre-register for these on the Advance Registration form and pay the fee, if any.

PAID WORKSHOPS

1A and 1B — Kids Aren't the Only Wigglers in Your Classroom –Worm Composting
1A — Friday, October 16
2:50 - 3:40 PM
1B — Friday, October 16
3:50 - 4:40 PM
Worms in your classroom – Soil making 101. Make your own mini-worm bin. $5. Elementary, middle.

2 — Using the Internet to Promote Inquiry-Based Learning
Friday, October 16
8:30 AM -12:15 PM
This hand-on session will empower teachers with strategies to effectively incorporate internet research projects into their curriculum. A new framework for such projects will be presented, including a model for student research as well as techniques for managing the research. Participants will work online. $25, Includes all materials. Any grade level.

3 — Building a 3-D Model of a Topographic Map
Friday, October 16
12:30 - 2:20 PM
During this workshop, participants will build their own models from various topographic maps. Students love this fun activity! Fee includes all materials. $12. Middle/H.S..

4 — Practical Astronomy for All
Saturday, October 16
9:20 AM – 1:20 PM
Gain an understanding of astronomy concepts while doing a myriad of student activities and constructing models. $10. Middle/H.S.

5 — Using the Polaroid Camera in Your Science Classroom
Saturday, October 17
9:20 - 11:20 AM
Discover photos as a visual learning tool within the science classroom. Receive a 600 series Polaroid Camera, film to get you started, and a newly released Polaroid science curriculum. $25. K-12.

6 — Constructing a Tabletop "Hydroponics" Classroom Display
Friday, October 16
1:30 PM - 3:40 PM
Participants will construct a 36" x 14" x 36" hydroponics classroom display. All materials including PVC pipe, air pump, and hosing provided. $45.

7 — Applied Environmental Science
Friday, October 16
12:30 - 1:30 PM
This workshop will demonstrate this new curriculum guide which includes hand-on activities in: water and air quality, chemicals and the environment, land uses, and others. $20. Any grade level.

8 — Tissue Culture of Venus Flytrap
Friday, October 16
8:30 - 9:20 AM
Practice hands-on horticulture skills that can be used with your students. Participants take home Venus flytrap cultures. $15. Middle and High School

9 — Students and LogIT = Great Experiments
Friday, October 16
1:40-3:20
Discover easy to use technology for data acquisition. Perfect for all disciplines and grade levels. No cost but preregistration is required. Limit: 26 participants.

TOURS

ALL TOURS ARE ON FRIDAY.

1 — Illinois Mathematics & Science Academy
8:30 AM - 12:45 PM
Enjoy a visit to the Illinois Mathematics and Science Academy, an educational laboratory established to serve the people of Illinois as a preparatory institution. Hear a student led panel presentation on "Life at IMSA," followed by a question and answer session. Visitors will take student guided tours of the facilities and have the opportunity to hear about the work being done by IMSA's Center for Problem-Based Learning. You may purchase lunch in the school cafeteria. $10.00.

2 — DuPage County Solid Waste Recycling Center
9:00 AM - 12:45 PM
Tour two state-of-the art waste facilities. Tour DuPage Co. Solid Waste Education Center and observe where 225 tons of recyclables are prepared for market every day. Tour Mallard Lake Landfill's new Gas to Energy Electric Generation Facility which generates 23 million watts of electricity per hour from waste gas. No Waste Lunch provided by Browning Ferris Gas Services. $10.00.

3 — JFK Health World
12:30 PM - 5:00 PM
The mission of JFK Health World is to promote the development of healthy lifestyles among children through interactive exhibits and special demonstrations. The tour will consist of a brief orientation by staff, a self-guided tour, and a recap. This is a new museum with 85,000 sq. ft. of healthful learning for kids! Lunch can be bought in the cafeteria. $10.00.

4 — Fermi National Accelerator Laboratory
9:30 AM - 2:30 PM
A guided tour of Fermilab will include an introduction to the laboratory, a tour of Wilson Hall and the Linear Accelerator Building, a question and answer period with a scientist and demonstrations. Lunch on your own in the cafeteria. The afternoon will feature a visit to the bison herd and the Lederman Science Center where participants will have a chance to explore the interactive exhibits and to learn more about the Teacher Resource Center and the Technology Classroom. $10.00.

5 — Scitech
12:30 PM - 3:30 PM
Scitech is an interactive science museum which runs school programs, summer camps, and after school science clubs. The tour will introduce participants to Scitech programs and than allow participants to get involved with the interactive exhibits on their own. $10.00.

6 — NEUQUA Valley High School
12:30 PM - 4:30 PM
NEUQUA Valley High School incorporates the latest in technology and innovative ideas about teaching and curriculum into an environment that encourages learning and personal growth among both students and staff. Computers are available throughout the school in classrooms, resource centers, labs, and offices. Specialized software and equipment extend capabilities for data collection and experiments in science. In addition, each classroom is equipped with a television that is connected to a central media distribution center in the library for video tape and laser disc programming. This tour will provide an overview of these facilities, including a detailed tour of NEUQUA's state-of-the-art science labs. $10.00.

7 — Brookfield Zoo
10:00 AM - 2:30 PM
Learn about endangered species and how zoos are working to conserve animal diversity in a one-hour formal presentation, followed by lunch on your own. Teachers will then do an Endangered Species Zoo Survey. New exhibits to see are: Quest to Save the Earth, The Living Coast, and The Swamp. $10.00.

8 — DuPage Children's Museum
12:30 PM - 4:30 PM
Math, science and the arts intersect at the DuPage Children's Museum in an open-ended, interactive environment. Exhibits are designed to address every learning style and intelligence. Explore geometry, energy, patterns, magnets, momentum, gravity, capacity, spatial relations, and more. A detailed tour lasting no more than one hour will leave teachers free to explore the museum for the remaining time on their own. $10.00.

ISTA GENERAL MEMBERSHIP MEETING
SATURDAY, OCTOBER 17
8:00 AM — 9:00 AM

Enjoy complimentary coffee and rolls during this annual meeting. This session of the Convention affords the members of the Illinois Science Teachers Association the opportunity to express their ideas, concerns, and suggestions to the Board, regarding the future directions of the Association. ALL MEMBERS (including those who have just joined at this Convention) should plan to attend. This year the vendors have donated an unprecedented amount of valuable prizes to be given away during the drawing. You won't want to miss it!

IMPORTANT NOTE

Reserve your room directly with the Holiday Inn O'Hare International, 5440 North River Road, Rosement, Illinois, (847) 671-6350, Fax (847) 671-1378. Be sure to mention that you are a participant in the ISTA convention to receive the discount rate. Special room rates are $119.00 for a single or double, $129.00 for a triple or a quad.

Visit our Website:
http://www.ista-il.org

1998 CONVENTION COMMITTEE

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1998 Illinois Science Teachers Association Convention Advance Registration Form
"PLUGGING IN TO THE FUTURE"
Rosemont Convention Center
October 15-17, 1998

PLEASE FILL OUT FORM COMPLETELY
(PRINT CLEARLY: INFORMATION WILL BE USED FOR MAILING YOUR CONFIRMATION.)

Name: _____ Spouse's Name (if attending): _____

Home Address: _____ Home Phone: (____) _____

City/State/Zip: _____

Affiliation (school, college or organization): _____

Business Address: _____ Business Phone: (____)_____

City/State/Zip: _____ E-mail_____

_____ CHECK HERE IF YOU NEED SPECIAL ASSISTANCE DUE TO HANDICAP.
_____ CHECK HERE IF YOU WOULD LIKE TO BE A PRESIDER FOR A SESSION.

REGISTRATION	**COST**	
_____ Registration and Membership (includes 1999 dues)	$75.00.	_____
_____ Current Member Registration (does not include 1999 dues)	$50.00	_____
_____ Registration only (does not include 1999 dues)	$75.00	_____
_____ Full Time College Student (includes Membership)	$15.00	_____
_____ Non-teaching Spouse	$10.00	_____

LEADERSHIP CONFERENCE - Thursday (Fee Includes Continental Breakfast and Lunch)
_____ Science Leadership Conference "Plugging In To the Future" $50.00 _____

MOTOROLA MUSEUM VISIT ON THURSDAY— INCLUDES DINNER $30.00_____

RECOGNITION LUNCHEON ON FRIDAY—ALL ARE ENCOURAGED TO ATTEND $10.00_____

PAID WORKSHOPS - See Listing

Workshop #	Workshop Title	Fee	
_____	_____	_____	_____
_____	_____	_____	_____

EDUCATIONAL TOURS - See Listing

Tour #	Tour Name	Fee	
_____	_____	_____	_____
_____	_____	_____	_____

PRE-REGISTRATION DEADLINE: Advance registration must be postmarked no later than **September 11, 1998** to ensure processing before the convention. **TOTAL:** _____
Make checks payable to: **Illinois Science Teachers Association**. Send registration form and check to:

Diana Dummitt, ISTA Registration, College of Education, University of Illinois 1310 S. Sixth Street, Champaign, IL 61820

BY ACTION OF THE THE ISTA BOARD OF DIRECTORS, REGISTRATION IS REQUIRED FOR PARTICIPATION IN ALL ACTIVITIES OF THE CONVENTION. THE BADGE ISSUED TO EACH REGISTRANT IS THE TICKET OF ADMISSION TO ALL SESSIONS, EXHIBITS AND OTHER ACTIVITIES. THE LAST DATE TO CANCEL WITHOUT PENALTY IS SEPTEMBER 11, 1998. WE ARE UNABLE TO MAKE EXCEPTIONS.

LETTER FROM THE EDITOR

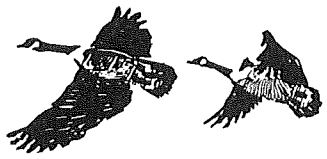
One of the purposes of our journal, the ISTA Spectrum, is to help keep our membership informed about various issues pertaining to science education. Another is to provide helpful teaching and activity ideas and places from which to obtain resources to enhance science instruction. I imagine most readers use the journal for these purposes. There is an additional purpose of the journal, however, which may be underutilized: dialogue.

A number of professional journals consistently receive and publish communications from their readers. Usually, this occurs in the form of "letters to the editor." Readers often comment about articles, both pro and con, sometimes offering additional information and or resource information, and sometimes reacting to (again both pro and con) to editorials. Professional dialogue is healthy, and we' like to encourage that in ISTA. The reason I write letters from the editor for each issue of The Spectrum is not simply to spout off about something. Editorials attempt to elicit thinking in the readership, and to be a beginning point for dialogue on issues important to science education.

In this issue, we are printing a letter from one reader who is reacting to the last journal issue's editorial focusing on appropriate educational technology. As always, reader response is welcome. I encourage each of you to consider not only contributing manuscripts (articles) to the journal, but to respond to letters from both the ISTA president and journal editor. (Of course, we obtain writers' permission prior to publishing their letters.) Let's begin this academic year with some dialogue! And many thanks to Michael Breidenstein for his contribution!

Kevin

Kevin Finson



I just finished reading your Letter From the Editor in the Spring/Summer Spectrum and feel I have to write this message. As a science teacher at Rock Island High School, I used technology daily in my classroom -- everything from my own record keeping and test writing to researching, preparing and presenting my lessons. When I was appointed head of the science department, I supported the use of technology in all our science classes. Every science classroom now has a computer, TV, VCR, remote control mouse, laser disk player, and a connection to our local Intranet and the Internet. Four months ago our district created a new position of Instructional Technology Specialist. I left the classroom to take this position and am now promoting the use of technology as a tool to improve instruction throughout the district.

Your letter addresses one of the major concerns I have about the use of technology. With much disappointment, I have seen the laser disk, CD-ROM, and video replace rather than enhance science education. A CD-ROM allowing students to conduct simulated chemical reactions requires much less preparation time than the real thing. Do students learn just as much from neutralizing an acid with a base on the computer screen as they do performing a titration in the lab? Is a virtual field trip to the Everglades of Florida more beneficial than a field trip to Sunset Marina on the Mississippi?

As I read your letter, I kept finding myself saying "Yes!", and "That's so true!" If the addition of technology doesn't improve the effectiveness of a teacher, why waste all that money and time? Science teachers need to use good judgment when bringing technology into their classrooms. It would be a step backwards if we use it to replace the hands-on learning that is characteristic of a good science class. Students learn more when they experience science first hand. Technology offers many opportunities to improve these experiences, such as videotaping unique observations seen through a microscope or in the field, recording data that may typically be too fast or slow to observe by students, and sharing data over the Internet through projects such as Monarch Watch, Journey North and student or teacher web pages. If technology is going to assist as we improve the methods used to educate our students, more teachers need to address the concerns presented in your letter.

Michael Breidenstein
Instructional Technology Specialist
Rock Island School District #41

REGIONAL REPORTS

GEORGIEAN BENSON
REGION 4

Greetings from Region 4. I hope everyone had a great vacation and is ready to return to the classroom. This summer almost 100 students in grades K-6 in my school district went to school and enjoyed it, while learning lots of science. They participated in an inquiry based and hands on science camp taught by local teachers and coordinated and developed by Marilyn Sinclair and Margery Osborne of the University of Illinois. The teachers actively participated in inquiry based activities during the first week and then planned and tried activities for students the next. The students attended for the final 2 weeks. One goal was to support Illinois and National Science Standards. It was a great success! We plan to do it again next summer.

Now that we have the standards, the next step is the revision and alignment of state and local assessments to these standards. There is a committee (including an external chair, ISBE staff, and about 50 teachers) that is collecting student work that meets state standards. If you are interested in contributing, call or write for further information at (217) 782-4283, Eunice Ann Greer, PhD., Division Administrator, Standard and Assessment Division, ISBE, 100 N. 1st St. , Springfield, IL 62777-0001. Have a great school year!!

PAM KECK
REGION 5

Two years ago a decision was made to alternate the SIUE Winter Conference (SIU-Edwardsville) with the Science in the South Conference held at SIUC (Carbondale). Since it has been observed that these two conferences attract different groups of teachers, SIUE has reinstated the yearly SIUE Winter Conference. The conference this year (1998) will be on Monday, November 23 (first Monday of Thanksgiving break).

This summer a variety of activities have been occurring on the SIUE campus in Region V. In particular, several faculty have written (or are in the process of writing) grants to support teachers. In particular, I am currently submitting grants to support teachers doing research during their summer breaks. Since many high school teachers have not had the opportunity to do research, we feel this experience is important to help achieve goal 11 in the Illinois State Standards. I am currently investigating grant opportunities to purchase equipment to be used at secondary and middle school levels, particularly in the area of biotechnology. We currently have electrophoresis equipment available to loan and would like to purchase other equipment to support lab exercises in biotech (eg., microcentrifuges, light boxes, PCR machine). Additionally, we have held several workshops on campus for teachers this summer including: uses of CBLs, environmental chemistry and techniques in biotechnology. An internal grant from SIUE will support the training of science to preñservice teachers in local (lower IGAP scoring) schools using M.A.S.H. (math and science hands-on) kits. Further information about the kits may be obtained from Denise Plunk at the science resource center at 618-650-2149.

SUZANNE ASATURIAN
REGION 6

Hello from Southern Illinois! Welcome to Max Reed as Regional Director for Region 6. Max and I attended the Summer ISTA Board meeting in Champaign June 26 and 27, 1998. We added input from our region and want to continue to represent our constituents- YOU! Let us know by phone or email, or mail your interests, concerns, and positive rewards you are receiving. We will be glad to share the news to the board and all ISTA members. Due to a great attendence at our first two Science in the South meetings, our Third Annual Science in the South will be held March 12, 1999 at Southern Illinois University in Carbondale. This one day workshop has become very popular and we want to continue to serve all teachers in our region. Note the Call for Papers on Page 11 of this issue of the *Spectrum*. We need you to present your best lessons and also to attend this one day ISTA/SIU workshop. All levels will be represented in Science and Math topics. Look forward to meeting you there. The State Convention is October 15-18, 1998 and we will set up a meeting there for all Region 5 and 6 members. Join us in Chicago Rosemont Convention Center!!

In Region 6, there are many opportunities for you and your students to become involved in:

- Expanding Your Horizons for 7, 8, 9th grade girls- November 21, 1998 SIU-Carbondale
- 16th Annual ICTM/Southern Section Regional Math Conference- February 18, 1999 SIU-Carbondale
- Junior Science and Humanities Symposium- March 7-9,1999 Southern Illinois University Carbondale
- Science in the South: March 12, 1999 SIU- Carbondale
- Math Field Day for High School Students- March 26, 1999 SIU-Carbondale
- Regional Science Fair- April 13, 1999 SIU-Carbondale

Best wishes for a fun and educational year. If you have any information you want publicized, e-mail me!

SYLVIA GILBERT AND MICHAEL LACH
REGION 7

In Region 7, there are many new initiatives being started this fall. At the elementary level a designated lead teacher from each school will be asked to attend a meeting on October 2 at the CPS headquarters. At the meeting the attendees will be provided with information about science opportunities for both teachers, students, and parents. At this meeting there will be some presentations and lots of SHARING. Future meetings are scheduled for Dec. 4, 1998, March 5, 1999, and May 21, 1999. We are asking these teachers to be a liason between CPS and the teachers in their schools. We hope this will be a two-way communication network. In such a vast system as Chicago's, classroom teachers can often feel isolated and miss many opportunities to improve and share their skills. We are working to build closer ties.

For all science teachers, CSI has established a mail list server to enhance communication. To subscribe, send a message to <mailto: requests@lists.csi.cps.k12.il.us> with subscribe science (first name) (last name) in the subject.

Expanding the sucess of last year's EnviroNet program, CPS has also started an initiative to have monthly content-specific meetings for all its science teachers. These meetings featured regional presentations from science and science-education organizations, handouts and freebies, and plenty of collegiality and networking. Look for further information this fall.

CPS is also moving forward with revisions of the CASE exams and Programs Of Study, both due to plenty of teacher feedback. Again, more information is forthcoming.

Every CPS high school has been promised one "state of the art" science lab. Prototype labs were developed by teachers in consultation with architects. Labs are currently being installed in 6 high schools, with construction due to be completed before the school year begins. Lists for Phase II and Phase III have been developed. Schools that are receiving priority are those that do not have sufficient space to offer three years of science to their current student population, have been reconstituted, or have a critical need because of the age of the building.

Ann Wild
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703/312-9247 (phone) 703/243-7177 (FAX)

HIGHLIGHTS FROM JULY/AUGUST NSTA LEGISLATIVE UPDATES

Key results of the NSTA Electronic Survey on the use of Eisenhower funds:

1. In most districts, Eisenhower funds are the primary or only source of professional development support for science and math teachers.
2. Many respondents wanted the $250 million set-aside earmarked for science and math teachers in the Eisenhower program increased.
3. Overwhelmingly, respondents said that the Eisenhower program should not be put into a block grant, but should keep its focus on science and math. One teacher wrote, "Block grants will go the way of all dollars. If the funder doesn't earmark the money, it disappears in the bottomless pit of needs that schools have. Teachers won't see it anymore."
4. Many teachers do not have sufficient information about the Eisenhower program---how it works and how they can access funds.
5. In a number of districts, teachers are not involved in drawing up the annual plan for how Eisenhower funds are to be used. Yet teacher participation is required BY LAW.
6. In some districts, administrators tightly control Eisenhower funds with the result that teachers are unable to access the money and/or teachers do not know how district Eisenhower funds are being spent.
7. Some respondents cited examples of misuse of Eisenhower funds by administrators.
8. Many of the college and university respondents who receive grants to conduct professional development programs would like the higher education portion of Eisenhower funding increased.

Appropriations

The House passed 11 of its 13 appropriations bills before members left town for the August break, but work was not completed on the appropriations bill for Labor, HHS, and Education (HR 4274). As you know, a rider in this bill would allow the combining of funds from the Eisenhower Professional Development Program and Goals 2000 with those of Title VI, in effect creating a block grant. If this happens, Eisenhower funds would not be targeted solely for professional development. In addition, the House proposes to fund the Eisenhower program at $50 million less than in FY 1998.

WHAT YOU CAN DO: Although we have said this before, we cannot stress how important it is for you to call or visit your Congressional representatives. THE MESSAGE: Ask your representative and senators to vote AGAINST any appropriations bill that would blockgrant the Eisenhower Professional Development Program. In addition, ask that the Eisenhower program be funded at a minimum of $335 million (the current FY 1998 amount) or more. See government web addresses on page 20 of this issue.

Ed-Flex

The Senate Labor and Human Resources Committee voted, by 17 to 1, to expand the Education Flexibility Demonstration Program (S 2213) from 12 to all 50 states. This legislation was sponsored by Senator Bill Frist (R-TN). Ed-Flex allows states to waive many requirements of federal education programs if these requirements interfere with state and local efforts to improve education. In exchange, participating states must prove they have solid education reform plans, and they must be willing to waive their own regulations for schools if those rules interfere with individual school reform plans. IDEA and civil rights requirements cannot be waived. Although many amendments to this bill were offered, only one was accepted: an amendment that would authorize $40 million for inservice teacher training in school technology for FY 1998. NSTA objected to the expansion of the Ed-Flex program, noting that it could threaten the availability of professional development funds to science and math teachers.

Dollars to the Classroom Act (HR 3248)

No new action has occurred with this legislation. Introduced by Representative Joe Pitts (R-PA) and approved by the House Committee on Education and the Workforce, the bill seeks to combine $2.74 billion for 31 Department of Education programs into a single block grant. Similar legislation in the Senate (S. 1589), introduced by Senator Tim Hutchinson (R-AR), has not yet been taken up by the Senate Committee on Labor and Human Resources. Both the Council of Chief State School Officers and the American Association of School Administrators have opposed this bill, and the President has vowed to veto it. In your letters/calls/visits to your elected representatives, feel free to also express your displeasure with this legislation.

Teacher Tests and Merit Pay

Before adjourning, Senator Connie Mack (R-FL) introduced S 2421, a measure that would set aside half of any increase in Eisenhower professional development funds after FY 1999 and instead give these funds to states that allow merit pay and teacher testing. (This provision was also part of the Coverdell education savings bill that President Clinton vetoed earlier this year).

The E-Rate

The battle continues over the fate of this program. In early August, the Oversight Subcommittee of the House Committee on Ways and Means held a hearing to examine whether the funding mechanism the FCC established for the E-Rate program qualifies as an administrative fee or as a tax. To fund this program, which would provide schools and libraries with discounted Internet access, the FCC has imposed mandatory charges on all telecommunications service providers. The House panel is looking into whether the FCC went beyond its scope and instituted a tax, which only Congress is permitted to do. The issue is also before the U.S. Fifth Circuit Court of Appeals, and a ruling is expected shortly. For the most part, panel members were clearly divided on whether the funding mechanism was a tax or a fee: Republicans asserted it was a tax, and Democrats called for their colleagues to wait until the court issues its ruling.

Vouchers and Charter Schools

Before adjourning, the House passed HR 4380, the appropriations bill for Washington, DC, which included an amendment introduced by Majority Leader Richard Armey (R-TX) to fund a $45 million, five-year school choice plan in the District of Columbia. This amendment would let 2,000 families with incomes below the poverty level to apply for up to $3,200 to use in schools in the metropolitan DC area, including Virginia and Maryland. The Senate Labor and Human Resource Committee approved a bill that would require charter schools to include their students in state and district assessments and to report the performance of their students on these tests. The bill would also allow state education agencies to distribute Title VI block grant funds to charter schools and award federal charter funding to states with the most charter schools. There will be a great deal of activity between now and when Congress adjourns again in October for the elections. Education will likely be a big issue this election year, so watch for all the developments in future legislative updates. As always, please contact your representatives to let your opinions be heard, and remember to forward any feedback you receive to Ann Wild at NSTA Headquarters. Thanks.

Dick Seng
2407 Kentucky St.
Racine, Wis. 53405

A GRAND TIME FOR SCIENCE

Join the Wisconsin Society of Science Teachers for their Convention, April 22-24, 1999 at the Grand Geneva Resort and Spa.

For current information, check out the web site at: www.genevaonline.com/~wsst/wsst.html.

The keynote speaker at the banquet will be Frank Ogden, a futurist who sometimes goes by the nickname of "Dr. Tomorrow".

The 1999 convention will see a return of the Saturday Luncheon, during which time, the satellite feed will be used to talk to Researchers at the Rocky Mountain Institute. Their topic for discussion will be the use of Hyper cards for the 21st Century.

At Thursday night's social in the Exhibit Hall, entertainment will be provided by the Jazz band, "Main Stream". Friday night's dance music will be provided by "The Milwaukee Revue". Wisconsin science teachers welcome you to Lake Geneva for "A Grand Time for Science."

NATIONAL SCIENCE TEACHERS ASSOCIATION
FUTURE CONVENTIONS

1999 Annual Convention and Exhibition
Boston, MA
March 25-28, 1999

2000 Annual Convention and Exhibition
Orlando, FL
April 6-9, 2000

2001 Annual Convention and Exhibition
St. Louis, MO
March 22-25, 2001

2002 Anual Convention and Exhibition
San Diego, CA
March 27-30, 2002

2003 Anual Convention and Exhibition
Philadelphia, PA
March 27-30, 2003

ILLINOIS SCIENCE TEACHERS ASSOCIATION
SECOND ANNUAL SCIENCE IN THE SOUTH CONFERENCE
SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE
FRIDAY, MARCH 12, 1999
CALL FOR PAPERS

Any science-related topics that would be of interest to K-12 science teachers. Hands-on, applied, and activity-oriented sessions/workshops would be preferred.

DEADLINE FOR SUBMISSION: POSTMARKED BY NOVEMBER 4, 1998

Complete (print or type) a form for each workshop. This form may be duplicated.

Principal presenter:

Name_____

Affiliation/School_____

Mailing Address_____

City, State, Zip_____

Day phone (____)_____

Evening ___(____)_____

Additional presenter(s) should be listed with all of the above information of back.

Check time preferred: _____ 50-minute session _____ 70-minute workshop

Title of Presentation_____

Program Description (exactly how you want it to appear) 30 word maximum:

_____

_____

_____

_____

_____

Check the Intended Audience: (any or all) ___K-3, ___4-6, ___7-8, ___9-12, ___ Administration

In order to minimize costs, presenters are encouraged to bring their own equipment when possible. Audio Visual Equipment required:_____

_____

SAFETY: Will you be using chemicals or hazardous materials? _____ If yes, please describe:

_____

Principal presenter will receive a complimentary registration and lunch. Additional presenters will receive a complimentary registration but will pay a $10.00 fee for lunch.

Signature_____ Date_____

Return to: Sandy Rhoads
Division of Continuing Education
Mailcode 6705
Southern Illinois University
Carbondale, IL 62901

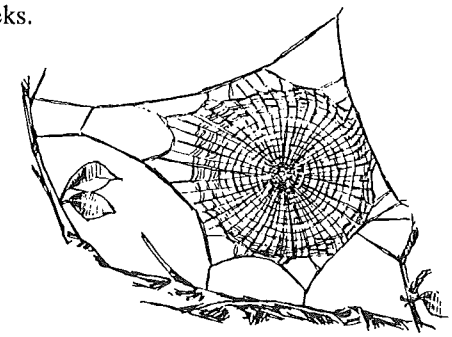
(618) 536-7751
FAX: 618-453-5680

SPECIAL INTERESTS

Dr. Bob Williams
Rivers Project
Box 2222
Southern Illinois University
Edwardsville, IL 62026
618-692-3788 Phone
618-692-3359 FAX
Home page
Http://www.siue.edu/OSME/river

PROVERBS OF THE 20TH CENTURY

1. Home is where you hang your @.
2. The E-mail of the species is more deadly than the mail.
3. A journey of a thousand sites begins with a single click.
4. You can't teach a new mouse old clicks.
5. Great groups from little icons grow.
6. Speak softly and carry a cellular phone.
7. C:\ is the root of all directories.
8. Don't put all your hypes in one home page.
9. Pentium wise; pen and paper foolish.
10. The modem is the message.
11. Too many clicks spoil the browse.
12. The geek shall inherit the earth.
13. A chat has nine lives.
14. Don't byte off more than you can view.
15. Fax is stranger than fiction.
16. What boots up must come down.
17. Windows will never cease.
18. In Gates we trust (and our tender is legal).
19. Virtual reality is its own reward.
20. Modulation in all things.
21. A user and his leisure time are soon parted.
22. There's no place like http://www.home.com
23. Know what to expect before you connect.
24. Oh, what a tangled website we weave when first we practice.
25. Speed thrills.
26. Give a man a fish and you feed him for a day; teach him to use the Net and he won't bother you for weeks.



IFIC
International Food Information Council
1100 Connecticut Avenue, N.W.
Suite 430
Washington, D.C. 20036

HOW ARE AMERICANS MAKING FOOD CHOICES?

It is recognized widely that American consumers, and consequently American media, are fascinated with food. Open any newspaper or magazine, or turn on the television or radio and inevitably a story about food and the relationship between diet and health will appear.

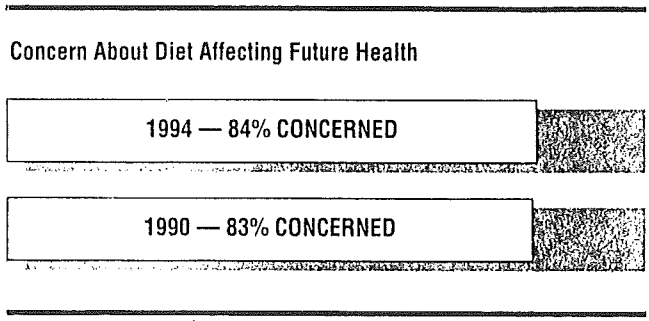
While these are hot topics, what consumers know and how that information influences their food choices is somewhat unclear. To better understand consumers' perceptions, the Gallup Organization conducted a survey for the Information Council (IFIC) and The American Dietetic Association (ADA) to assess Americans' attitudes, concerns and behavior regarding diet and health; their sources for nutrition and health information, and confidence in those sources; confidence in their own ability to select a healthy diet; their perceived barriers to eating a healthy diet, and; their attitudes toward physical activity, as well as other topics related to health and nutrition.

The survey results are based on telephone interviews with a national sample of 754 adults, over the age of 18, which were conducted in December, 1993. For results based on samples of this size, there is a 95% confidence level that the error attributable to sampling and other random effects could be plus or minus four percentage points.

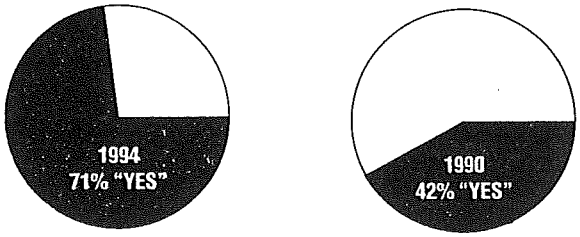
Some of the results were compared to those of a similar survey IFIC and ADA conducted in 1990 to determine any changes in behavior or attitude. Other questions reflect new and emerging food, nutrition and health issues. This review will summarize the results of the latest survey.

NUTRITION AND HEALTH

Americans are genuinely interested and concerned about the role foods play in their overall health. participants were asked, "How concerned are you that what you eat may affect your future health." Eighty-four percent of those responding said they were either concerned or very concerned that what they ate could have an affect on their future health. This is an increase of only 1% from 1990.



Have Made Changes Regarding Fat in Diet



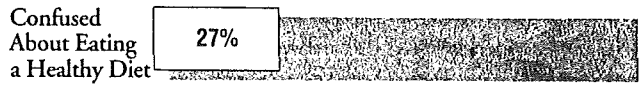
The majority of respondents believe they are capable of selecting a healthful diet, with 48% saying they are very confident in their ability and 40% somewhat confident in their ability to select a healthful diet.

While fat is one of the buzz words in today's popular nutrition vocabulary, the question remains; are consumers still making changes specifically regarding fat in their diets. Seventy-one percent of the respondents said they made specific changes in their diet regarding fat. This is a significant increase from the 1990 survey when only 42% of respondents reported making any changes.

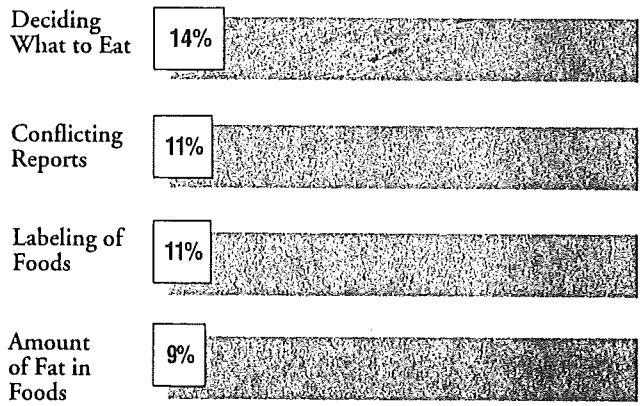
Improving Diet Means Eliminating Foods

Foods That Are Good For Me Don't Taste Good

Most consumers recognized that taste does not have to be compromised for health benefits. Seventy-two percent disagreed with the statement, "To improve my diet, I have to eliminate my favorite foods," and 70 percent of respondents disagreed that, "Foods that are good for me usually don't taste good."



WHY:



NUTRITION CONFUSION

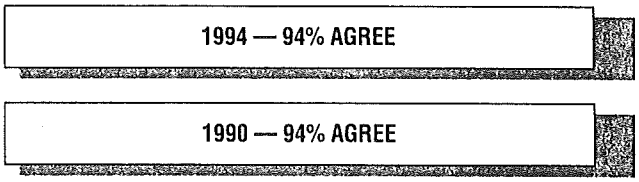
When asked if they feel confused about knowing how to eat a healthy diet, 45% said they are not at all confused and 27% responded that they are not very confused.However, 27% reported feeling very or somewhat confused. Deciding what to eat was most confusing for 14% for those who feel confused, 11% find the conflicting nutrition and health reports confusing, an additional 11% said food labeling is the most confusing aspect of healthy eating, and 9% found understanding the amount of fat in food to be confusing.

BALANCE, VARIETY AND MODERATION

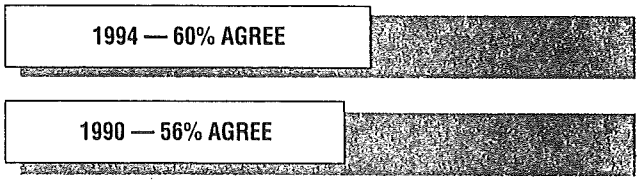
Despite these feelings, 94% of those surveyed agreed that balance, variety and moderation are the keys to healthy eating. This figure was the same in the 1990 survey.

Consumers also understand the concepts of these terms. Sixty percent of those surveyed agree that higher fat foods can be part of a healthy diet if balanced with low fat choices, a slight increase from 56% who agreed with this idea in 1990.

Balance, Variety and Moderation Keys to Healthy Eating



Higher Fat Foods Part of Healthy Diet If Balanced With Lower Fat Choices



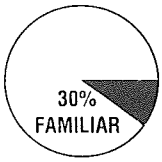
Almost everyone surveyed (92%) agreed that controlling the portions or serving sizes of food is important to maintaining a healthy diet.

A little more than half of those surveyed (56%) also agreed that any food can be a part of a total, healthy diet.

Consumers also are becoming better informed about food and nutrition, with 30% reporting that they are familiar with the Food Guide Pyramid. Those who are college educated were more likely to say they know of the Pyramid.

CONTROLLING PORTION SIZES IMPORTANT TO MAINTAINING HEALTHY DIET

ANY FOOD CAN BE PART OF A HEALTHY DIET



FAMILIAR WITH THE FOOD GUIDE PYRAMID

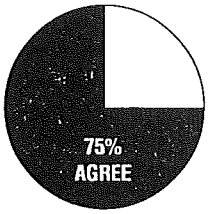
MISCONCEPTIONS

While 56% had agreed that any food can be part of the diet, 67% believe there are good foods and bad foods, even though health authorities advise there are only good and bad diets. This was similar to the 1990 responses.

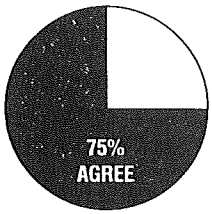
Believe There Are No Good or Bad Foods

	Strongly Agree	Agree	Mostly Disagree	Strongly Disagree	Don't Know
1994	11%	18%	31%	36%	4%
1990	9%	20%	27%	40%	4%

Many consumers are also confused about the amount of fat in individual foods. Sixty-nine percent say that foods should contain 30 percent or less calories from fats, representing an increase of 4 percent from the 1990 survey. It seems that consumers are applying the 30 percent calorie principle to individual foods rather than total diet.



TOO MANY CONFLICTING REPORTS



INFORMATION ABOUT HOW TO EAT A HEALTHY DIET TOO CONFUSING

INFORMATION SOURCES

Americans continue to rely on the media for their food and nutrition information. When asked in an un-aided question about their sources for nutrition and food information, participants mentioned magazines (34%), newspapers (16%) and television reports (16%) as the top choices.

This reliance on the media is also reflected in how consumers react to what they hear. Sixty-eight percent of those surveyed said they are very or somewhat likely to change their food selections based on information from the media.

While they rely on media for information, 75% of the survey respondents agree that there are too many conflicting nutrition reports and 75% also agree that the information about how to eat a healthy diet is too confusing.

When presented with conflicting reports about the same nutrition issue, 42% of those surveyed said they would seek additional information, 27% said they would feel confused, 15% said they would ignore all the reports and 5% reported they would not believe any of the reports.

All Foods Should Contain Less Than 30% Calories from Fat

	Strongly Agree	Agree	Mostly Disagree	Strongly Disagree	Don't Know
1994	37%	32%	12%	5%	14%
1990	29%	36%	15%	5%	15%

USEFULNESS OF INFORMATION SOURCES

As noted earlier, consumers indicate that their primary source of nutrition information is the media. however, of those who have received nutrition information from a health professional, at least two-thirds say they have a great deal of confidence in advice from registered dietitians.

Of those who have received nutrition information from health professionals:

- They are more likely to rate the advice from registered dietitians (70%) and physicians (68%) as very useful.
- They are very likely to say they will change their eating habits if advised to do so by a doctor (68%) or registered dietitian (65%).
- In spite of their perceived value, physicians and registered dietitians are less common sources of food and nutrition information than the media, with approximately half of those surveyed getting information from a doctor and fewer than one-quarter from a dietitian.

Sources and Usefulness of Nutrition Information (Based on Those Using Specific Sources)

	Sources (%)	Very Useful (%)
Registered Dietitian	5%	70%
Doctor	15%	68%
Books	15%	32%
Magazine	34%	22%
TV	16%	19%
Newspaper	16%	16%

Likelihood of Changing Dietary Habits (Based on Those Using Specific Source)

	Very Likely	Somewhat Likely	Not Likely
Doctor Advice	68%	27%	2%
Dietitian Advice	65%	27%	3%
Magazine	8%	52%	27%
TV	8%	49%	27%
Newspaper	5%	52%	28%

PHYSICAL ACTIVITY

In addition to applying balance, variety and moderation to their food choices, 85% of respondents said that physical activity is very important to maintaining their health.

When asked to list the types of physical activity they do at least a few times each week, more than half (55%) said walking. This was the most popular response for both men (45%) and women (64%).

Respondents were also asked to compare their present activity levels to that of five years ago. Forty-two percent said they are as active now as five years ago, 36% said less active and 22% said more active. 18-30 year olds tend to say they are more active (30%) while 43% of those over the age of 50 are either the same of less active.

Physical Activity Compared to Five Years Ago?

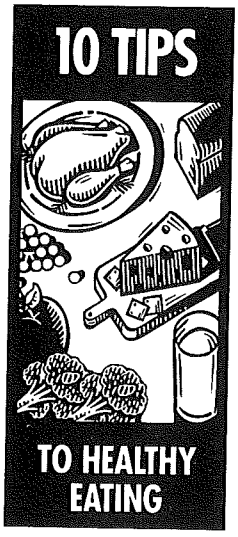
	Total	18-30	31-49	50+
More	22	30	23	14
Less	36	32	33	43
Same	42	38	44	43

CONCLUSION

Overall, Americans have a healthy attitude toward food and nutrition. They are concerned that they "are what they eat," recognizing that food choices may impact their future health. They do seek nutrition information, but tend to get confused by information overload. Unfortunately, there are still a number of nutrition misconceptions lingering, and registered dietitians may need to increase their outreach efforts. In addition, Americans recognize that physical activity contributes to overall health.

10 TIPS TO HEALTHY EATING

To help consumers better incorporate healthy eating habits, ADA and IFIC developed a brochure, **10 TIPS TO HEALTHY EATING** reminding everyone to:



- Eat a variety of nutrient-rich foods
- Enjoy plenty of whole grains, fruits and vegetables
- Maintain a healthy weight
- Eat moderate portions
- Eat regular meals
- Reduce, don't eliminate, certain foods
- Balance your food choices over time
- Know your diet pitfalls
- Make changes gradually
- Remember, foods are neither good nor bad

For a free copy of the brochure, send a self-addressed, stamped, business-sized envelope to:
10 Tips, P.O. Box 1144, Rockville, MD 20850.

National Engineers
Week Headquarters
1420 King Street
Alexandria, VA 22314
(703) 684-2852
eweek@nspe.org

NATIONAL ENGINEERS WEEK FUTURE CITY COMPETITION
1999 REQUEST FOR PARTICIPATION

OVERVIEW

The 1999 National Engineers Week Future City Competition will be held from October 7, 1998 through January 31, 1999. The regional finals will be held the second, third, and fourth weeks of January 1999 in the selected cities. The national finals will be held during the 1999 National Engineers Week, February 21-27, 1999.

DESIGN AND BUILD A FUTURE CITY

Three students will work as a team of "engineers" to design and build a city of the future. The other two team members will be the teacher and engineer-volunteer, who will provide practical advice and technical assistance.

Phase I: Design City

The competition has four phases. In Phase I, the team will design its city using SimCity 2000 provided by Maxis. Students will work as a team in designing the city using math, science and problem solving skills through the use of the computer program.

Phase II: Build Model

In Phase II of the competition. the team will build a scale model of a section of the city. (Please note that it would be impossible to build a model of the ENTIRE city, since the SimCity 2000 printout represents approximately 10 square miles.) The purpose of the model is to give a 3-D view of how the future city would look and give students hands-on experience in modeling. Students will use team building, modeling, math, and problem solving skills while constructing the model city. The model must contain a moving part such as a transportation or communications component. If a power source is used, the power must be self-contained, i.e. no plugs. The model must be no larger than 34" (width) x 60' (length) x 24" (height). The team will decide what materials to use to construct the model. The TOTAL cost of all materials used to make the model and materials used for the visual presentation, i.e. city map, flip charts, may not exceed $100 cash or in-kind. * No laptop computers or VCR (video machines) will be used for the oral presentation. An accounting of all expenses related to the building of the model and visual presentation materials will be requested at the regional and national competitions.

Phase III: Essay

In Phase III, the students will write an essay on a specific topic. The essay will be 500 words or less. Students will work as a team while researching and writing the essay. Students will be required to submit a competition form, verifying that the essay was written solely by the students. Phase IV: Oral Presentation Students will be required to give an oral presentation of their work at the regional and national contests. Students will work as a team to present the city to a panel of judges by making a short 5-7 minute oral presentation to a panel of judges and then answering questions. Regional Contests The regional contests will be scheduled during the second, third, and fourth weeks of January 1999 and are the responsibility of the regional coordinator. The regional coordinator will notify participants of the date, time and location at least 6 weeks in advance.

NATIONAL FINALS

The national finals will be held during the 1999 National Engineers Week, February 21-27. The winning team (3 students, teacher, engineer) from each of the fifteen to seventeen cities participating in the competition will compete in the national finals.

WHAT'S COMING IN 'GAW' '98?

Join other teachers across the nation November 15-21 in celebrating Geography Awareness Week (GAW) 1998. Students will take a look at characteristics of populations through the theme "People, Places, and Patterns: Geography Puts the Pieces Together."

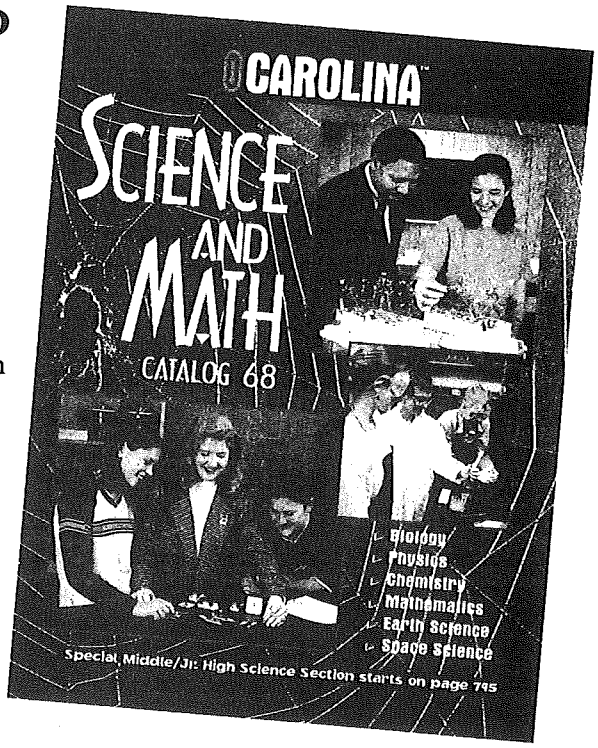
The Geography Education Program is developing a rich and colorful packet of teacher's materials for the week. The activities are designed to help students in grades K-12 understand the composition, distribution, and movement of populations, and they challenge students to think about ways to manage resources and plan for future growth.

The packet will include four full-color posters, a 26-page handbook of classroom activities, and a CD-ROM with population data and mapping software. A poster with an original perspective of people and places of the world announces the week. The second poster provides 10 colorful maps of the United States and Canada that students can compare to derive correlations between the data shown on the maps. The third poster shows a dramatic view of the contiguous U.S., southern Canada, and Mexico from space at night, with activities related to responsible use of natural resources. The fourth poster focuses on cultural variations among populations, looking at foods favored by people around the world. The activities are designed for use in the classroom with a minimum of preparation time and materials. Most are adaptable for a wide range of grade levels.

Geography Awareness Week 1998 is generously supported by International Paper, MOTTS, Exxon, DuPont, Nabisco, and ESRI. Contact Geographic Education Progam, P.O. Box 98190, Washington, DC 20090-8190 <www.nationalgeographic.com>

YOUR SCIENCE TEACHING RESOURCE

EVERYTHING YOU NEED TO TEACH SCIENCE



Carolina's new *Science and Math Catalog 68* is big. 1,184 pages big! And it's packed with the quality products you need to teach science effectively, all backed by the great service and timely delivery you deserve—as well as by The Carolina Pledge: 100% satisfaction guaranteed.

Carolina's dedicated staff is ready to serve you—whether you have questions about a specific product or need help selecting materials for specific applications—we're just a free phone call away (1-800-227-1150). Now you can contact us on the Internet at www.carolina.com. All in all, nobody delivers as much value for your money.

If you have not received your science teaching resource—Carolina's *Science and Math Catalog 68*, call 1-800-334-5551.

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Carolina Biological Supply Company

2700 York Road, Burlington, NC 27215

COMPUTER SPECTRUM

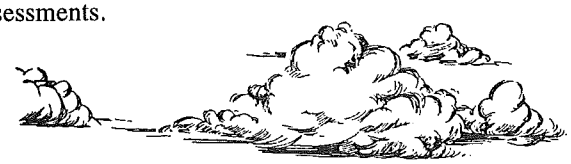
ASSESSMENT MID-CONTINENT

Regional Educational Laboratory (http://www.mcrel.org) provides information on assessment and contact information for individuals who will assist with questions. E-mail links are provided. The site features 20 Whelmer activities (http://www.mcrel.org/whelmers/ index.html) aligned to standards appropriate for elementary and middle school physical science. Each has an alternative assessment.

Colorado CONNECT (http://ben.boulder.co.us/connect/), Colorado's State Systemic Initiative from the National Science Foundation, has put a number of science activities and assessments on-line. to download many of the assessments you must have Adobe Acrobat Reader installed on your computer. This is not to be confused with the Adobe Acrobat application. The reader can be found and downloaded free at numerous locations on the web.

A very unlikely site has produced some outstanding examples of activities and assessments. This site is at the Center for Analysis and Prediction of Storms (http://www.ou.edu/tornado/CAPS.WWW/teacher.html). Included are teacher enhancement activities and science experiments with embedded science process assessments such as making charts, making predictions, some of the process skills we tend to omit when assessing students only on science knowledge.

Martha Phelps-Barrowman (www.cs.rice.edu/~mborrow/Lessons/assessls.html) has compiled a healthy list of links to other sites full of examples of alternative assessments.



EDUCATION WEEK QUALITY COUNTS '98

The majority of urban students in about half the states fail to meet even minimum national standards in mathematics, reading, and science, finds Education Week's report, Quality Counts '98, which is available on the Internet at http://www.edweek.org/qc/. Students in urban schools where most of the children are poor fare worst of all.

The 272-page report, provides a detailed analysis of previously unpublished data on the condition of public education in the nation's cities. It ranks each state on more than 75 indicators, which were based on what research suggests makes schools effective.

ICE

Are you familiar with the Institute for Chemical Education? You may find their resources useful.
Their home page is http://ice.chem.wisc.edu/ice.

SCHOOL TO WORK

The National Skill Standards Board sponsors projects that link skill standards with school-to-work projects. The board can be reached at 1441 L St. NW, Suite 9000, Washington, DC 200005; 202-254-8628; http://www.nssb.org.

Want to find out how workplace skills can be integrated into your curriculum? Contact the SCANS/2000 Program, Johns Hopkins University, Institute for Policy Studies, Wyman Park Bldg., Fifth Floor, 3400 N. Charles St., Baltimore, MD 21218; fax 410-516-4775. SCANS/2000 also has a website: http://infinia.wpmc.jhu.edu/default5.htm.

WORKING TO LEARN INITIATIVE

TERC's Working To Learn Initiative was created to meet the need for stronger connections between in-school learning and learning that takes place at work and in the community. Founded on the concept of learning partnerships, the initiative promotes thoughtful and planned collaboration between teachers and workplace or community partners.

Working To Learn is looking for curricula that use workplace and community experiences to contextualize science, math, and technology learning. If you know of a curriculum that connects or could be adapted to connect science, math, or technology learning in the classroom with learning in the workplace, e-mail the title of the curriculum and information on where it can be obtained to Irene Baker at Irene_Baker@terc.edu. For more details on Working To Learn, see the website http://www.terc.edu/wtl.html.

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- **http://volcano.und.nodak.edu**
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- **http://volcano.und.nodak.edu/vwlessons/activities/p_number6.html**
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- **http://manbow.ori.u-tokyo.ac.jp/tamaki-html/nuvella.html**
  Enter plate names, latitude, and longitude, and get the velocity and direction of two plates.

- **http://marin.org/npo)geo/edmatl.html**
  Find information and classroom materials.

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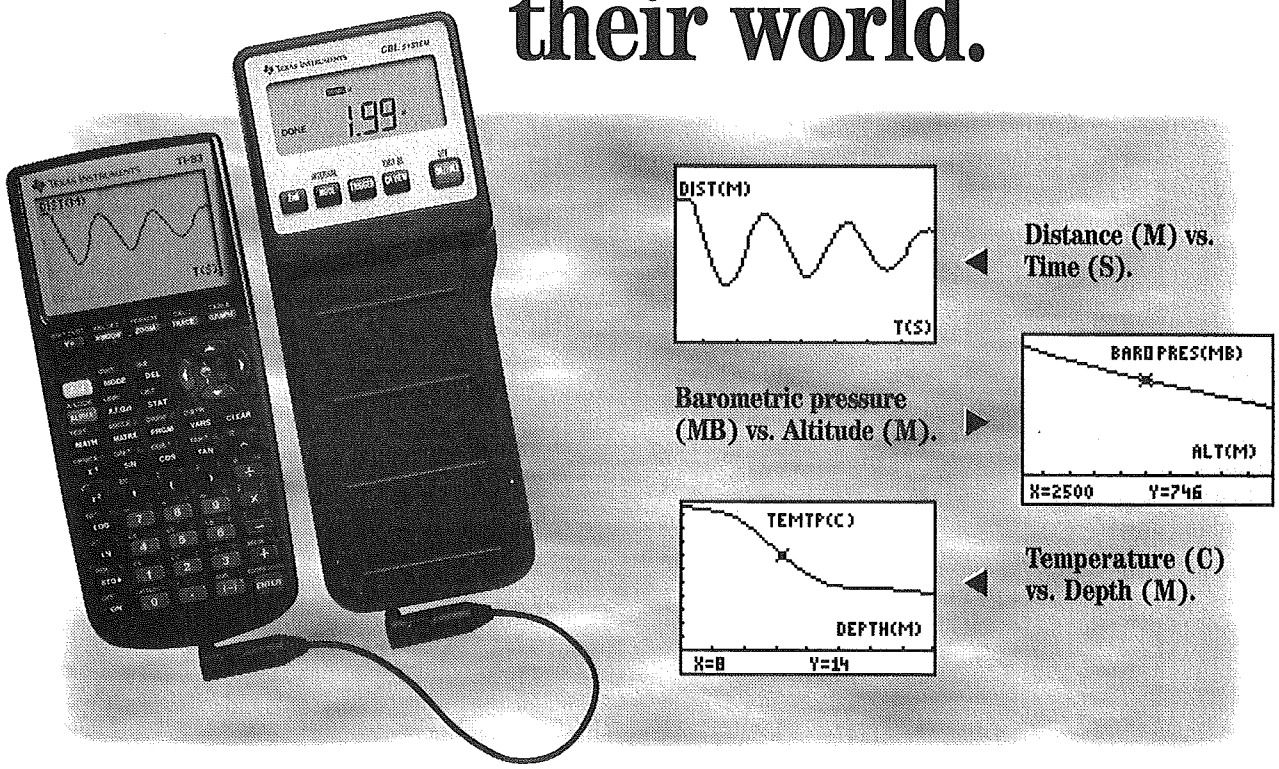

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ANNOUNCING SCIENCE NETLINKS! www.sciencenetlinks.com.

Designed specifically for teachers, parents and librarians, Science Netlinks is a detailed guide to the best science resources on the internet. In addition to reviews by a panel of the nation's top science and education experts, Science Netlinks provides added information on how teachers can use these sites to make science come alive.

Each month, Science Netlinks has a special focus on a featured science standard from the National Science Education Standards and the Projevct 2061 Benchmarks for Science Literacy. The Curriculum Connections section of the site provides detailed activities and ideas for incorporating the standards into lesson plans for students. The Internet Help section provides information and advice on using the internet in educatinal activities. And the Discussion Board lets teachers discuss science education issues and topics with others, across the country and around the world.

http://www.ed.gov.

Faster searches, greater access to information and attractive layouts await users of the newly redesigned Education Department web site at http://www.ed.gov. In one month alone, the home page recorded more than 10 million hits from 1209 countries.

Student financial aid materials, tips for parents, statistics and the latest findings on what works in education are among the myriad of documents stored on the site, helping make it one of the most widely used education resources on the Internet.

AMONG THE IMPROVEMENTS:

- A state-of-the-art search engine that sifts through more than 20,000 files to produce much faster and more accurate results.

- A new "cross-site indexing" project (http://www.ed.gov/Search/), extending searches beyond Education Department offices to more than 100 department-sponsored web sites. What previously could take hours can now usually be accomplished in seconds by scanning data from more than 80,000 files at ERIC education research clearinghouses, regional labs, and national research centers.

- Headlines that are regularly updated.

- "Topics A-Z," offering an alphabetical list of links to the best starting points for several hundred topics.

- Revamped buttons that make popular information such as "Student Financial Assistance" and "Research and Statistics" easier to find.

- A more "Navigation friendly" graphical design, with a text-only equivalent for individuals with visual disabilities, low-bandwidth connections, or non-graphical browsers.

- A "Contact Us" page that provides e-mail addresses, tollfree telephone numbers & postal addresses for key contacts, as well as a link to the Department's ongoing Internet Customer Survey.

- Links to education-related conference and event calendars at Department-sponsored sites, as well as more prominent connections to state education agencies.

LEGISLATIVE SITES
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Senate homepage
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To get names (with address, phone, e-mail) of your Senators and Representatives by zip code:
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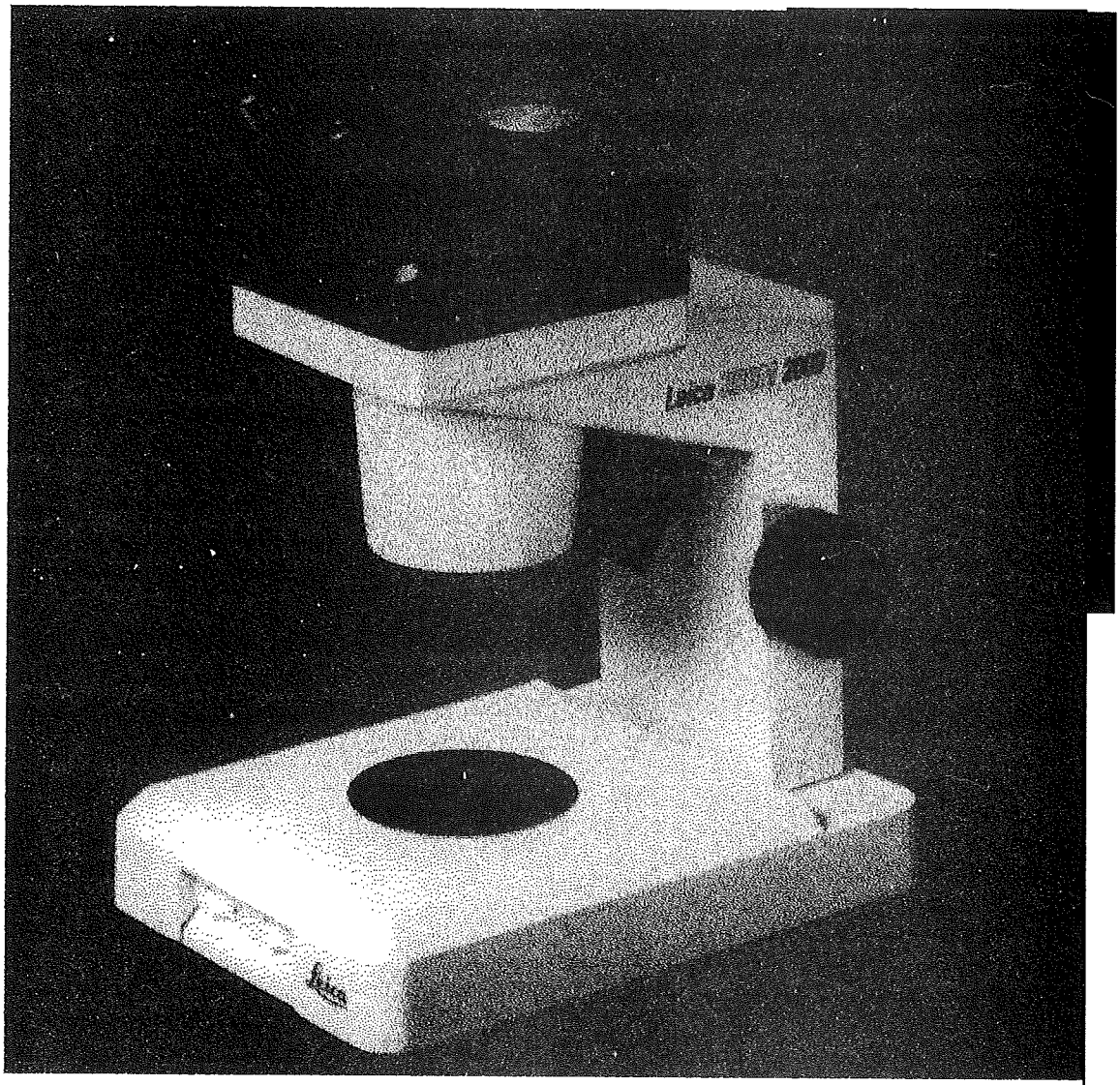
Department of Education homepage
http://www.ed.gov/



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SCIENCE TEACHER EDUCATION SITES

NSTA is redesigning standards for science teachers that, if approved, will have significant impact on teachers and on teacher preparation programs. Now is the time to provide input. Check them out at:
http://www.iuk.edu/faculty/sgilbert/draftstand.htm.

Some of you may not have seen the (relatively) new standards for science teacher educators. These standards may help develop standards for an award for science teacher educators and it could help in developing services to science teacher educators. Check them out at
http://science.coe.uwf.edu/aets/standards.htm.

To locate science teacher organizations.
>http://science.coe.uwf.edu/.

MERCURY WARNING!

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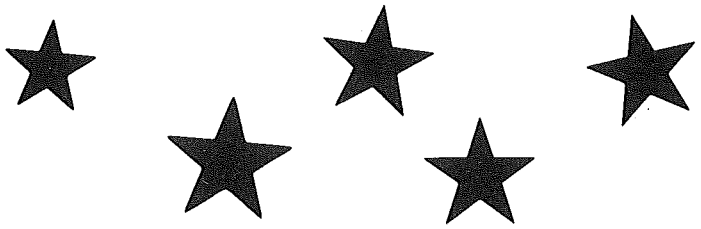
See alert at http://atsdr1.atsdr.cdc.gov:8080/alerts/970626.html



NASA LAUNCHES LIVE INTERNET WEBCASTS WORLDWIDE

NASA recently started the Learning Technologies Channel that transmits live audio and video through the "web." The main focus of the channel is to provide teacher training to educators where they are located. chat windows on their computer screens permit students to submit questions that are answered during the webcasts. For some programs, a text transcription is generated to allow users with slow data services to participate. For schedules and computer links to this and other broadcasts, visit the channel's website (http://quest.arc.nasa.gov/ltc). To register to automatically receive email about the webcast service, send an email to: listmanager@quest.arc.nasa.gov and type "subscribe updates-ltc" in the message box.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES Web Site Index

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(dnr.state.il.us)

Office of the Director
(dnr.state.il.us/ildnr/director/director.htm)

Office of Public Affairs
(dnr.state.il.us/ildnr/offices/pubaffrs/pubaffrs.htm)

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Outdoor Illinois Magazine
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Office of Public Services
(dnr.state.il.us/ildnr/offices/pubsrvces.htm)

Division of Education
(dnr.state.il.us/nredu/nredpage.htm)

Illinois State Geological Survey
(http://DENR1.igis.uiuc.edu/isgshome.html)

Illinois State Water Survey
(http://www.sws.uiuc.edu)

Illinois Natural History Survey
(nttp://www.inhs.uiuc.edu)

Illinois State Museum
(http://www.museum.state.il.us/)

Hazardous Waste Research and Information Center
(http://www.hazard.uiuc.edu/hwric/hmlhome.html)

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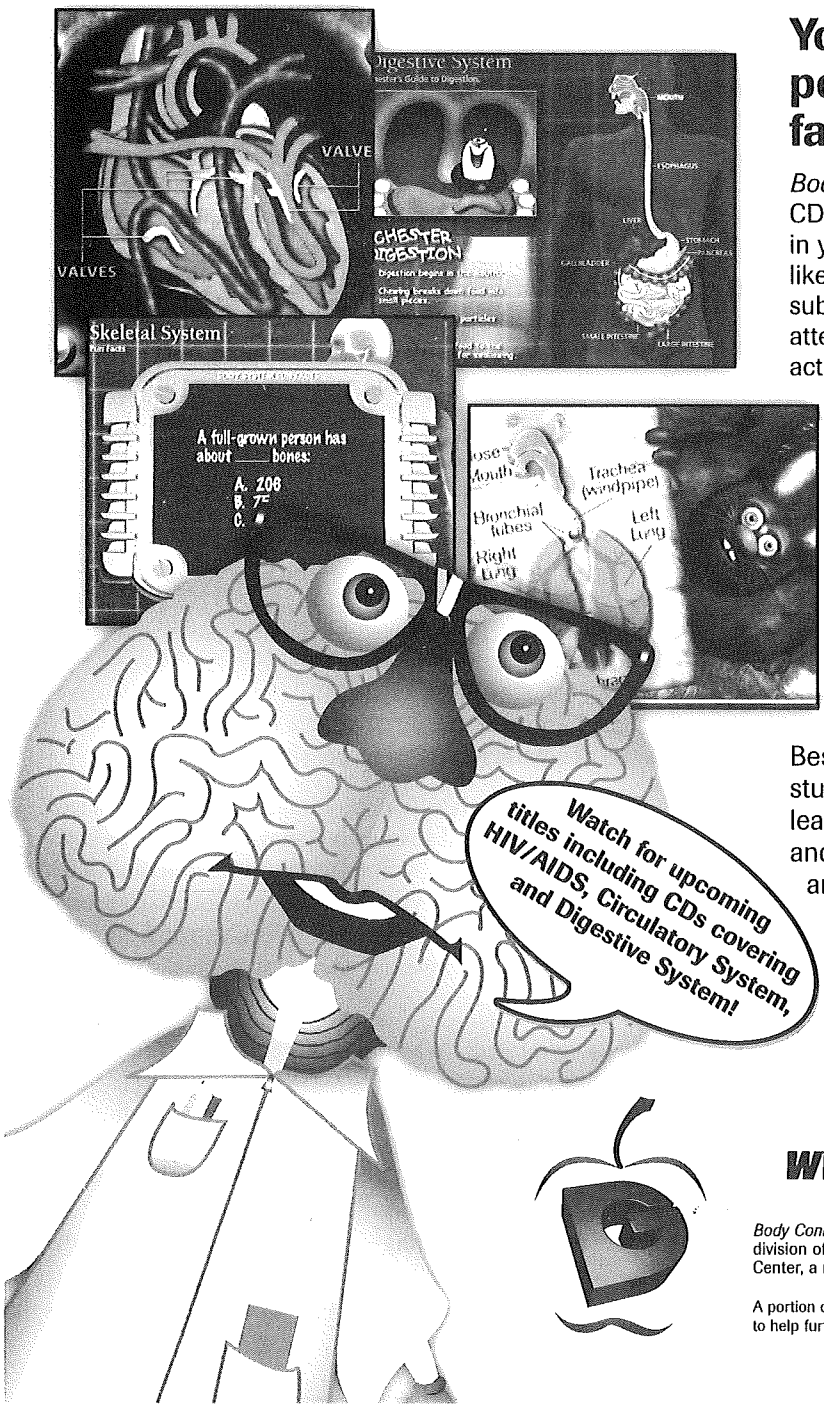

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ARTICLES

Dr. Marlow Ediger
Truman State University

AFFECTIVE OBJECTIVES IN THE SCIENCE CURRICULUM

Science teachers need to stress three kinds of objectives in teaching and learning. The first kind, cognitive, does receive major emphasis by teachers. Cognitive goals stress pupils achieving well in acquiring vital facts in ongoing lessons and units of study. There are selected educators in science who tend to downplay the importance of vital facts that learners are to acquire. Perhaps the problem here is more of what is done with the facts as compared to saying that pupils acquiring factual information is unproductive. Facts are the building blocks of developing concepts. Concepts are broader than facts and may contain many facts in each concept. Consider the following fact: there are three major kinds of rock—igneous, metamorphic, and sedimentary. I believe this is a valuable fact for pupils to learn in a unit on "Rocks and Minerals." The term "igneous" is a concept. Many facts are contained therein, such as

1. Igneous rock comes from the interior of the earth where temperature readings are very high.
2. Molten rock is made of magma and lava.
3. The molten rock comes through fissures in the earth.

In addition to vital facts and concepts, pupils should also acquire major generalizations (Marlow, 1997a). Generalizations in science relate several concepts into a declarative sentence. The following is a generalization: "Common forms of igneous rock are granite used for tombstones, pumice used in building materials, and obsidian used in making decorative items." The concepts here are igneous rock, granite, tombstones, pumice, building materials, obsidian, and decorative items.

In addition to facts, concepts, and generalizations, pupils also need to be able to think critically. When pupils, for example, make comparisons among igneous, metamorphic, and sedimentary rocks, critical thinking is involved. When pupils brainstorm the many uses of rock and think of unique uses also, then creative thought is in evidence. Going one notch higher in level of thought, if pupils engage in problem solving, they need to identify a problem, gather information in answer to the question or problem, and test the information in a utilitarian situation. The following are examples of identified problems:

1. Why does the interior of the earth continually become hotter the further one goes inside the surface?
2. What causes volcanic eruptions?

Higher levels of thinking are salient for pupils to internalize in ongoing lessons and units of study. Thus there is much knowledge that a pupil needs to acquire as well as use the knowledge in a practical way in society. Related to cognitive objectives are affective ends for pupil attainment. With good affect, pupils have more of an inward desire to acquire subject matter. Negative affect generally makes for feelings of downplaying the importance of learning.

Affective Objectives in Science

Affective objectives involve attitudes, feelings, emotions, and beliefs. There are several relatively new programs in science education that stress the emotions and their consequences for individuals. I have noticed several of my student teachers and cooperating teachers, each pair called a teaching team, who stress much pupil involvement in the science curriculum. These teachers emphasize rather heavy pupil involvement in curriculum development. In several situations these teaching teams had worked out a set of learning centers whereby pupils individually could choose which tasks to pursue and which to omit in an ongoing science unit of study. Learners might then sequence their very own experiences in the ongoing science unit of study. I will describe one set of centers I observed in which the unit of study in science was entitled, "The Changing Surface of the Earth." The following learning centers were then in evidence:

1. a soil erosion center
2. folding and faults in and on the earth's surface
3. flood damage in an area center
4. contours, strip cropping, terracing, and planted grass/trees to avoid erosion
5. wind and water erosion
6. the weathering process, including freezing and thawing
7. pollution of the natural environment
8. saving forest regions
9. mining for rocks and minerals in a responsible manner
10. use of natural resources responsibly.

Each center had concrete (real objects and items), semiconcrete (audiovisual aids), and abstract materials of instruction (cassettes, reading materials, written work, discussions and other oral communication activities). There were four to five tasks per learning center for pupils to select to work on. For example, center #2 above had the following tasks on a task card:

1. By using reference material at this center, find causes for both folding and faulting.
2. Using the modeling materials, make a model of folding and of faulting in and on the planet earth.
3. Prepare an oral report on folding and faulting to be presented to the entire class.
4. Make drawings of folding and faulting for display on walls in the hallway.
5. What happens to lives and property when severe faults cause problems?

Pupils at these learning centers make many decisions, such as which tasks to pursue sequentially. Teachers are guides and encourage as well as assist pupils to achieve continually. The pupil then chooses which tasks to complete and which to omit. The choices are made based on purposes unique to each pupil. Then too, there are ample opportunities for pupils to work collaboratively if they so desire. There are activity centered tasks as well as those that require or stress more of abstract endeavors. The learning style of individual pupils is involved in making decisions. The teacher does not dictate what pupils are to learn. The interests of pupils are salient in learner centered instruction. Thus, the attitudinal dimension of the learner is paramount in an affective centered science curriculum. The feelings and emotions are involved here in decisions made. The pupil also assists in evaluating his/her own progress in products and processes of learning.

Emotional Intelligence

There are an increasing number of educators who advocate the feeling dimension in learning. Pool (1997) summarizes key ideas presented by Dan Goleman (*Emotional Intelligence,* 1995). According to Goleman, there are five dimensions of emotional intelligence, The first is self awareness. Here, pupils realize increasingly that there are personal strengths and weaknesses and use these to become decisive in decision making. Understanding their own feelings is important so that action options are more prevalent. Self-confidence is very important in order to make choices and act to make decisions.

Second, pupils need to learn to handle their emotions. Impulsive behavior may lead to incorrect decisions. Learners need to develop more of a *wait* approach so that options may be scrutinized in terms of advantages and disadvantages. The consequences of each choice need to be assessed. Being impulsive might well lead to improper ends in life. Third, learners need to feel motivated in achieving definite goals. Hope is involved in having these goals in life. The motivation then comes from diverse goals that an individual aims for. Optimism is necessary to achieve and reach objectives one has in mind. Fourth, empathy is very important for pupils to develop. Feelings of empathy make it possible to sympathize with others. Empathy is learned. Thus, one learns to assist others in positive ways or be brutal to others. Compassion for others is important. Fifth, the development of social skills enables a pupil to help others in every day situations in life. Politeness and friendliness enable a person to interact well with others in society on a daily basis.

Emotional intelligence harmonizes well with an affective science curriculum. Thus with pupil/teacher planning of the curriculum, self awareness is increasingly developed when pupils select the order of learning activities in science. Strengths in decision making should be an end result. When pupils learn to handle emotions, there is persistence and effort put forth in learning. The immediate goal is not what is necessarily good, such as in impulsive behavior. Rather, the pupil needs to evaluate the pros and cons in making choices. Motivation is necessary in order that goals are achieved by pupils in science. With the absence of goals, energy levels for learning go downhill.

Feelings of empathy make it possible for pupils individually to get along well with others. In school and in society, it is necessary to have good human relations so that achievement and group efforts are possible. Human beings are feeling individuals, not automatons. Social skills need learning by pupils so that a friendly and considerate environment is available for all to achieve more optimally.

In my own experience as teacher, school administrator, and university professor, including supervising student teachers and cooperating teachers for thirty years, I believe affective and cognitive objectives interact. It is difficult to separate the two categories. Thus, when I speak at conventions for teacher education and write for publication, I stress that quality emotions and feelings assist pupils achieving at a more optimal rate in the cognitive domain. My observations of pupils in the public schools indicate that individuals who are hostile, negative, have short attention spans, and mistreat others in the classroom have a difficult time to achieve their potential, much more so than other pupils in the class setting. Thus, quality attitudes in the affective dimension assist learners to achieve more optimally in the cognitive area.

Humanists desire open ended or general objectives, rather than measurably written or behaviorally stated objectives for pupils to achieve. Why? Not all pupils, by any means, learn the same things due to choices and decisions made by pupils in ongoing units of study. If teachers determine objectives for all pupils to achieve in science units of study, there is no room for learners to select and omit selected learning opportunities, based on learner perceived purposes (Marlow, 1996b).

A pupil centered curriculum might be emphasized, in part, through individualized reading in science. Instead of using basal textbooks in science units, pupils may choose to read library books that related directly to the unit title being studied. In a unit on "The Changing Surface of the Earth," an adequate number of library books on different reading levels need to be available for pupil choice. I have observed this approach to be very successful in ongoing lessons and units of study. Pupils then relate what was read from a library book to the ensuing discussion. There appears to be much discussion and excitement when this approach is used in teaching science. Pupils might then notice different points of view expressed which can lead to analysis and evaluation of subject matter read.

In addition to pupils choosing library books to read and relating the content to ongoing discussions, the science teacher might also have conferences with individual pupils or several pupils who have read the same library book where multiple copies of a book were available. Here, the teacher might observe pupil enthusiasm, interest, and quality of comprehension. The science teacher can always diagnose strengths and weaknesses shown by pupils in the conference setting. What has been diagnosed as weaknesses might then be remediated through additional learning activities (Marlow, 1997c). Pupil choices in the science curriculum might be made in whole or in part. The latter might be stressed in individualized reading in science which then substitutes for the basal textbook in ongoing units of study.

Conclusion

Emotions, feelings, and values are important parts of an individual's well being and achievement in life. Science teachers should emphasize an adequate number of objectives stressing the affective domain. Actually, the affective domain cannot be separated from the cognitive. If pupils possess quality attitudes, the chances are the rest will be achieved well in life as much as the individual is capable.

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NEW PERSPECTIVE—NEW PRACTICE
CURRICULUM AS WEB OF INQUIRY

Customary Perspective - Curriculum as Prescribed Course of Study

Typically, mathematics and science curricula treat topics as isolated entities with little attempt made to connect them. A week of study of photosynthesis might follow a week of study of the sun, but connections, when they are made, are either superficial or come from teacher initiative and knowledge, not from the K-12 textbooks. Even thematic units tend to rely on context to connect topics, with little deliberate integration of disciplinary content or cognitive work across the various subject areas that come into play.

This organization of study makes it convenient to consign topics, rather arbitrarily, to grade levels. Partly as a result, coverage is generally valued over understanding, and adherence to predetermined time units for studying a topic (seldom longer than a week or two) becomes as important a way of measuring successful teaching as student scores on standardized tests. Textbook questions, often used as models to teacher-designed tests, tend to call for one-word, fill-in-the-blank, or, at best, short-answer responses that match the answers (often also even the exact wording) in the textbook. Those memorized responses are easy to grade—and easy to "learn." Students have no time (and no need) to think in depth, to explain their reasoning, to understand each other's thinking, or to raise new questions. All too often the questions students do raise are given short shrift because of the necessity to remain on schedule, or because they seem peripheral to the topics at hand. Even in the later grades, students are seldom encouraged to engage in *doing* and *using* science and mathematics to investigate and solve problems as scientists and mathematicians do, or even as nonscientists do at home or on the job.

This traditional, prescribed curriculum also leaves little room for teachers to engage in and deepen their own understanding of science and mathematics and of the rich interrelationships across those (or other) subject areas. Particularly when the course of study in a classroom is dictated by a textbook, teachers are asked to make few substantive decisions. Their decision making tends, instead, to revolve around classroom management rather than around student thinking and understanding. So-called "teacher-proof" curricula actually *require* the teacher to do little or no thinking about the ideas they are teaching. Because teacher involvement in the development of curriculum is so undervalued, their participation, even when they are involved, is generally limited to finding new contexts to serve as the backdrop or medium of instruction. Determining *what* content will be pursued and to what depth is too often seen as beyond the scope of even the most experienced teachers.

New Perspective—Curriculum as Web of Inquiry in a Content Domain

Richard Lehrer, Leona Schauble, and collaborating teachers and researchers, in their Modeling in Mathematics and Science (MIMS) project, take a fundamentally different approach. They view curriculum as a web of inquiry—*purposeful* inquiry designed by the teacher and comprising everything that students do and learn, the complete classroom ecology related to student understanding in a domain.

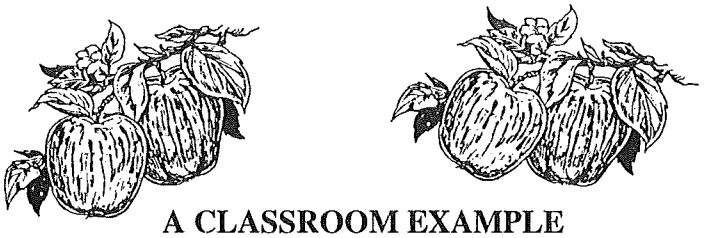
Teachers not only plan discrete activities and give quizzes and tests, but also plan, evaluate, build, and continuously reshape exactly what is studied and how, with specific attention to student thinking and the development of deep understanding.

A web of inquiry in a domain involves many complex connections to previous knowledge and extends those connections in ways that build new student knowledge. Webs of inquiry begin with questions that come from the teacher, or arise out of students' curiosity. Content is not left to chance or to students' whims, as critics sometimes accuse, but is driven by inquiry guided by the teachers' knowledge of the subject to be taught. Because teachers determine which broad concepts are to be studied (e.g., change over time, decomposition) and design chains of inquiry to do so, they must have a clear understanding of the important central concepts of science and mathematics, of the connections across mathematics and science, and of the skills students need to extend or apply their knowledge. *Specific* content (e.g., tomato rot) and *specific* tasks (e.g., using compost columns, studying bread mold) may be determined, in part, by students' questions and curiosity as they participate in the *process* of inquiry.

Adopting this perspective of curriculum means that important central concepts of mathematics and science become the focus and substance of prolonged study: They can no longer simply be consigned to a particular grade level. More attention is paid to what students study (and how) *over much longer periods of time*. For example, students' early experience characterizing variation in growth and development (in plants, perhaps) may be drawn on in a later grade when they search for explanations for variation based on principles of evolution. Understanding and this kind of content knowledge do not simply happen because content has been presented or "delivered" clearly. If student understanding is to be as full and complete as possible, deliberate attention must be given to making strong connections across students' webs of inquiry, including strong connections across mathematics and science. Care must also be taken to design webs of inquiry such that student understanding deepens and becomes more mature, complex, interconnected, and formal over time.

In the web of inquiry approach used in the MIMS project, teachers are much more than activity monitors and grade keepers: They are designers. Teachers must ensure that students engage with *worthwhile* content and that they learn and understand that content with accuracy and depth. They must see that the tasks students carry out have *purpose* in terms of their web of inquiry. As illustrated in the classroom example and the comments that follow in the next sections, teachers daily make a myriad of *substantive* decisions that shape students' web of inquiry over extended periods of time.

Students are more than human file cabinets. In web-of-inquiry classrooms, they participate in mathematical and scientific inquiry. Guided by teachers' questions, students move from informal to formal ideas in a domain, from *wondering about* to *doing* mathematics and science. They formulate precise questions and conjectures, design ways to test those conjectures, make careful observations, gather data, represent and make sense of data, draw conclusions based on their data, and formulate new questions and hypotheses based on what they have learned. Students in these classrooms learn and use science and mathematics in ways that scientists and mathematicians do in the real world. The result is increased student interest, ownership of their work, and deeper understanding of content.



A CLASSROOM EXAMPLE

In the fall, the teacher, Ms. Putz, asked her first-grade students to bring different varieties of applies to school and to describe them in terms of color, shape, and size. As days went by, students conjectured that apples change color as they ripen.

Apples, Tomatoes & Questions— Beginning a Web of Inquiry

Ms. Putz generalized the question to "*Why* do you think that happens? What makes fruit change color?" During the ensuing discussion, students speculated that the sun had something to do with it. Encouraged to think of a way to find out how the sun affects fruit, students suggested putting some fruit in the sun, then watching what happened. More discussion followed, and everyone agreed that bananas or tomatoes would work best because they change rather quickly, and in ways easy to see.

The next day, Ms. Putz brought green tomatoes to class. Building on students' previous ideas, Ms. Putz asked, "How do you think the sun helps change the color of the tomatoes?" Most students conjectured, "Because the sun gives light." Again encouraged to think of a way to test this idea, students quickly suggested putting one tomato in the sunlight and another somewhere in the dark, then waiting to see if color change resulted from the difference in light the tomatoes received. The students negotiated and eventually agreed as a class to put one tomato on the window sill and another elsewhere under a cover "to see what happens." Then, however, a student, drawing on informal knowledge, raised a related question, "But the sun is hot—Does heat matter?" Other students felt this was an important question, so the discussion now encompassed two variables ("things") to consider: light and heat.

Devising a Convincing Test

Encouraged by Ms. Putz, students hypothesized ways to test the role of heat in tomato color change. At first, some students suggested putting one tomato on the window sill and one in the refrigerator, tacitly assuming that the data they collected the tomato on the window sill would give them information about the effects of both light and heat on color change. As a class, students also believed that observing change in the tomatoes in these two locations would be a good test. Noting that students were not separating the two variables in their discussions, Ms. Putz asked probing questions: "Is the window sill the warmest place in the room?" "How do you know?" "Can warm places be light?" "Are all dark places cold?" Such questions helped students think more deeply about the problem and about the test they were devising.

As students discussed and designed ways to separate the roles of light and heat, they touched on several important scientific and mathematical ideas, in first-grade terms, definitions of light and dark, for example. Students had to decide what "counted as dark." Is one location in the classroom "as light as" or "as dark as" another location? Does it matter? Students also had to define warm and cold. They easily agreed that the refrigerator was "cold," but what location was "warm?" Some thought the window sill was the warmest "because it's closest to the sun." Others were not convinced because the weather was cold. (When one student suggested using a thermometer to find out whether the sill was warm, teacher and students took an extended digression into the subject of measurement.)

After a thorough discussion and consideration of options, students agreed on four conditions necessary to "test" how light and heat affect color change in tomatoes. They placed tomatoes (a) in the window sill, a *light and cool* place, (b) in a sunny spot away from the window, a *light and warm* place, (c) under a cover away from the window, a *dark and warm* place, and (d) in the refrigerator, a *dark and cold* place. Students then waited with great interest and anticipation to see "what will happen."

Moving From Observations to Inscriptions

Lehrer and Schauble (in press-a) and Latour (1990) explain in detail the vital role students' *inscriptions* play in developing understanding and skill in mathematics and science. Such inscriptions include drawings, maps, graphs, bar or pie charts, tables, time lines, arrangements of physical objects, physical models, and mathematical formulae—in short, anything students produce to record, summarize, display, or analyze their observations and data.

By asking guiding questions, Ms. Putz helped students realize that they needed inscriptions of their tomato observations. Students recognized that, without these, they "might not all remember the same things," or they "might forget something important." At first, students decided to make drawings of the tomatoes, which sufficed until the tomatoes began to get "squishy," "smelly," and "stuff began to run out" of them.

As this happened, color became more problematic to depict, and new decisions had to be made about how to alter their inscriptions to show "oozing" and "degree of squishiness." It was not a simple matter to decide how to represent adequately more than simple color change in the tomatoes. During extensive discussions about this, Ms. Putz asked probing questions to help students focus on change over time and on the type and quantity of detail they needed to record in their inscriptions that would enable them later to draw conclusions, formulate new hypotheses, and pose new questions—to fruitfully extend their chain of inquiry. With guidance, students were able to negotiate choice of color shadings to represent squishiness.

Drawing First Conclusions

Students' initial conclusions were based on one dimension of the physical condition of the tomatoes at the time of their discussion. One student, in trying to make sense of the data, noticed "sort of a pattern." The tomato in the window sill and the tomato in the refrigerator (both cold places) took longer to change. Because the students had originally made no specific conjectures about the role of heat (although they had wondered about it), the conclusion that cold "made a difference" was new and somewhat surprising information to them.

Another student, also trying to make sense of the data, observed that of all the tomatoes the one in the refrigerator and the one under the cover in the room "changed the slowest." To encourage students to justify statements and explain observations, Ms. Putz asked, "*Why* do you think they changed the slowest?" The student reasoned that the other tomatoes had changed color faster "because they had light." At the beginning of the experiment, students conjectured "that light mattered," that is, that light brought about or hastened color change. Students were satisfied that their observations of the tomatoes had confirmed their original conjecture.

To help students consider both variables and to look at all their data, Ms. Putz asked, "So does this mean that light is the only factor in the changing color?" This question sparked a long discussion and encouraged students to look at the records of their observations as well as at the current state of the tomatoes. They carefully considered what happened to tomatoes in all four locations. Students noticed that the tomato in the location with both heat and light changed the fastest, and the one with neither heat or light changed the slowest. The change in the tomatoes in locations with only heat or only light was "in between." Students concluded that *both* heat and light "made a difference," that is, both factors contributed to color change.

Tomatoes, Pumpkins, and New Questions—Making Connections and Extending the Web of Inquiry

Given the condition of the tomatoes by this time, students agreed that the phenomenon they were observing was no longer "ripening" but "rotting." They were, however, still intensely interested in what was happening, so they found a place outside to put the tomatoes and continued their observations. A bit later, students noticed signs of rot in some pumpkins they had carved (after using them to study measurement in mathematics) and were quite excited.

Building on their previous knowledge and understanding of both tomato rot and of the process of scientific inquiry, students observed and compared what was happening to the tomatoes and pumpkins and made inscriptions of their observations and speculations. They noticed that tomatoes had mold on the outside, whereas pumpkins had more mold on the inside—a difference they conjectured had occurred because the inside of the pumpkin had more space, air, and wetness. Comparing the fast change in the pumpkins, which they had carved, with the slow change in the tomatoes, which they had not carved, students connected the difference to the carving. They observed that the tomatoes changed color on the outside, but the pumpkins did not, and that the tomatoes did not get as soft as the pumpkins. Students also noted that both the tomatoes and pumpkins became softer, decomposed, had juice coming out, changed shape, and got moldy.

Observations and questions flowed: "There are different kinds of mold." "How does mold happen?" "Is it different for tomatoes than pumpkins?" "Why did pumpkins rot faster than tomatoes?" All agreed, however, that observations were becoming more and more difficult because of the cold weather and snow. Students were also concerned, as a result of their conclusions about the effect of heat on rotting, that not much would happen to the tomatoes until spring.

Introducing Modeling

Using students' interest and enthusiasm as an opportunity to extend their chain of inquiry, Ms. Putz introduced a new and purposeful tool of inquiry: She asked students if they thought it might be helpful to make a *compost column* out of clear, 2-liter bottles to model the rotting process. Students readily agreed that this would be better, especially during winter, than "watching the pile outside in the dirt." Ms. Putz asked questions that encouraged students to think more deeply about modeling (e.g., "Why would we do this?" "How will it [the compost column] help us understand rot?")

Students' initial approach to making this model was to replicate, in miniature, what they saw outside. Accordingly, they argued for including tomatoes, dirt, leaves, gum wrappers, and even a piece of foam and for watering the columns "like rain." Ms. Putz's probing questions guided lengthy classroom discussions. Students negotiated which outdoor conditions were essential to

the function of the model and which could be left out; they did not, for example, include gum wrappers and foam.

Guided by questions that encouraged students to think more analytically about what phenomena they wanted to observe, what they wanted to know, what questions they wanted to answer, and what factors "matter in rotting" (i.e., affect decomposition), students decided to make two columns using tomatoes and to keep one column warm and one cold. Because they were interested in making comparisons, they also made two similar columns using pumpkins.

More Observations, More Conclusions, More Questions—New Avenues in Students' Web of Inquiry

Observing Mold

As students observed the compost columns, they noticed more and more mold, which quickly became a focus of attention and interest. When guided to think about why the mold was there, most students attributed the presence of the mold to the presence of "lots of dead things" in the columns.

To encourage students to think more analytically and to use their observational data to support their conjectures, Ms. Putz asked if all the columns had the same amount of mold. Students observed that one tomato column had more mold than the other. Pointing out that all the columns had the "same things [in addition to the tomatoes and pumpkins] in them to begin with," Ms. Putz asked students why that column had more mold. Noticing that the columns in the refrigerator had less mold, students suggested that "being cold" had something to do with it.

One student hypothesized that "maybe the mold was growing." Others thought that was a pretty wild idea—mold "isn't alive," so it "can't grow." At this point, students still associated mold with "dead things," and, to them, the amount of mold was somehow inexplicably related to "being cold." Seeing that students had no causal conjectures grounded in their observations and that they had dismissed the notion of mold being alive, Ms. Putz designed an extension of their chain of inquiry: the observation of dishes of wet bread, which began to mold within a short period of days. Ms. Putz made available magnifying glasses and microscopes so students could make detailed observations of the bread mold. To help students know what to look for, she also showed a video about fungi. Students observed that the bread mold had "something like stems on a plant" and had "different shapes" on top "kind of like a flower part." Connecting this observational data to the continuously increasing amount of mold, both on the bread and in their columns, students eventually concluded that the mold really was "growing" and that the bread and the leaves, dirt, and tomatoes (which steadily disappeared) were "food" for the mold. They also concluded that if they stopped watering their columns, the mold would die.

Observing Fruit Flies

Students noticed fruit flies in one of the pumpkin compost columns and wondered where they came from. Remembering that some of the pumpkins had worms, some students conjectured that the worms had "turned into fruit flies." Encouraging students to support their statements with evidence (as was, by now, the established norm) and to make connections to previous knowledge (from a story about the life cycle of insects), Ms. Putz asked students, "How do you know that?" Students supported their conjecture by reporting that they had noticed "bumps" on the side of the compost column. One student, delighted with his insight, said, "The larvae turn into bumps on the wall. Then they hatch into fruit flies! The fruit flies lay more eggs, and the eggs hatch more larvae!" Another excited student piped up, "It's just like the circle story!"

Complaints were soon coming from all over the school about the pesky population. Capitalizing on this opportunity, Ms. Putz and the students began to design another extension in their web of inquiry. Students collected data by doing fruit fly counts in every room. They decided that displaying their data on a school map would be most helpful in drawing conclusions about the dispersal of the fruit flies. From this map, students observed that fruit flies were, as they expected, in large concentrations near their classrooms and, surprisingly, in some areas far from their room. After some discussion, they realized that those areas contained large amounts of food. Encouraging students to make predictions based on their data, Ms. Putz asked, "What do you think will happen over time?" Students predicted that when the food was taken away or ran out, the fruit flies would be gone. Their subsequent observations verified their prediction.

Verification and Understanding

In the spring, students resumed observations of the rotting tomato pile outside. Their observations verified the accuracy of their models (the compost columns) and gave them confidence in the conclusions they had drawn and the conjectures they had made based on the models. Over the course of the year, students became more deliberate in making observations and inscriptions of their data; more sophisticated in posing questions, making conjectures, and designing experiments to answer their questions; and more adept at supporting their reasoning with evidence. Students came to understand science learning as an ever-building process of inquiry rather than the opening and closing of discrete packages of isolated bits of knowledge. They had *done* science as scientists and come to deeper understandings by doing so.

Note that gaining content knowledge is important in this inquiry process. Students do not simply memorize facts unrelated to experience or other knowledge. They do not engage in isolated episodes of "active learning" for the sake of being active. Instead, students gain content knowledge—here, about decomposition, growth of (living) mold, and the life cycle of fruit flies—through *purposeful* inquiry connected to previous knowledge, extending what they know to the construction of new knowledge.

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SHOULD FOUR YEARS OF HIGH SCHOOL SCIENCE AND MATH BECOME A NATIONAL POLICY?

Most high school students should take four years of mathematics and science. This policy should be a national policy in the sense that although in the United States educational policy is initiated and implemented by the state and local governments, there should be a tacit agreement by educators and parents that four years of mathematics and science is the best course for all of the youngsters in secondary school. At the state and local level I mean regulations that mandate four years of advanced science and mathematics for all secondary students who have average or above ability. Not only does this requirement benefit the student, but also it benefits the nation and society as a whole.

What four years of mathematics and science does for the student is first that it gives him or her a rational view of the world. Many of the things that happen in the world, not only in the physical and mathematical world, but also in the social and humanistic world, are the result of some rational process, one of which may be cause and effect (Kadanoff, 1992). By taking physical sciences such as physics and chemistry—if taught properly, and advanced mathematics, a student's rational processes are enhanced and his/her understanding of the physical world is increased. Also, in an increasingly technological world, highly dependent upon advances in the physical sciences, it is extremely important that any individual know how things work, and the theory behind them so that he/she can deal with this aspect of the world effectively. Only four years of science including chemistry and physics can give the high school student an initial insight into this aspect of his/her environment.

As Aristotle has pointed out in his *Politics* for a man to be happy he must have goods of the soul, goods of the body, and external goods (Book VII, I). Taking four years of science and mathematics not only begins to give the high school student "goods of the soul" by giving him insight into his world and rationality, it provides the basis by which "can be what he can be" as Horace Mann has stated in his Twelfth Annual Report (1848). As Horace Mann stated in that report we do not want to develop two classes of people, "some to toil and carn, and others to seize and enjoy." Without a strong dose of the fundamentals of math and science a high school student in America will be unable to go into certain careers such as medicine, engineering, physics, chemistry and computer science. By the time a student enters college, it is very unlikely that he or she will choose these career paths, or if he or she does, the initial phase will be difficult since material and processes for the courses will be unfamiliar. At this stage in our country we are developing two classes of people, the haves and the nave nots. Careers in medicine, health fields, engineering, chemistry and physics are the higher paying careers. In contrast, lower paying jobs requiring little or no amount of technical expertise are the only thing available to the untrained individual. Therefore, a student not taking four years of advanced mathematics and science is often excluded from reaching his or her potential. Furthermore, external goods such as a warm home in winter, a bicycle for one's children, a ticket to a Beethoven concert are all the result of financial resources derived from a good paying job, jobs often found in the technical or health fields. One cannot enjoy the good life of Aristotle without a good financial base that can come as a result of such an education

As most educators are aware, high school is just a starting point for a student to enter a field. Usually, the student must get some kind of specialized training beyond high school be it in technical school (such as auto mechanics school, computer school) or in a college or university. To obtain part of the good life, goods of the soul and external goods, one must have a university education some would argue. At many universities the first year is like a bloodbath with about one-half the students flunking out, thus excluding them from that education. In a study by The College Board entitled *Changing the Odds* it was found that students taking Geometry in high school are more likely to go on to college and succeed. Those who had less than two years of high school mathematics and laboratory science were less likely to go on (Pleavin, S. & Kane, M., 1990). For Hispanic and Black students, the taking of at least two years of high school mathematics, Algebra and especially Geometry, were even more strongly correlated with attending college and graduating (Pleavin, S. & Kane, M. 1990). Higher requirements such as adding Advanced Algebra, Physics and Chemistry will certainly increase the probability of a student going on to college and succeeding. If the ACT is a true predictor of success in college then the four year math and science requirement will help to get higher scores on the test. The ACT assumes at least three years of high school mathematics specifically Algebra, Geometry and Advanced Algebra-Trigonometry. The more math, the higher the score, and the higher the score the greater the probability of succeeding in college or university.

The four year requirement for mathematics and science also has a national interest component. Even as far back as Aristotle it was noted that the state has an interest in what students should learn. Aristotle stated there should be training in things of "common interest" (Book VIII, 1). In reading *A Nation at Risk* one can see that our country needs a four year mathematics and science requirement. According to Milton Goldberg and James Harvey (1983) the United States is at risk because "competitors are overtaking our lead in commerce, industry, science and technological innovation." In order to combat this eroding of the nation's supremacy in the world there was a recommendation that all students in the

United States take three years of mathematics and three years of science in high school. As one can see an increase of the science and mathematics requirement will help the nation since the country needs engineers, chemists, computer specialists and technicians to make business run more efficiently and with improvement through highly trained decision makers, people who can interpret statistics, make industrial plans, design machinery and provide technological innovation through invention. While the four year science and mathematics requirement will not guarantee more of these trained individuals, it will improve the probability that more scientists and engineers will result since more students will be aware that these career paths exist and the necessary high school science and mathematics preparation will give them hope of succeeding (Brekke, S. 1989). As the report pointed out the problem is not just superiority alone, but rather our prosperity and standard of living is at stake (Goldberg, M. & Harvey, J., 1983). As Horace Mann pointed out (*Twelfth Annual Report,* 1848) the state prospers with education for all since education generates wealth through productivity and invention. The problem today is that a mediocre education will not do. With the scarcity of jobs and the loss of the manufacturing base, a person needs an education that will provide him or her with a decent income. *A Nation at Risk* observed in the early 1980's that two-thirds of the states require one year of mathematics and one year of science for a student to graduate high school. Certainly, with education reform the requirements are higher today generally speaking, but they are not high enough.

The ancient Greek mind was deeply rooted in the sense of the community (Jaeger, W., 1965). Aristotle contended that "each (individual) is part of the state and the care of each is inseparable from the care of the whole" (*Politics*, Book VIII, I) and that education be the same for all (Book VIII, I). Society as a whole benefits from upgrading the present one and two year science and mathematics requirements to a four year science and mathematics requirement in the high schools. First, as Horace Mann pointed out a separation of society into two classes, one that toils and one that enjoys, will lead to a destruction of society (1848) and that this concept is patently unfair to begin with. We have already a growing two-tiered society with a dwindling middle class. Students must have the opportunity to obtain external goods through education and training in science, engineering and mathematics as well as health fields such as medicine itself or allied health such as nursing. The jobs in these fields pay well and tend to be jobs of long duration and relatively immune from the vagaries of economic recession. Further, there is a continuing demand in these areas. Training and education in these areas therefore provides a basis for elimination of the two-tiered society. Therefore, the four year mathematics and science requirement in high school would eliminate indirectly the societal faction. Further, inner city children who rarely take four years of science and math would gain equality with suburban children at least in some of the basics and would put them in a better position to obtain the higher paying jobs in engineering, health and science, thereby eliminating racial and minority divisions due to income in our society.

Four years of mathematics and science would give all students a common education eliminating for some students at least cultural divisions and resulting in a more cohesive society. Chemistry and Physics as well as advanced mathematics such as Trigonometry and Advanced Algebra require more mental effort and create more high mindedness which may lead to less violence among individuals (*Twelfth Annual Report,* 1848).

Benefits to society from a four year mathematics and science requirement also promote innovation and invention. More education will produce more invention and the wealth of the state would improve better and new machinery, tools and devices (*Twelfth Annual Report,* 1848). Not only will more scientific and mathematics education produce more and better industrial devices, but also devices and drugs that improve the quality of health care. Invention of better devices to improve living such as more fuel efficient cars, solar heating devices and so on will come from more people being in science and engineering fields. Therefore, increasing the science and mathematics requirements in high school will increase ultimately the numbers of individuals producing new devices that benefit society and the entire global population and their cultures.

In conclusion a national policy requiring four years of science such as chemistry, physics and biology, four years of mathematics such as algebra, geometry, advanced algebra-trigonometry and a fourth year such as college algebra will benefit the student so that he or she can "be what he can be," benefit the country so that the standard of living can be enjoyed by future generations, and benefit society through more common experiences in high school leading to less polarization among the various classes in America. It will also provide the seeds of new inventions that will benefit society through improved health care and devices that make life for individuals easier.

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THE TEACHERS CLEARINGHOUSE FOR SCIENCE AND SOCIETY EDUCATION

THE GLOBAL CHANGE RESEARCH PROGRAM

I first learned about the threat of enhanced global warming from carbon dioxide produced by fossil fuel combustion when I worked on a unit on this topic for NSTA's Project for an Energy Enriched Curriculum in 1979. Ten years later the U.S. federal government realized the significance of this and other threatened environmental changes, and the U.S. Global Change Research Program (USGCRP) was established to "combine and coordinate the research and policy development interests of 15 departments and agencies of the U.S. Government and Executive Offices of the President." Coordinating efforts of the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, and Transportation, the Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and Tennessee Valley Authority, it is "organized under the auspices of the Subcommittee on Global Change Research...one of the seven environmental issue subcommittees established by the Committee on Environment and Natural Resources — one of the 9 committees organized under the National Science and Technology Council."

To disseminate information about its efforts, the USGCRP has set up Information Offices in Washington, DC, and Michigan (2250 Pierce Road, University Center, MI 48710, (517)-797-2730, FAX: (517)-797-2622, E-mail help@gcrio.org) and has established a web site (http://www.gcrio.org). Among the documents regularly issued is a series entitled *Our Changing Planet*, a supplement to the federal budget and therefore addressed to members of Congress in a very attractive package subtitled "An Investment in Science for the Nation's Future." A USGRP internal review and a 1995 external review by the National Research Council recommended "focus on priority issues in four mature areas of Earth system science that are of great scientific and practical importance." These four areas are "Seasonal to Interannual Climate Variability," "Climate Change Over Decades to Centuries," "Changes in Ozone, UV Radiation, and Atmospheric Chemistry," and "Changes in Land Cover and in Terrestrial and Aquatic Ecosystems."

Each of these four areas is a classic example of scientific methodology. First data must be gathered — temperature, precipitation, atmospheric constituents such as ozone, volatile organics, nitrogen oxides, sulfur oxides, chlorine, ocean circulation, and land use. A lot of data, mostly from satellites in NASA's "Mission to Planet Earth" program. Models are constructed to analyze these data, to make predictions, and apply them for the benefit of humankind. The primary model for studying climate variability is ENSO, El Niño and its atmospheric counterpart, the Southern Oscillation, and the coupling of this system to other determinants of climate. The models for studying climate change are Climate System Models, the most advanced of which is at the National Center for Atmospheric Research in Boulder, CO. (Two years ago, this model was able to partition the atmosphere into "cells" of space-time with a square base 500 km on a side, a height of 1.5 km, and a time of 1 hour, and the 16 May 1997 issue of *Science* reports that it could compute for 300 years without drifting more than 0.5 degrees Celsius in average temperature, thus reflecting accurately three centuries of the past when there were no major atmospheric changes as have been wrought since the Industrial Revolution.) For atmospheric chemistry the model is that of the interaction and migration of molecular species in the troposphere and the stratosphere; and for land cover and ecosystems it is the connection between global warming and land habitability.

In addition to focusing on the "four mature areas of Earth system science," the past three issues of *Our Changing Planet* (for FY 1996, FY 1997, and FY 1998) also discuss integrative and cooperative efforts, such as those between governmental agencies and among the governments of the world. Perhaps the foremost international cooperation supported by the USGCRP is the IPCC (Intergovernmental Panel on Climate Change), jointly established by the World Meteorological Organization and the United Nations Environment Programme in 1988. Although the conclusion of the IPCC's Second Assessment Report in 1995 that "there is a discernible human influence on global climate" brought forth a storm of criticism from industry (as reported on p. 31 of our Winter 1997 issue) and is still regarded by some climate modelers as obscuring the uncertainty which still belies climate prediction (R.A. Kerr, *Science*, 276, 1040 [16 May 97]), it is printed without adverse comment with all the other "Key Findings of the IPCC Second Assessment Report" in the FY 1997 volume of *Our Changing Planet* (Resource #6, Winter 1997 issue). Unfortunately, all the attention devoted to this one conclusion overshadowed the others.

Also of possible interest to teachers are some of the tidbits of information related to the "four mature areas of Earth system science":

"Seasonal to Interannual Climate Variability"

* In some regions of the globe, seasonal to interannual variations of atmospheric conditions can be predicted up to two years in advance.
* The U.S. Government is now issuing, on a monthly basis, the first-ever year-in-advance forecasts of seasonal mean temperature and precipitation for the United States.
* Medical research has linked changes in the incidence of diseases carried by mosquitoes and rodents with changes in temperature, rainfall, and the patterns of extreme climatic variations associated with El Niño events.

* The 1992-93 El Niño event reduced the 'normal' (non-El Niño) CO_2 release to the atmosphere from this region of the ocean by more than 50%.
* TOGA [Tropical Ocean-Global Atmosphere program] developed a number of coupled ocean-atmosphere models, one of which successfully forecasted the El Niños of 1986-87 and 1991-92 more than a year in advance. TOGA researchers began distributing experimental forecast products to a number of tropical countries. Peruvians have been able to sustain the gross output of their agricultural sector, increasing it by 3% in 1987 in spite of the moderate 1986-87 ENSO event (in contrast to a 14% decrease in 1983, which accompanied the devastating 1982-83 event.

"Climate Change Over Decades to Centuries"

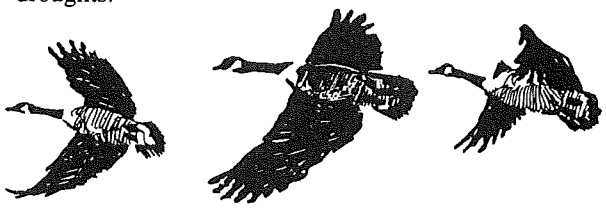
* The newer climate models, which include the effects of aerosols, predict that they are exerting a cooling influence on global temperatures.
* Natural biological and physical processes, such as photosynthesis and oceanic uptake, are able to limit the annual increase in the atmospheric loading of CO_2 to just under half the annual emissions of CO_2. How long will these elevated removal rates continue?

"Changes in Ozone, UV Radiation, and Atmospheric Chemistry"

* Human initiated biomass burning is estimated to be a significant source of the emissions of methyl bromide globally. A bromine atom is about 40 times as efficient as a chlorine atom in destroying stratospheric ozone.
* The Ozone Depletion Potential of HFC-134a is very small.
* Emissions of chlorofluorocarbons (CFCs from human activities have been unambiguously identified as the causes of the Antarctic ozone hole. [To this was added in FY 1998 "and the hydrochlorofluorocarbons (HCFCs)," once regarded as an alternative to CFCs.]
* Stratospheric ozone depletion is now understood to introduce a cooling tendency in the climate system.
* At 45° N latitude. Springtime exposure to DNA-damaging and erythemal (sunburn-inducing) radiation is calculated to have increased by 8.65 and 5.1% per decade, respectively, for the past 2 decades.

"Changes in Land Cover and in Terrestrial and Aquatic Ecosystems"

* The decline in snow cover extent in the Northern Hemisphere by about 10 percent over the past 20 years has resulted in decrease in Arctic sea ice-melting of alpine glaciers and a rise in sea level.
* Sea level is suggested to have risen 10-25 cm this century, of which about 1 cm (range -5 cm to +7 cm) may have been due to the direct effects of humans in changing land use.
* Oceanographic observations along the central North Atlantic have revealed a distinct warming in the upper 2500 meters over the past 35 years.
* The far-northern climate has warmed by roughly 2°C since the 1880s. Tree growth at first accelerated but then flattened, even though the climate continued to warm. The most recent decades of warming may be stressing northern forests by speeding up moisture loss and perhaps subjecting them to more frequent insect attacks.
* Elevated CO_2 concentrations may, for selected species, mitigate the damaging effects of elevated ozone (O_3) concentrations. However some species, such as aspens, become more sensitive to increased concentrations of O_3 if CO_2 concentrations are elevated.
* Soil carbon losses from intensive farming systems can be reversed through changes in farming technology.
* As much as 30% of the deforested [Amazon rain forest] land is in some stage of secondary succession.
* Conversion of natural tropical forests to farm and ranch land has the potential to increase nitrous oxide (N_2O) emissions from that land by as much as a factor of three. N_2O is a greenhouse gas with a global warming potential per unit mass that is 120-330 times greater than CO_2 over the next 100 years.
* 43 years of observations (1951-1993) along the coast of southern California indicate that the biomass of large zooplankton has decreased by 80%.
* Increased concentrations of atmospheric CO_2 are likely to enhance productivity of major rice varieties, providing more food, but also leading to greater emissions of methane. The associated climate changes are also predicted to substantially alter the relations between major insect pests of rice and their natural predators, potentially creating significant pest management problems.
* Global scale variations in climate alter regional patterns of rainfall and temperatures.
* Changes in land cover such as the conversion of forest to pasture in the tropics, and changes in land use such as increases in fertilizer applications to croplands worldwide, are contributing to changes in atmospheric composition and may also contribute to climate change on both regional and global scales.
* Precipitation is among the most important climate variables in socioeconomic terms because it affects water management and agriculture and causes floods and droughts.



Effects of Human Activities on Regional and Global Climate, and on Sea Level

* Human activities are increasing the atmospheric concentrations of CO_2 and other greenhouse gases that tend to warm the atmosphere and, in some regions, of aerosols that tend to cool the atmosphere.

* The Earth's climate is changing. The surface temperature this century is as warm or warmer than any other century since 1400 AD; the global average surface temperature has increased by 0.3 to 0.6°C over the last century; the last few decades have been the warmest this century; sea level has risen 10 to 25 cm; and mountain glaciers have generally retreated this century.
* Models that account for the observed increases in the atmospheric concentrations of greenhouse gases and sulfate aerosols are simulating the recent history of observed changes in surface temperature and its vertical distribution with increasing realism.
* Without specific policies that reduce the growth of greenhouse gas emissions, the Earth's average surface temperature is projected to increase by about 1 to 3.5°C by 2100 — a rate of warming that would probably be greater than any seen in the last 10,000 years.
* The reliability of regional-scale predictions is still low, and the degree to which climate variability may change is uncertain.
* Sea level is projected to rise by 15 to 95 cm by 2100.
* The long atmospheric lifetime of many greenhouse gases, coupled with the thermal inertia of the oceans, means that the warming effect of anthropogenic emissions will be long-lived.
* Even after stabilization of greenhouse gas concentrations, temperatures would continue to increase for several decades, and sea level would continue to rise for centuries.

Potential Health and Environmental Consequences of Climate Change

* Human-induced changes in temperature, precipitation, soil moisture, and sea level add important new stresses on ecological and socioecnomic systems that are already affected by pollution, increasing resource extraction, and non-sustainable management practices.
* Most systems are sensitive to both the magnitude and rate of climate change.
* Many regions are likely to experience adverse effects as a result of climate change, some of which are potentially irreversible; however, effects of climate change in some regions may be beneficial.
* Changes in climate include the following potentially disruptive effects: (1.) Human Health will be adversely affected through an increase in the rate of heat-related mortality and in the potential for the spread of vector-borne diseases such as malaria, dengue, yellow fever, and encephalitis and non-vector-borne diseases such as cholera and salmonellosis. (2.) Food Security will be threatened in some regions of the world, especially in the tropics and subtropics where many of the world's poorest people live. On the whole, the effects of climate change over the next century on total global food production may be small to moderate in comparison to the effects of population change and demands for improved nutrition. (3.) Water Resources will be increasingly stressed, leading to substantial economic, social, and environmental costs, especially in regions that are already water-limited and where there is strong competition among users. (4.) Human Habitat Loss will occur in regions where small islands and coastal plan and river areas are particularly vulnerable to sea level rise. (5.) Natural Ecosystems will be degraded because the composition, geographic distribution, and productivity of many ecosystems will shift as individual species respond to changes in climate. This may lead to reductions in biological diversity and in the goods and services ecosystems can provide for society.
* Developing countries are more vulnerable than developed countries to climate change because of their socioeconomic conditions.
* Impacts will be hard to quantify with certainty because of uncertainties in regional climate projections, the complicating effects of multiple stresses, and a lack of understanding of some key processes.

Approaches to Mitigate or Adapt to Climate Change

* Adaptation — which involves adjustments in practices, processes, or structures of systems — can be helpful in reducing adverse impacts or in preparing to take advantage of potential beneficial changes in climate.
* Successful adaptation will depend upon education, technological advances, institutional arrangements, availability of financing, technology transfer, information exchange, and incorporation of climate change concerns into resource-use and development decisions. Potential adaptation options for many developing countries are extremely limited due to the limited availability of technological, economic, and societal capabilities.
* Options such as migration corridors to assist adaptation of natural ecosystems to new climate conditions are, however, currently limited and their effectiveness is generally unproven.
* Stabilization of the atmospheric concentrations of CO_2 at three times the pre-industrial concentration or less will eventually require human-induced emissions of greenhouse gases to be cut below today's levels.
* Gains in energy efficiency of 10-30% above present levels are feasible at little or no cost in many parts of the world through technical conservation measures and improvement management practices over the next 2 or 3 decades.
* Significant reductions in net greenhouse gas emissions can be achieved utilizing an extensive array of technologies, and policy measures that accelerate technology development, diffusion, and transfer in all sectors.
* Flexible, cost-effective policies relying on economic incentives and instruments, as well as internationlly coordinated instruments, can considerably reduce mitigation and adaption costs.

MINI IDEAS

Dr. Kim Pittman
Aurora University
347 S. Gladstone
Aurora, IL 60506-4892

THREADING SHEEP HEARTS

Science students often have a difficult time understanding the abstract nature of the simultaneous pumping of heart atria and ventricles, synchronization closing of valves, "hollow" heart chambers and the heart/lung connection. Student misconceptions involving the circulatory and respiratory systems have been clearly documented. This activity provides a concrete experience for an abstract concept by incorporating Howard Gardner's *Theory of Multiple Intelligence.* This activity utilizes the visual-spatial, body-kinesthetic, interpersonal and logical-mathematical intelligences.

Expose the students to the general anatomy and physiology of the human circulatory and respiratory systems. *Optical Data Videodisc* provides a laser picture of blood flow through the heart.

Obtain sheep hearts (from Wards Biological Supply) or cow hearts (from your local butcher). Secure only a class set because the hearts can be used over from class to class and from year to year. Slice the hearts in half exposing the interior walls of the atria and ventricles, but not separating the halves completely. Leave the heart sections attached at the posterior end of the ventricles to make it easier for the students to explore the heart. Give each pair (interpersonal) of students two pieces of string or yarn approximately one foot long. I suggest using a burgundy color to emphasize the deoxygenated blood and a bright red color to represent the oxygenated blood to confront the student's misconceptions about red and blue blood.

Starting with the deoxygenated system (burgundy yarn) have the students "thread" (body-kinesthetic) the yearn through the system in the following order (logical-mathematical):

- superior vena cava
- right atrium
- through the bicuspid valves
- right ventricle
- pulmonary artery
- pulmonary valve
- to the LUNG

Once they have threaded the deoxygenated system, using colored stickpins and labels, have them flag the vessels, valves and organs (visual-spatial).

Now, using the bright red yarn to represent the oxygenated blood flow, have them thread the flow back from the lung:

- via the pulmonary veins
- left atrium
- valves (tricuspid)
- left ventricle
- aortic valve
- aorta
- cells in the body

In addition, you can use a "pluck" (from Ward's Biological Supply Company) to demonstrate to the students the relationship between the heart and lungs. Some students were also able to view heart and vessel tissue under the microscope.

Student "surprises" as a result of the activity:

- Students were surprised that the bicuspid and tricuspid valves are "string-like"
- Students were surprised at how "small" the atria are
- Students were surprised at how "tough: the heart muscle really is (comparative to that of a chicken leg)
- Students were surprised at the size of the aorta compared to the pulmonary arteries and veins.
- Students were surprised at the relative thickness of the arterial and venous walls.
- Students were surprised at the amount of "fatty" tissue surrounding the heart.
- Students were surprised at the intricate connection between the heart and lung.

This activity provided the students an excellent opportunity to master the circulation through the heart and lungs.

SciencePlus *Communicator*, Issue No. 11

CHEMICAL CHANGES

Use this imaginative extension to pique students' interest and sharpen teamwork skills.

Divide your students into teams, and announce that each team will prepare an entry for the Annual Soda Bottle Boat Race. have students test the following substances, looking for the best combination to generate carbon dioxide gas for propulsion: lemon juice, vinegar, water, baking soda, baking powder, Alka-Selzer®. Ask them to set up a chart comparing the reactions of the three liquid reactants with the three dry compounds. (Each team can use as little as a teaspoon of each dry substance or half a tablet of Alka-Selzer to perform all necessary tests.)

Next, have the student teams design and build boats using the plastic 16-oz. soda bottle available at any convenience store. The boats they design and build should be capable of racing the length of an eight-foot rain gutter filled with water, powered only by the carbon dioxide reaction.

Structures and Design can be a fertile field for imaginative, hands-on student building projects that utilize everyday items. here's an example from the September 1991 issue of *Instructor* magazine:

Divide your students into teams, and ask them to build the tallest, cheapest tower that will hold a table tennis ball - using only spaghetti, masking tape, and marshmallows. To boost interest still further, assign a price to each building material (example: $100 for one stick of spaghetti, $10 for one cm of masking tape, and $50 per marshmallow).

On the first day, have students draw sketches and buy materials, with students keeping a record of their building costs (no refunds on unused items). Set aside the second day for construction of the towers, setting a time limit for completion.

The winner should be determined according to three criteria: tower height, material costs, and construction techniques (durability, neatness, etc.).

The following activities can serve as discussion starters on the effects of pressure on water and air:

• Fill a container with water and place an index card over the top of the container. Turn the container upside down. What happens? Why?

• Put approximately four cm of water in a container, and add several drops of food coloring. Take a small glass and invert it over the top of the container of water. Push down straight on the glass until you touch the bottom of the container. What happens? Why?

Activity extensions were contributed by Mark Horan (Mitchell, SD), Betsey Stehm (Wichita, KS) and Mary Butel (Wichita, KS).

555 N.Kensington Avenue
LaGrange Park, IL 60526-5592

THE HUMAN POWER PLANT

In this project, students will learn how a nuclear power plant works. It is intended for younger students, no older than 4th grade. Essentially be playful and creative as you lead through understanding this concept.

You will need:

(1) Sign Boards* (marked with the following labels:)

Fuel/Atoms of Uranium	Coils of Wire (2 sets)
Customer/Home	Customer/Business
Fission/Splitting of Atoms/Heat	Steam
Turbine	Magnet (2 sets)
Distribution Center	

(2) Bubble Jar (soap bubble solution)
(3) Stick/Pointer
(4) Ribbons

*Most of the signs should be made into "sandwich board" signs which the youngsters will wear as they build their Human Power Plant. One set of the "Magnet" signs, though, should be glued or stapled to the stick/pointer.

Step 1: Ask the students if they know what utility is produced at a power plant and then explain that they are going to make a Human Power Plant.

Step 2: Ask the students questions relating to atoms, the building blocks of all matter, to atoms of Uranium. Lead them to the conclusion that atoms of Uranium are what is used for fuel at the nuclear power plant.

Step 3: Select a student to represent fuel wearing the "Fuel/Atoms of Uranium" sign board. Give the student the bottle of bubble solution and have them blow some bubbles. Equate the bubbles with uranium.

Step 4: Lead the students through understanding that "fission" means "breaking apart" the atoms of uranium and that this process produces heat. Select a student to wear the "Fission/Splitting of Atoms/Heat" sign board and have that student break the bubbles that the first student is blowing.

Step 5: As students what happens when water is heated. Lead them from heat through boiling to producing steam. Select a student to wear the "Steam" sign and tell his/her job is to take the heat from "Fission" student pass it on to the next component.

Step 6: Discuss how steam turns the turbine. Select a student to wear the "Turbine" sign. Help them to demonstrate that when "Steam" takes "Heat," they push on "Turbine," and "Turbine" turns slowly.

Step 7: Explain that a generator is attached to the turbine and introduce the concept of a magnet turns on the end of the turbine shaft. Select a student to be the "Magnet" and as "Turbine" turns, have "Magnet" slowly spin the magnet stick in front of him/her.

Step 8: Lead students to understand that the magnet turning inside coils of wire to generate electricity. Select two students to portray the "Coils of Wire" and have them hold hands across from each other with the magnet stick turning within their arms.
Step 9: Explain that electricity produced goes to a distribution
g customers. Have the "Coils of Wire" hold one end of a ribbon and select a "
student to hold the other end.
Step 10: Discuss the difference between "Home" and "Business" customers. The "Distribution Center" student should thread the ribbon to the two new components wearing the "Home" and "Business Customer Signs.
Step 11: Start up the "Human Power Plant," working the "Fuel" through the "Customers." Maybe ask the student what sound they think electricity makes and let them enjoy humming or "cracking."

NMLST——————> LEVEL LINE
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December 1997

IDEA EXCHANGE EARTH SCIENCE

Official Earthquake Plotters from Susan J. Vogel, Fort Madison, IA

Let your students become official earthquake plotters for the entire school year! Begin by assigning three to four students to be responsible for gathering data on current earthquakes each week of the school year. Obtain a large, laminated world map to post in the hallway or where most of the school can view it daily. Purchase three sizes of colored stick-on dots to use in pinpointing the exact location of earthquakes. Have the students help create a scale for magnitude for the various sizes of dots to represent the earthquakes. Students win have to review early in the school year the application of longitude and latitude for locating the epicenters of; the earthquakes.

If the school has Internet access, assign the students to gather their own data from the school computer. Posting the printout is informative and an attention-getter. If the school does not have Internet access, find someone who does and make a weekly printout of a good reporting web site. *Last Earthquake Report is* a good, readable source. You can access it under Yahoo - Science - Earth Science (new)- Geology - Earthquakes - Current Earthquake Information or http://home.synapse.ru/cgibin/eq/ Students become very competitive and very excited when they get a "big" earthquake. Keep the printouts in a notebook so the students can check accuracy at any time.

John Niemoth
Niobrara Public School
Reprinted *Kentucky Science Teachers Newsletter*

MUD PIES

Introduction: Making mudpies was a very memorable experience for a lot of individuals in the past. Most were dried after being made. The chef used the basic ingredients in making this unique concoction with various reasons for during what they did. The basic ingredients were silt, sand, clay, gravel, water, and other organic substances.
Purpose: Develop a recipe to make the perfect soil pie!
Procedure:
1. Evaluate the consistency of the basic ingredients when mixed to make the perfect soil pie to your standards.
2. The finished pie should weigh about 2 pounds or 1000 grams with the measurements of each ingredient listed on a recipe card with the appropriate name for the pie.
3. The pie should be allowed to be dried, cooled, or heated-solar until done to the chef perfection.
4. The pie would be exhibited with a slice on a paper plate for evaluation when all pies are completed.

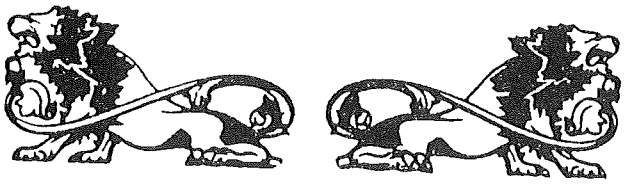
Results
1. The completed recipe card with the precise measurements of the ingredients used.
2. Briefly describe, orally or written, why their pie is the perfect soil pie.

Discussion
This discussion could lead to a variety of soil properties with the usage of their ingredients listed in percentages. List the features of the soil pie when using larger percentages of each?

Conclusion
List the observations separate from the inferences?

Further Research Options
Suppose you had a spot that needed to be filled in next to your basement, what type of soil or mixture should be used? What type would you use in a low spot in your yard farther away from the house? What type of soil would cost more? What are some desirable and undesirable things to know about purchased soil?

OPPORTUNITIES



ADVANCE NOTICE!!!! HISTORY OF SCIENCE TOUR JUNE/JULY 1999

NOW THAT THE WORLD CUP IS OVER AND SOMEONE WON - we are turning our minds to arranging another trip to Europe for next summer. Science History Tours is proposing their THIRD custom-designed tour which will be of interest to science teachers, social studies teachers and others interested in the history of science.

The theme of the tour will be "SCIENCE of the INDUSTRIAL REVOLUTION" and we will focus on the midlands, the north of England and Scotland which are considered to be the cradle of the Industrial Revolution. We will visit sites in such significant areas as Ironbridge Gorge, The Black Country, Derbyshire, York, Glasgow and Edinburgh where there will be lectures by experts on topics relevant to our subject. Also we will see some important SCIENCE AND INDUSTRIAL museums and to round things out we will make visits to some stately homes, gardens and beauty spots in this very scenic part of the world. In addition to the science history, every opportunity will be taken to interact with local teachers, historians and other interesting people. Opportunities for participating in cultural and other events are also available.

A graduate course (3 semester hours credit) will be taught by Lee Marek and provided at a very moderate extra cost. Planning and organization of the tour will be done by Yvonne Twomey. We both will lead you every step of the way!

While the exact details are not yet finalized, the trip will start sometime during the second half of June 1999, will last two weeks and the cost will be somewhere between $2000 and $2500, not including your transatlantic airfare. During the trip all accommodations in comfortable small country inns or hotels, all breakfasts, many other meals, all group surface transportation, all lecture and entrance fees and some other expenses will be included. On both previous tours, participants have voted the trip to be excellent value for money; Science History Tours is a non-profit organization and both our 1997 and 1998 tours were sponsored by NSTA. Funding is available to some people for courses such as this, so an early start in checking this out with your district or other source might dig up some. Don't forget Eisenhower funding.

Travelling companions are welcome; non-scientists will find that there is a great deal to interest them. Persons travelling alone can be introduced if they would like to share a room to save single room supplements. Those wishing to extend the trip at either end can expect good advice on where to go and where to stay.

If you are interested in receiving further information on the tour, please contact:

Yvonne Twomey, 841 Kinston Court, Naperville, IL 60540 Tel: 708-961-9811 Fax: 708-961-0495 e-mail: ytwomey@mcs.com Or: Lee Marek by e-mail at LMarek@aol.com

CALLING ALL THIRD-GRADE TEACHERS

Douglas Jenkins, a third-grade teacher from Silverton, OR, wants to determine to what extent third-grade reading and literature skills can be taught using books that are written on science topics. He says, "This is not an 'integrated' program that I would like to examine, but a reading skills program based on science reading selections. I would like to hear from third-grade teachers who have structured their reading programs based on science." You an write to him at 116 Webb St., Silverton OR 97381; or send e-mail to efield@capnet.k12.or.us.

AGTECH INPUT SOUGHT

Would you like to have a free field trip to a place in Chicago's NW suburbs, where your students could have an interactive, hands-on experience, that would reconnect them to the land and people that produce their food? Give AgTech your input. Visit AgTech at the agriscience section of the ISTA exhibit area (booths 420-429). Check out their developing website at

http://www.cbcast.com.agtech
PHONE: 847-888-1570,
FAX: 847-888-3797
e-mail mariannenelson@compuserve.com

Water is essential to us all, whether it is gushing from faucets, trickling from springs, and flowing in rivers and streams. To ensure that youth appreciate the need for the conservation of water, soil, and related natural resources educators from around the Midwest will gather on September 18 & 19, 1998 to exchange ideas and programs at this year's "Every Drop Counts" Youth Educator's Workshop.

This year's workshop begins with panel discussions focusing on tri-state education standards and how such requirements should be utilized when developing school programs. Panelists Bora Simmons (Illinois), Sam Carmen (Indiana), and Jane Wilson (Kentucky) will share their experiences in using standards to their fullest while working with conservation issues.

Guest speakers at this year's workshop include internationally-acclaimed writer and conservationist Wendall Berry, who reflects on his deep ethics on land use and conserving natural resources; Mike Jeffords, scientist with the Illinois Natural History Survey and "Eco Watch's" scientific advisor; and Eldon Weber, retired USDA scientist who shares his love of nature's "tillers of the soil" as he discusses earthworms and student centered learning. Special emphasis is again focusing on promoting existing programs found in the tri-state area.

Morning sessions focusing on participating states' water qualitymonitoring, local youth-oriented field days, and 4-H soil and water activities will round out the morning sessions.

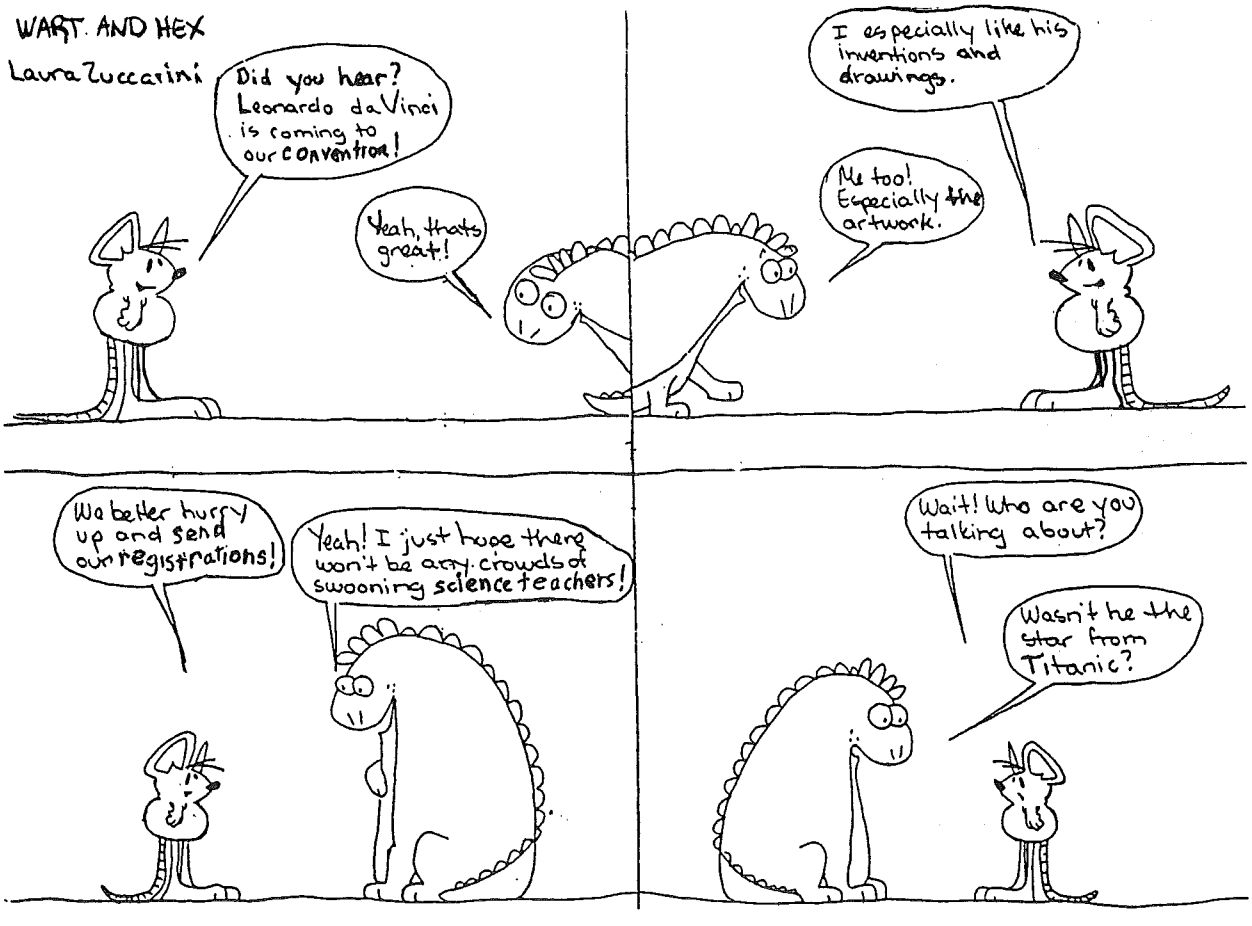
Friday afternoon sessions include Sandbox Geology; H2O Below; Arrow Head River Expedition; Nonpoint Sources Pollution; Kentucky Water Awareness Month; Food, Land, & People; FFA and Water Quality; PLAN-IT EARTH; Envirothon; Farm-A-Syst; and EM*Power!; and Planning Guide for Environmental Camps.

The workshop concludes on Saturday with hands-on outdoor sessions including Project WET, Go Fish IN!, I.E.C. for Wetlands, and Outdoor Classrooms.

The 1998 "Every Drop Counts" workshop will take place at the Radisson Hotel in downtown Evansville, Indiana. The event is open to anyone interested in education related to soil, water, and natural resources. For additional information access the Every Drop Counts website at

http://www.iaswcd.org/InProjectWet.htm or

Or contact Kenneth Eck, Purdue Agronomy Department, at ph.(812)482-1171. e-mail, keck@purdue.edu



AWARDS AND RECOGNITION

THE 1998 ILLINOIS PRESIDENTIAL AWARDS OF EXCELLENCE

SECONDARY

Marianne Barker
Carmel High School
Mundelein

Donna Brown
Margaret Mead Jr. High School
Elk Grove

Lynne Zielinski
Glenbrook North H.S.
Northbrook

ELEMENTARY

Terry Liddle
South Central Elementary
Kinmundy

Jennifer May
Ellis School
Belleville

Susan Wagner
Jay Stream School
Carol Stream

FREE PROPOSAL-WRITING RESOURCE

Writing Winning Grant Proposals I and II is available free to K-12 educators. This resource contains a beginners course and an advanced course. A facilitator guide, learner guide, handouts, and exercises come with the package. The courses can be taught in class or studies at home. Each takes an estimated four hours to complete. The resource was produced by the U.S. Department of Energy and Westinghouse Electric Co. To order, request a form from Bill Keeley, Economic and Technical Development, Westinghouse/CBS Inc., Carlsbad, NM 88221; 505-234-7200; or http://www.t2ed.com.

Why not apply to the **1999 YOUTH GARDEN GRANTS PROGRAM?** This year, 300 school and youth groups will receive hundreds of dollars' worth of tools, seeds, garden products, and educational materials. Winners will be chosen for innovative programming, sustainability, community support, and strong leadership. The application deadline is **Nov. 15**. If you have an outdoor school garden or plan to start one, you can request an application from the National Gardening Association at 1-800-538-7476. Or: http://www.garden.org.

Deb Greaney
ISTA Awards Chair

AWARD OPPORTUNITIES

Listed below are the current award opportunities offered by N.S.T.A. in conjunction with a variety of sponsors. There are awards available for teachers at all levels, as well as competitions and awards for classrooms. The applications and more detailed criteria for entry are available at the N.S.T.A. web site at : HYPERLINK http://www.nsta.org If you would like an entry form faxed to you, they are also available using NSTA Fax on Demand. This 24-hour touch-tone telephone service will prompt you into selecting a form, which will then be automatically faxed to you.
Call toll free 1-888-400-NSTA (6782)

You may request a directory of all NSTA forms, or select the form number listed below the award you are interested in.
Deadline: The deadline for submitting applications for the 1999 awards is November 16, 1998, unless otherwise noted.
I encourage you to take advantages of these opportunities, and to watch for new awards being developed by I.S.T.A. If you have any questions or comments, please feel free to contact me at HYPERLINK mailto:mdg2574@htc.net Also, if you have won an award, or know of one of your colleagues who have been honored, please email that information to me so I can share the good news!

American Water Works Association Award

Sponsor: American Water Works Association
Eligibility: K-12 science teachers
This award recognizes one teacher who has developed an instructional program and/or innovation using a multicultural approach that encourages students to explore and enjoy sciences related to drinking water.
Award: $1,000 and up to $500 to attend the NSTA National Convention
Form : Please request form 561

Barrick Goldstrike Exemplary Elementary Earth Science Teaching Award

Sponsor: Barrick Goldstrike Mines, Inc.
Eligibility: Full-time elementary (Kñ6) science teachers.
This award is given to an elementary science teacher who has demonstrated exemplary earth science (specifically environmental or geology) teaching practices.
Award: Desktop or laptop computer system; $2,500 for the purchase of earth science materials and/or equipment for the awardee's school; an all-expense paid trip to NSTA's National Convention; an all-expense paid trip to the Nevada Mining Association's Minerals Education Workshop for teachers.
Form: Please request form 562

Ciba Specialty Chemicals Exemplary Middle Level and High School Science Teaching Award

HYPERLINK "http://www.cibasc.com"
Ciba Specialty Chemical Corporation
Eligibility: Full-time middle level and high school science teachers.
This program recognizes one middle level and one high school teacher who have demonstrated exemplary science teaching in one or more of the following areas: creativity using science teaching materials; design and use of innovative teaching plans and ideas; and development and implementation of department, school, or school-community programs that improve science instruction and/or stimulate interest in science and the learning of science
Award: $1,000, a one-year membership in NSTA, and up to $500 to attend NSTA's National Convention.
Form: Please request form 557

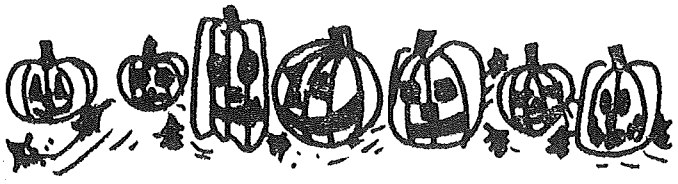
Distinguished Informal Science Education Award

Sponsor: NSTA
Eligibility: NSTA members who are not classroom teachers and who have demonstrated their dedication to informal science education.
This award honors one individual who has made extraordinary contributions to the advancement of science education in an informal or nontraditional school setting, such as a museum, or community science center.
Award: Formal citation, two nights' hotel accommodation, and $100 towards expenses to attend the NSTA National Convention.
Form: Please request form 551.

Distinguished Service to Science Education Award

Sponsor: NSTA
Eligibility: NSTA members who have shown long-term dedication to science education.

These awards honor individuals who, through active leadership and scholarly endeavor over a significant period of time, have made extraordinary contributions to the advancement of education in the sciences and science teaching. The number of awards given each year is at the discretion of the judges.
Award: Formal citation, three nights' hotel accommodation, and up to $500 towards expenses to attend the NSTA National Convention.
Form: Please request form 552.



Distinguished Teaching Award

Sponsor: NSTA
Eligibility: K-college-level teachers.
NSTA members who are teachers who have made extraordinary contributions to the field of science teaching are honored with this award. The number of awards given each year is at the discretion of the judges.
Award: Formal citation, three nights' hotel accommodation, and $200 toward expenses to attend the NSTA National Convention.
Form: Please request form 553

Drug, Chemical & Allied Trades Association Education Foundation's "Making a Difference" Award

Sponsor: The Drug, Chemical & Allied Trades Association Education Foundation
Eligibility: Innovative middle level science programs
This award will recognize and honor excellence in a science program developed and implemented by middle level science teachers, grades 6-8. Entries must show innovative and effective teaching strategies that focus on science and its application to global problems.
Award: $2,500 to be used to enhance or expand the winning science program.The winning school's lead science teacher and principal will be awarded airfare and one night's hotel accommodation to attend NSTA's National Convention
Form: Please request form 563.

Gustav Ohaus Programs for Innovations in Science Teaching

Sponsor: Ohaus Corporation
Eligibility: Science teachers in four grade-level categories: elementary, middle level, high school, and college level. These awards encourage and honor science teachers who have developed innovative programs in one of the following areas: new curriculum design, instructional methods or techniques, unique organization, administrative patterns, new approach to laboratory activities, or other enhanced learning activity for students.
Award: One $1,000 award and one $750 award in each of the four grade-level categories.
Form: Please request form 564.

Robert H. Carleton Award

Sponsor: NSTA with funding from Dow Chemical Company
Eligibility: NSTA members who are Kñcollege-level science educators.
This award recognizes one individual who has made outstanding contributions to and provided leadership in science education at the national level and to NSTA in particular. It is NSTA's most prestigious award.
Awards: $5,000, medallion, formal citation, and an all-expenses-paid trip to NSTA's National Convention.
Form: Please request form 554.

Science Screen Report Award

Sponsor: Science Screen Report, Inc.
Eligibility: K-12 science teachers.
This award is given to one teacher who has creatively used commercially available films or videotapes to develop a science unit or theme.
Awards: $1,000 and up to $500 to attend NSTA's National Convention
Form: Please request form 566.

Sheldon Exemplary Equipment and Facilities Award

Sponsor: Sheldon Laboratory Systems, Division of General Equipment Manufacturers
Eligibility: K-12 classroom science teachers.
This award honors one teacher who has demonstrated exemplary approaches to science teaching and new designs using science equipment and facilities available at the K-12 level. Equipment and facilities include classroom and laboratory space, furniture, fixtures, and science teaching apparatus.
Awards: $1,000 and up to $500 to attend NSTA's National Convention.
Form: Please request from 567.

The Science Teaching Award

Sponsor:Shell Oil Company
Eligibility: K-12 classroom science teachers.
This award recognizes one outstanding classroom science teacher who has had a positive impact on his or her students, school, and community through exemplary science teaching.
Awards: $10,000 and an all-expense-paid trip to NSTA's National Convention; two finalists will also receive all-expense-paid trips to the convention.
Form: Please request form 568.

MATH AND SCIENCE CURRICULUM DEVELOPMENT GRANTS

Hewlett-Packard's math and science curriculum development grants range from $30,000 to $50,000 worth of computer equipment. Types of equipment include copier products, printers, multimedia PCs, and photography equipment. At the national level, only education-related nonprofits are eligible. The company's regional offices conduct their own local giving to individual schools. Grants are awarded to projects that will reach large numbers of K-6 students to increase their knowledge of math and science, provide ongoing support for teachers, and use technology. For more information, contact Nancy Thomas, Corporate Philanthropy, Hewlett-Packard, PO Box 10301, Palo Alto, CA 94303-0890; 650-857-5197. See also

http://www.corp.hp.com/Publish/UG.

Elementary and secondary teachers interested in promoting aerospace education can apply for grants of up to $250 from the **Aerospace Education Foundation.** The same teacher may receive a grant every other year. During one calendar year, two teachers per school are eligible. **The deadline is open.** For more details, contact AEF, 1501 Lee Hwy., Arlington, VA 22209-1198.

The Environmental Protection Agency's education grants provide seed money for environmental education projects linked to school curricula. **The application deadline is Nov. 15.** To request an application, send your name, address, phone number, and name of your school to U.S. EPA, 401 M St. SW, Washington, DC 20460; or download the application from http://eelink.umich.edu.

Would your school benefit from having a pond habitat? Schools can apply for **Lily-ponds for Youth Matching Grants.** These grants will match each dollar spent on merchandise ordered from the Lilyponds water gardening catalog. For an application, call 1-800-825-5459.

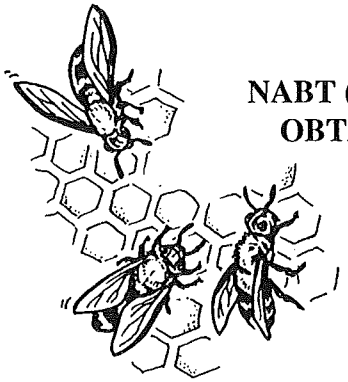
Congratulations to ISTA member Bobbie Klaus for receiving funding from 1998 Toyota TAPESTRY grants!

She was honored at the Toyota TAPESTRY banquet, held at the recent NSTA National Convention in Las Vegas. A description of her award-winning project follows:

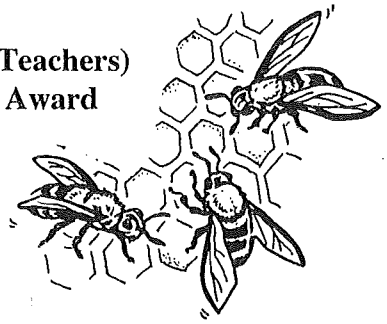
Project SAGS *(Students Accessing Geological Subsidence)*
Project Director: Bobbie Klaus
West Elementary School, Carlinville, IL

Students are working closely with the Illinois Abandoned Mine Reclamation Council to determine the status of a venting mine shaft located one mile from their school. The grant will allow students to use Global Positioning Systems to locate the other four shafts of the mine. Students will visit a public school that had to be abandoned due to a nearby mine and travel to Chicago to tour the Museum of Science and Industry's coal mine.

Toyota Motor Sales, U.S.A., Inc., has given nearly $3 million in grants to 293 projects throughout the country during the first eight years of the program. To add your name to the mailing list to receive the 1999 Toyota TAPESTRY application, call 1-800-807-9852. The deadline for applications will be **mid-January 1999.**



NABT (National Association of Biology Teachers)
OBTA (Outstanding Biology Teacher Award
1997/98
Mr. William C. Donato
Woodstock High School
501 W. South St.
Woodstock, IL 60098



In addition to being recognized as the 1997/98 OBTA from Illinois, Mr. Donato's credentials include the following:
Northern Ill. Regional Ground Water Protection Committee
Project WET Facilitator
McHenry County Environmental Assessment Committee
Ground Water Project Northern Coordinator
Ground Water Guardian Community Coordinator - McHenry, Boone and Winnebago Counties
River Earth Science Book, Addison Wesley, Lead Author
Rivers Biology, Addison Wesley, Contributing Author
On Tap, author, The Illinois M. S. Ground Water Project
H_20: Below, author and trainer, a water curriculum
Rivers Project Developer and Trainer, 1991 to present
Plan-It Earth, author and trainer
North Central Dist. Student Councils Exec. Board, 10 years
McHenry County Federation of Teachers Vice Pres, 3 years
District 200 Curriculum Area Specialist
Adjunct Professor - National Louis University (Teacher Effectiveness Training and Cooperative Learning)
Conference Presenter at ISTA, NSTA, Illinois Geographic Society, National Ground Water Partners, American Federation of Water Professionals and Ill. Federation of Teachers
Ground Water Guardian Comm. Award 1995, 1996, 1997
Groundwater Science Award in Public Education, Illinois Groundwater Association, 1996
Woodstock Council of Teachers President for 8 years
B.S. - Bradley University
M.S. - Bradley University

If you would like applications for the 1998/99 OBTA Award from Illinois, after January 1, 1999 contact:

Mrs. JoAnne Edwards
OBTA Illinois State Chair
Wheeling High School
900 S. Elmhurst Rd.
Wheeling, IL 60090

The deadline for receiving applications is March 1, 1999.

FIVE ISTA MEMBERS HONORED AS 1998 GOLDEN APPLE AWARD FINALISTS

Some of Chicagoland's best 9-12 grade teachers were selected from 295 completed applications by the Foundation's Selection Committee, made up of 75 volunteer Chicago-area educators and education administrators. This year, the Foundation received 700 nominations of outstanding high school teachers from Cook, Lake and DuPage counties.

Congratulations to these ISTA Members who are1998 Golden Apple Award Finalists!

Ramzi I. Farran	**Fenwick High School**	**Oak Park**
Ken Indeck	**Buffalo Grove High School**	**Buffalo Grove**
Michael C. Lach	**Lake View High School**	**Chicago**
Lee R Marek	**Naperville North High School**	**Naperville**
James H. Stankevitz	**Wheaton Warrenville South High School**	**Wheaton**

EDUCATIONAL MATERIALS

Tandy Lacy
Illinois State Museum, Education Section
Spring and Edwards Streets
Springfield, IL 62706
(217) 782-5993 or email: tlacy@museum.state.il.us

WETLAND STUDY KITS AVAILABLE

In conjunction with the Illinois State Museum's Scientific Literacy Program *An Interdisciplinary Study of Illinois Wetlands* (1995-1997), the ISM Education Section has produced 30 Wetland Study Kits which are available on loan to teachers throughout Illinois. Ten (10) of these kits are available directly from the Illinois State Museum in Springfield, and twenty (20) are located at different natural areas statewide.

Each Wetland Study Kit contains the publication *Illinois Wetlands: An Interdisciplinary Study*, an activity book targeting grades 5-8. This publication includes 25 activities and related resource materials. Each activity is written with a statement of purpose, suggested goals, targeted objectives, materials, procedures, extensions, recommended methods of assessment, recommended resources, a list of targeted learning skills, and a key to current Illinois Learning Standards (1997). Also included are several hands-on activity components, eg., 4 sets of slides, a video featuring 5 wetland sites in Illinois, a set of 5 freshwater mussel shells, laminated topographic maps, and reproduction effigy pottery. The majority of the materials in the kit are referenced in the activity book and designed as resources to be integrated into lessons.

To receive a thorough description of the ISM Wetland Study Kit and information on availability in your area, please contact Tandy Lacy at the address above.

THOMAS EDISON AND ELECTRO-TECHNOLOGY ACTIVITY GUIDE

The National Energy Foundation has developed a 120 page Thomas Edison and Electrotechnology activity guide for grades 5-12. the book's completion finalizes NEF's yearlong sesquicentennial celebration of the birth of Thomas Edison. It includes information on Thomas Edison as an inventor and entrepreneur; teaching strategies, which include using groups to enhance cooperative learning, developing a creative classroom, and understanding student needs; activities that stimulate the invention process from the origination of an idea through marketing it; and creativity and thinking skills such as brainstorming and problem solving. The Thomas Edison and Electrotechnology activity guide is 120 pages, priced at $12.00 per copy, and will be available for shipping in late January. To order, call the National Energy Foundation at 801-539-1406. For additional information call 801-539-1406 or e-mail: info@nefl.org

THE EVERGREEN PROJECT
WHAT'S IT LIKE WHERE YOU LIVE?

Exploring biomes through this video and CD Rom series is one way to bring the grasslands, deserts, and rainforests right into your classroom! The Evergreen project, in association with the Missouri Botanical Gardens, has developed a supplemental series to enhance your existing curriculum. These short videotapes and technology connections make this series one to consider!

Student research teams take "electronic" trips to various areas in North America to show, first hand, the types of organisms living in the particular biome. The student research teams visit the desert, temperate deciduous forest, and prairies in Biomes One; teams visit the temperate rainforest, tundra and taiga in Biomes Two.

The video series is both educational and entertaining as students speak to students and research teams conduct actual investigations. Teams answer many questions about animal and plant adaptation, what makes a biome a biome, and more. Teams communicate with electronic friends via e-mail to collect more data.

Each package contains three videotapes, 20 lessons and Student Journal sheets on CD, and over 4500 Biome Multimedia files on CD for student research use. Teachers may purchase the components individually or as a total package. It is slightly expensive at $249 for the total package, but components may be ordered individually and range from $24.94 to $125.00.

This is an excellent resource to allow students to create their own multimedia reports about biomes, to integrate technology with science, and to take desk-side field trips to study the biome right in your own classroom!

There are other video series and CD Roms available from: MBG Learning Network, 500 South Ewing, Suite C, St. Louis, MO 63103, 1-800-927-9229.

GIFTED STUDENTS IN SCIENCE, MATH

The School Science and Mathematics Association seeks manuscripts on issues related to the teaching of gifted, talented, and promising students in science and math. Selected papers will appear in the Oct. 1999 issue of SSMA's journal, *School Science and Mathematics*. Manuscripts will be due **Oct. 1, 1998**.

Send manuscripts to Robert W. Prielipp, Professor of Mathematics, Mathematics Dept., University of Wisconsin-Oshkosh, Oshkosh, WI 54901-8631. For more information, call Prielipp at 920-424-1057; e-mail prielipp@uwosh.edu; or see the SSMA website at http://hubble.bloomu.edu/~ssma.

AMERICAN CHEMICAL SOCIETY

The following products are available from the American Chemical Society at 1-800-209-0423.

The School Reference to Experiential Programs in Chemistry lists undergraduate and graduate programs offering cooperative education, internships, study- or work-abroad programs, and service-learning programs for their chemical science students. The book, published by the society's Experiential Programs in Chemistry, costs $15 including s/h. For more information, contact LaTrease Garrison at 202-872-6176 and ask about product #C41.

Materials Can Help Teachers Interest Young Minority Women in Science. During 1991-1995, The George Washington University (GWU) in Washington, DC, ran a program called Bringing Young Minority Women to the Threshold of Science. The program involved 100 minority high school girls in yearly cohorts of 24-30 girls in grades 9-10 from the Washington, DC, area. Along with six high school science teachers, the girls participated in a year-long program that introduced them to computers, role models from science and engineering, and hands-on science research conducted in collaborative teams. The girls also experienced 10 days of university dorm life.

To help motivate female minority students to consider careers in science, order The Young Minority Girls Program Planning Package containing a videotape describing how the program was developed and implemented, a report on the characteristics of exemplary programs for minority girls, and a paper describing a follow-up research study on the impact the program has had on the teacher and student participants. Order the package by sending a check (for $15.00, made out to GWU) to Professor Dianne Martin, Young Minority Girls Program, EECS Dept.-AC T640, GWU, Washington, DC 20052. Single copies of the report and the paper are available free upon request.

Critical Trends in Urban Education: A Poll of America's Great City Schools indicates that the most effective reform strategy in urban schools is staff development, and that the most commonly used strategy is the formation of partnerships with leaders in business and the community.

The study by the Council of the Great City Schools polled urban school leaders for its results. More than 86 percent of the respondents said that securing partnerships is the strategy they use the most, with implementing staff development coming second and setting higher performance standards third. Foundations, local public education funds, and business leaders received the highest ratings for groups seen as the most helpful to urban schools.

Urban leaders said that their top five needs are improving academic achievement, building public confidence, implementing professional development programs, securing additional funding, and developing higher academic standards. Their top 10 needs include improving racial attitudes.

For a copy of the report, call the council at 202-393-2427 or access its website at http://www.cgcs.org.

Dr. Bob Williams
Rivers Project
Box 2222
Southern Illinois University
Edwardsville, IL 62026
618-692-3788 Phone 618-692-3359 FAX
Home page Http://www.siue.edu/OSME/river

PROJECT ANNOUNCES PUBLICATION OF ITS BIOLOGY CURRICULUM GUIDE

The Rivers Curriculum Project of Southern Illinois University Edwardsville, an educational organization working to increase scientific literacy through river study, announces the publication of its Rivers Biology Curriculum Guide. Developed under a National Science Foundation grant and published by Addison-Wesley, the Biology Curriculum Guide is sure to be a teacher favorite! Focusing on hands-on stream-monitoring activities, the Biology Curriculum incorporates the study of living organisms in rivers, streams, or lakes which can be easily captured or documented to alert students to the connections between living organisms, water quality, and overall environmental quality. By stressing experiential educational activities, this guide affirms the legitimacy of local activities and hands-on learning.

Also available through the Rivers Project are three other curriculum guides: Chemistry (testing river water and analyzing data to explore the impact of society on the quality of N. American rivers), Earth Science (evaluating the physical features of a river system and exploring clues to historical development within a local area) and Geography (understanding the link between people and rivers--from human migration to industrial development). Language Arts and Mathematics Guides will be available soon.

All Rivers Project Guides are available through the Rivers Project for $23.95. Interested persons can contact the Rivers Project for information.

NSTA PUBLISHES MIDDLE LEVEL GUIDE TO STANDARDS

NSTA has just released the last in its three-volume series called *NSTA Pathways to the Science Standards: Guidelines for Moving the Vision into Practice*. This volume for middle level teachers follows the earlier high school and elementary school editions. The middle level volume examines the national Science Education Standards from the real-world perspective of a middle school teacher who is interested in putting the goals of the Standards into practice. The book covers standards applicable for grades 5-8. Chapters examine the standards on teaching, professional, development, assessment, content, program, and education system.

The 151-page middle school edition costs $29.95 plus shipping and handling. Contact NSTA, 1840 Wilson Blvd., Arlington, VA 22201-3000; 1-800-722-NSTA.
http://www.nsta.org/scistore

JOIN THE ILLINOIS SCIENCE TEACHERS ASSOCIATION!

BENEFITS AND ACTIVITIES FOR ISTA MEMBERS

PUBLICATIONS—*Spectrum* is the ISTA journal, published in April, August, and December. The *Spectrum* provides ISTA members with association news and updates from ISTA officers, a column on state initiatives, articles, teaching techniques, exciting classroom ideas and information regarding upcoming meetings, conferences and educational opportunities. The newly introduced **ISTA ACTION** provides up-to the-minute information on fast breaking news in Science Education and is published in February, June, and October.

THE ISTA CONVENTION—For over twenty-five years this annual conference has brought together educators and administrator through the state. Major speakers, group sessions, hands-on workshops, microcomputer labs, and extensive commercial exhibits are a few highlights of this outstanding program of renewal for science teachers. This year's convention will be held at the Rosemont Convention Center October 16-17.

LEGISLATIVE REPRESENTATION FOR SCIENCE EDUCATION—ISTA provides a direct line of communication between science educators and state officials. Our organization voices concerns and recommends programs and funding for science education.

ISTA HIGH SCHOOL AWARDS—Sponsored by Caterpillar, this honor is awarded annually to high school students who excel in science. Awards are available to all high schools.

PRESIDENTIAL AWARDS—ISTA participates in this NSF Program designed to identify and recognize exemplary science education programs at all levels.

WEBSITE—We are constantly updating our WEBSITE. Check us out at **http://www.ista-il.org**

ANNUAL MEMBERSHIP RENEWAL FOR THE 1999 YEAR

Join now and your dues will be in force until January 2000 (15 months). The new membership year runs for the calendar year January 1 through December 31.

MEMBERSHIP CATEGORIES

Any person interested in science education is eligible for membership. All memberships include a subscription fo the SPECTRUM, The Journal of the Illinois Science Teachers Association and a subscription to the new Newsletter, the ACTION. Write the number of the option for the membership category on the Membership Form on the back cover.

Option 1: Full Membership Dues- $25.00 Full Membership entitles individuals interested in Illinois science education to the following benefits: a one year subscription to the SPECTRUM, and ISTA ACTION. publications of the Illinois Science Teachers Association; notification of regional conferences and meetings; invitations to science issues activities; a reduced registration fee for the Annual ISTA Conference; voting privileges; and the opportunity to hold an ISTA Officer position.

Option 2: Two Year Full Membership Dues- $45.00 Two Year Full Membership entitles member to Full Membership benefits for two years.

Option 3: Five Year Full Membership Dues- $100.00 Five Year Full Membership entitles member to Full Membership benefits for five years.

Option 4: Associate Membership Dues- $15.00 Associate Student Membership applies to full-time students who are not currently employed as professional educators (Requires the signature and institutional affiliation of the student's professor). Entitles member to Full Membership benefits, with the exception of voting privileges and the opportunity to hold an ISTA Officer position. Associate Retired Membership applies to individuals who are on retirement status. Entitles member to Full Membership benefits, with the exception of voting privileges and the opportunity to hold an ISTA Officer position.

Option 5: Institutional Membership - $50.00 Institutional Membership entitles the member institution, for a period of one year, to two subscriptions to the SPECTRUM and ISTA ACTION; notification of regional conferences and meetings; invitations to science issues activities; and a reduced registration fee for the Annual ISTA Conference for a maximum of three members of the institution.

ISTA REGIONAL DIRECTORS

REGION II
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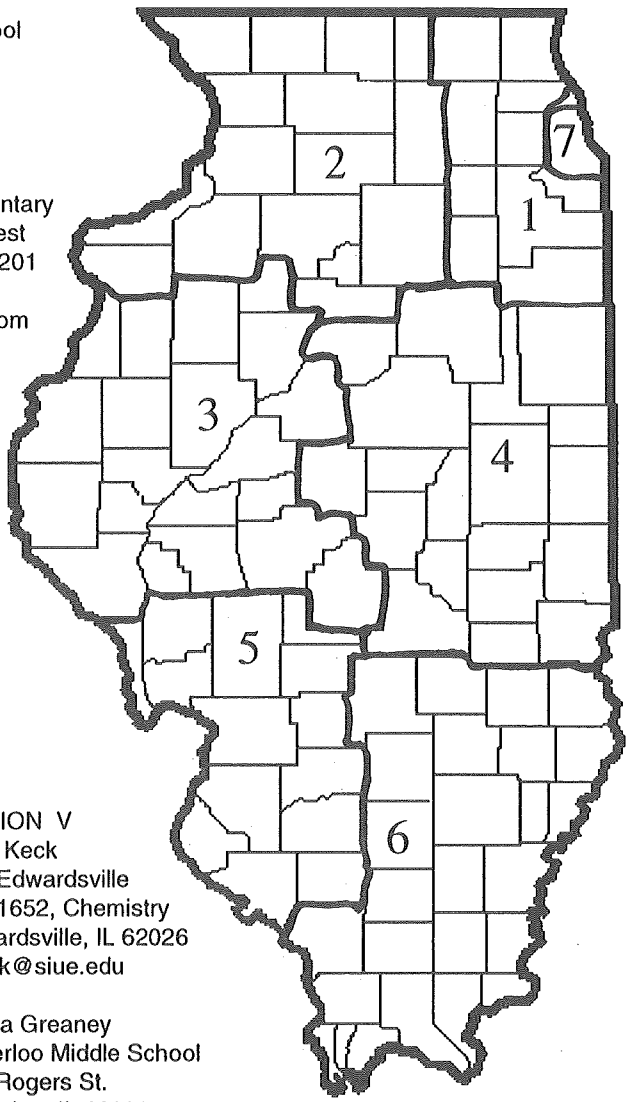
309-734-6822
lhall@peoria.k12.il.us



REGION V
Pam Keck
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Box 1652, Chemistry
Edwardsville, IL 62026
pkeck@siue.edu

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mdg2574@htc.net

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MikeLach@aol.com

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Al Fleming
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847-432-6510
afleming@d113.lake.k12.il.us

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Decatur, IL 62522

Georgiean Benson
Washington School
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Monticello, IL
gbenson@net66.com

REGION VI
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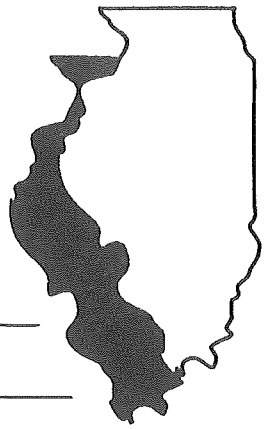
Hutsonville, IL 62433
618-563-4913

Suzanne Asaturian
Carbondale Comm. H.S.
200 N. Springer Street
Carbondale, IL 62901
(618) 457-3371 x 242
FAX (618)549-1686
sasaturian@cchs165.jacksn.k12.il.us

Region I	McHenry, Lake, Kane, Cook, DuPage, Kendall, Will, Grundy, Kankakee
Region II	Jo Daviess, Stephenson, Winnebago, Boone, Carroll, Ogle, DeKalb,Whiteside, Lee, Rock Island, Henry, Bureau, LaSalle, Putnam, Marshall, Mercer
Region III	Henderson, Warren, Knox, Stark, Peoria, Hancock, McDonough, Fulton, Tazewell, Schuyler, Mason, Adams, Brown, Cass, Menard, Pike, Scott, Morgan, Sangamon, Christian
Region IV	Woodford, Livingston, Ford, Iroquois, McLean, Logan, DeWitt, Piatt, Champaign, Vermillion, Macon, Shelby, Moultrie, Douglas, Edgar, Coles, Cumberland, Clark
Region V	Calhoun, Greene, Macoupin, Montgomery, Madison, Bond, St. Clair, Clinton, Monroe, Washington, Randolph, Perry, Jersey
Region VI	Fayette, Effingham, Jasper, Crawford, Marion, Clay, Richland, Lawrence, Wayne, Edwards, Wabash, Jefferson, Franklin, Hamilton, White, Jackson, Williamson, Saline, Gallatin, Union, Johnson, Pope, Alexander, Pulaski, Massac, Hardin
Region VII	City of Chicago only

ILLINOIS SCIENCE TEACHERS ASSOCIATION

MEMBERSHIP APPLICATION



NAME _____
LAST FIRST

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STREET APT. NO.

_____
CITY STATE ZIPCODE PHONE

☐ * EMPLOYER ADDRESS _____
COMPANY/SCHOOL STREET

_____
CITY STATE ZIPCODE FAX/EMAIL

* MARK BOX NEXT TO ADDRESS YOU WANT YOUR ISTA MAIL SENT TO.
THIS INFORMATION WILL NOT BE MADE AVAILABLE TO ANY OUTSIDE GROUPS.

Check applicable categories in each column

___ Elementary Level	___ Elementary Sciences	___ Teacher
___ Middle Level	___ Life Sciences/Biology	___ Administrator
___ Senior High Level	___ Physical Sciences	___ Coodinator
___ Community College	___ Environmental Science	___ Librarian
___ College/University	___ Earth Science/Geology	___ Student
___ Industry/Business/ Government	___ Chemistry	___ Retired
	___ Physics	
___ Other (list)	___ General Science	
_____	___ Integrated Science	
	___ Other (list)	
	_____	

REGION (FROM INSIDE BACK COVER) _____

MEMBERSHIP OPTION (See page 48)_____

AMOUNT ENCLOSED_____

SEND FORM WITH CHECK OR MONEY ORDER MADE OUT TO ILLINOIS SCIENCE TEACHERS ASSOCIATION TO: **DIANA DUMMITT, ILLINOIS SCIENCE TEACHERS ASSOCIATION, COLLEGE OF EDUCATION, UNIVERSITY OF ILLINOIS, 1310 S. SIXTH STREET, CHAMPAIGN, IL 61820**

ISTA SPECTRUM
UNIVERSITY OF ILLINOIS
COLLEGE OF EDUCATION
1310 S. SIXTH STREET
CHAMPAIGN, IL 61820

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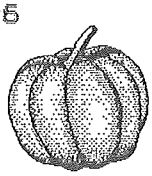

FALL 1998