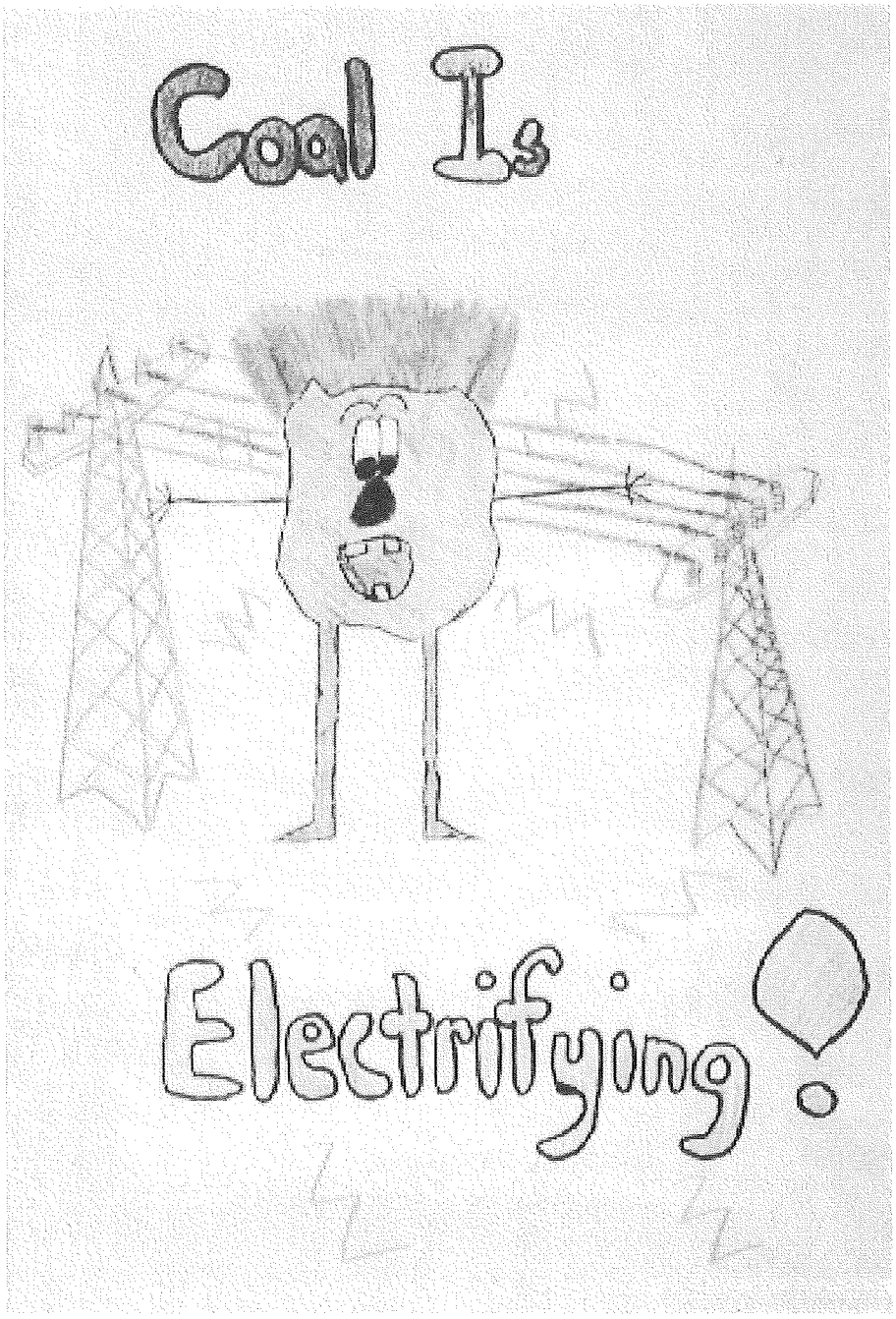
SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION



SPRING/SUMMER 1998

SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
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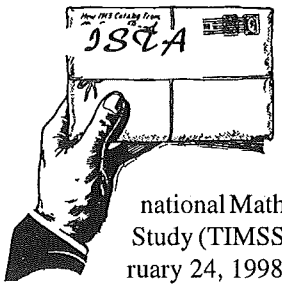
ISTA NEWS

SPRING PRESIDENT'S LETTER



High school results of the Third International Mathematics and Science Study (TIMSS) were released February 24, 1998 (see page 9 and the Articles section of this issue for more on the study). The results show that in both mathematics and science, US students were among the lowest achievers of the 21 participating countries. Top performing countries included the Netherlands, Sweden, Iceland, Norway, Canada, Switzerland, and New Zealand. Countries grouped with the US include the Russian Federation, Hungary, Italy, Lithuania, Cyprus and South Africa. Previously released data show US 7th and 8th grade students scored near the international average in science, while US 3rd and 4th grade students were among the highest achieving students in the world. Altogether nearly 50 countries participated in one or more portions of the study.

Some Illinois teachers will dismiss the TIMSS results as just another indictment of the US educational system. However, not taking these results seriously will be a mistake for several reasons. First, powerful people in Illinois and elsewhere are alarmed that US students as they grow up fall increasingly behind their international counterparts. Those wanting change will readily accept simple solutions proposed by would-be reformers who may be ill-informed or intellectually lazy. There is ample evidence showing that there are no simple pathways to increased student achievement. Efforts to implement simple solutions will mean that another round of mathematics and science reform will be wasted and teachers will be made victims.

Illinois teachers must be proactive if we are to avoid this mistake. We need to express our concern about an educational system that does not serve students as well as it should. We must commit ourselves to a rigorous study of the TIMSS data with the beliefs that our educational system is complicated and complex; that there are no simple solutions; and that teachers are in the best position to identify causes of low achievement and to propose remedies. The actions I propose are another expression of my belief that now, more than ever, teachers need to take control of their profession.

TIMSS is important for reasons other than political ones. I believe that analyzing the TIMSS data can form the basis for exceptionally rich professional development. Very importantly, TIMSS includes with the test results a wealth of demographic data, student, teacher, and administrator survey data, curriculum studies, released item sets, and preliminary analysis. Much of this is available at the TIMSS homepage (wwwcsteep.bc.edu/timss). Additional information is available for less than $100 from the Government Printing Office. Through inquiry, Illinois educators can learn where we are doing a good job of teaching and where we need to improve. We can learn from the ways that teachers in other countries do their jobs and how their practices affect student achievement. We can use TIMSS to turn a mirror on Illinois education and promote healthy discussion about ways that we can help students learn better. I believe that TIMSS data can teach us much about what we need to do to increase student achievement. TIMSS will fail to achieve its promise, however, if educators allow scholars and others to analyze and interpret the data for them.

Your Association is taking several steps to move the TIMSS analysis forward. Your Board is planning a joint meeting in September with officers of the Illinois Council of Teachers of Mathematics. We will discuss what we can do together to promote study of the TIMSS data. ISTA also has established a TIMSS Task Force to support teacher inquiry. Please contact me if you wish to know more about TIMSS or if you would like to offer suggestions about ways that your Association can help you become informed about TIMSS and active in its interpretation.

Doug Dirks, President

WATCH FOR

THE ADVANCE PROGRAM

FOR THE 1998

ISTA ANNUAL CONVENTION

"PLUGGING IN TO THE FUTURE"

ROSEMONT CONVENTION CENTER

"IN THE MAIL" BY MAY 18

LETTER FROM THE EDITOR SPRING 1998

I've been hearing a lot lately about educational technology in the classroom. This is not to say discussions and articles about technology have waned over the years. However, this past half year I've been hearing comments like that old familiar saw, "Technology is a wonderful thing...when it works." One could take such comments in two ways. First, a person making the comment may be having difficulties with pieces of technology and the frustration is showing through. I've been there, done that -- as have many of you. Who can forget the hours of agony fighting with a printer that refuses to print, no matter what you do with it? I have a printer now that is basically a big paperweight. The second way one might perceive the old comment is someone is actually trying to incorporate the use of technology in their instruction -- perhaps for the first time, perhaps in a new way -- but some effort is definitely being made.

Undoubtedly, if we find ourselves in the shoes of the second person, we will still experience some frustrations. Who doesn't when encountering something new (which doesn't mean the technology is actually new, but is just new to us and our use of it). Hopefully, as we listen to each other, we'll hear more comments about technology and education. There certainly is impetus for having it in our classrooms, especially considering some of the new standards released by the Illinois State Board of Education as well as those included in the National Science Education Standards and the AAAS Benchmarks. The "experts" seem to be telling us -- almost yelling to us -- that technology must be an integral part of our instruction, and that we must teach our students how to use it. As a consequence, we seem to be seeing ever more technology creeping into our schools and classrooms.

I would suggest that, in the midst of all the hype about educational technology, we take a careful look at what it is we think we are doing, and -- perhaps more importantly -- how we are doing it. My suggestions are drawn from experiences I've had over the past several years. Perhaps some of you can relate to them, too. Please keep this in the context that I'm all for using technology in my classroom and instruction -- as long as its use is appropriate and actually enhances the learning opportunities of my students. I am not anti-technology. I would be lost without my computer, and I would feel a definite absence of a valuable resource for my courses if my students did not have access to the internet. I know some of you have the same sense of the situation.

However, before we fling ourselves headlong into blindly embracing educational technology, there are some important issues we should consider.

First, let's address what is meant by "educational technology." In my opinion, any of us who have taught hands-on and minds-on science use educational technology. If you use magnifying lenses, microscopes, telescopes, stethoscopes, other 'scopes, etc., you are using technology. Hopefully, you are teaching your students how to use it effectively. All too often when I visit with some school administrators or with someone from the" technology office," their concept of educational technology is limited basically to computers and CD-ROMs. Where I work, we've added distance learning technologies (satellite TV, etc.) to the mix. The scope of the definition of educational technology must be broadened and extended beyond just computers, CD roms, and the like.

Second, we should ask ourselves if we are sometimes moving too fast and pushing computers and other technologies into the classroom too early, before our students are really ready for them. In her recent article about educational technology, Colleen Cordes relates what Edward Miller of Harvard pointed out: "that basic questions about the impact of computers on students have rarely been asked, let alone systematically studied" (Cordes, 1998, A25). Oppenheimer echoed that there is simply no good research evidence that most computer uses significantly improve teaching and learning (Oppenheimer, 1997). Cordes goes on to summarize discussion at a national conference on educational technology held in late 1997 at Columbia University. One point is that, too often, there may be a lack of carefully thought-out pedagogy that is sensitive to the changing developmental needs of children at different ages. In fact, the tendency is to focus on developing children's logical thinking skills too early, resulting in lack of attention to thinking capacities that are "least machine-like," including intuitive thinking, use of imagination, and creativity. In this view, we need to take care to help students learn to draw on and nurture their inner resources rather than directing them to using almost exclusively external ones (i.e. the logic imposed by computers). A teacher of advanced computer-technology classes in the Des Moines, Iowa school system recently noted that computers enhance basically one type of thinking, and that intuitive, creative, imaginative thinking can actually be stunted with over reliance on the use of computers in the classroom (Cordes, 1998, A25). For many children, especially at the younger grades, hands-on, personal experiences with nature are critical. Children need to explore their world with their tactile senses (touch, smell, even taste). I've seen far too many educational technology presentations where we're shown how efficiently students can look up science information, read it and write about it. Although this is one piece of the science instruction picture, it is but one. Reading and writing about science is not the same as actually doing science.

Third, what is the cost of educational technology? There are numerous facets to this question. Undoubtedly, the cost of not incorporating it is unacceptable to our future citizenry. However, there may be costs incurred for incorporating it in inappropriate ways. Some of those concerns were noted in the preceeding paragraph. Even looking at this question in the simplistic sense of how it impacts our budgets may reveal costs some are unwilling to commit to. Once the hardware is purchased, often at considerable expense, there is often little left for obtaining appropriate and useful software or other necessary supplies and equipment. Within a short while,

those machines will need upgrades or replacement -- another costly investment. Janet Gerking, editor of *The Science Teacher*, lamented this very thing in her editorial (February 1998). She noted how, to keep her classroom computer running, she had to dedicate far too much of her annual budget to that one machine, neglecting the purchase of test tubes and beakers.

How many of you know of some teacher (perhaps it is you!) who is tickled pink to have obtained an Apple IIe within the last year or two so he/she could have a computer in the classroom? I know of several teachers in this very circumstance (By the way, just when were Apple IIe computers last manufactured?). Beyond the actual machines, funding for their use may also become problematic. For example, I know of downstate schools which struggle to afford single telephone lines for their buildings, much less paying for any additional lines for internet access. Is our effort to include such educational technology in our classrooms realistically sustainable in the long term, particularly in light of the levels of funding coming from Congress and the state legislature? And if special funding is there, has it detracted from the basic maintenance of the rest of the curriculum -- or even of the physical structures of the buildings themselves? I've found it ironic that several rural schools I've visited were given monies to purchase computers and dedicated phone lines, yet their roofs leaked, plaster was falling, and cold air literally blew in through the walls during winter.

Fourth, we should be very cautious about imposing the use of technology when and where it isn't warranted. Although I enjoy using equipment such as large screen projector TVs and special overhead/opaque (all-in-one) projectors in my teaching, there are times when the good old chalk board is all that is necessary as an instructional tool.

I know of a couple of cases in which a technology company wanted to give some technology to schools, provided the schools figured out how to best use it and then let the companies know those details. I cringed when I asked an administrator why he would think of making such a "deal," and his response was that, ". . . it would get us 'free' technology." Instructional needs was not the first consideration; simply getting technology was. Determining what the teachers' and students' needs were and how best to use the technology were distant seconds. I've had to remind some folks that we need to look past the glitz of the educational technology hype to see what it is the technology is really enabling us to do in terms of good sound pedagogy and learning. A hammer is always a good tool to use when trying to nail something together, but it can be a poor screwdriver. In the same sense, educational technology must be a TOOL to use in our instruction rather than THE GOAL.

There are probably other concerns about educational technology "floating around" out there. I imagine that the four I noted here have "pushed someone's buttons" and irritated some folks, too. Ultimately, as educators in general and as science educators in particular, we must make the decisions as to which instructional techniques and resources are most appropriate and effective. I like the instructional technologies that are available to me and my students, but I must also understand there are limitations to their utility. As with my choices for science laboratory exercises and inquiry assignments, I must pick and choose them with care, always considering what is best for my students. I should do nothing less with the technology in my classroom.

Sincerely,

Kevin

Kevin Finson
Editor, ISTA *Spectrum*

Resources

Cordes, C. (1998, January). As educators rush to embrace technology, a coterie of skeptics seeks to be heard. *The Chronicle of Higher Education*, XLIV (19), A25-A26.

Oppenheimer, T. (1997, July). The computer delusion. *The Atlantic Monthly*, 45-62

REGIONAL REPORTS

Georgiean Benson
Director, Region 4

Greetings from Region IV. This year there has been considerable discussion about student and teacher standards. National Board for Professional Teacher Standards released the portfolio for science teachers of young adults (high school) in Dec. of 1997. The first tests will be this summer. Teachers will be piloting junior high science teacher portfolios in April and May of this year. The plan is to release this portfolio in Dec. 1998 to interested candidates. If you are interested in learning more about NBPTS in science or other areas, call 1-800-22TEACH. The web site is:

http://www.nbpts.org

For other information contact me: gbenson@net66.com

Do you have any ideas of what you would like to see ISTA doing in the future? Would you like to be more involved? Please send any of your ideas or comments to me or other board members.

CONGRATULATIONS TO OUR NEW REGIONAL DIRECTORS!

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In my experience I have found teachers as a whole to be a rather unique group of people. They are devoted, caring professionals who go above and beyond the minimum required to help children learn. They put in long hours, buy supplies out of their own pockets, and constantly deal with a myriad of problems. They perform one of the most important jobs on Earth: helping children learn what they need to live productive, satisfying lives. Could there ever be a group more deserving of thanks and recognition? Yet mention awards, and you get some very strong responses from many teachers. I've heard things from my own colleagues such as," Everybody deserves recognition. Why award just one?" and "I don't want to be singled out. Others will be resentful of me." And finally, " I don't expect to be awarded. I'm just doing my job." While I can understand this attitude, I have to disagree. My rationale for this difference in attitude is based on several factors.

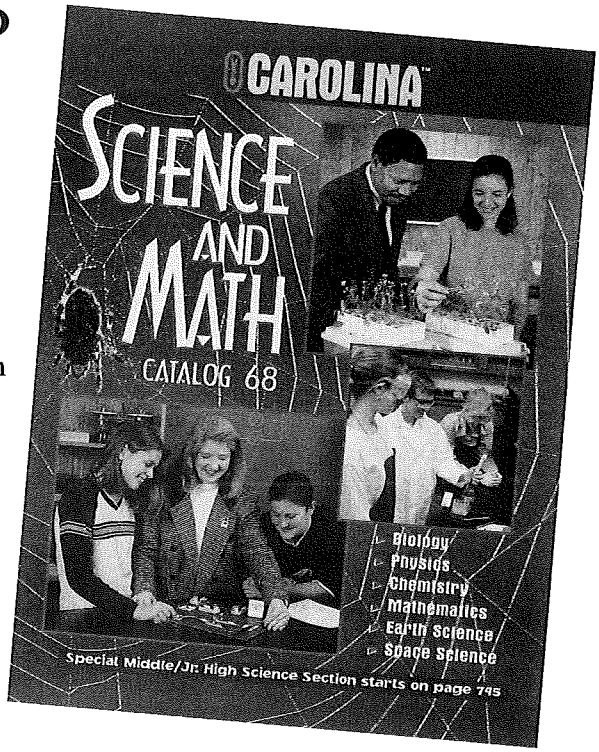
Teachers have as a group been getting some pretty bad press lately from many different directions. It seems that the majority of articles and news reports on education are negative. Low student test scores, cases of abuse and misconduct, teachers striking for more money are high profile news items. Positive teacher stories are a rarity. If we don't make the public aware of the wonderful things happening in so many of our classrooms, who will? Also, with recognition usually comes a measure of responsibility to share the award winner's ideas. One good idea shared can turn into a multiplicity of positive learning experiences.

It was with this outlook that I accepted President Doug Dirks invitation to become award chair for I.S.T.A. There are several things I will be doing to help promote the great science teachers and students we have here in Illinois. First and foremost, my primary responsibility will be to keep you informed of current award opportunities for both teachers and students through the I.S.T.A. publications and web site as they become available. I am also working to develop some new I.S.T.A. awards. Finally, I would like your help in recognizing outstanding science teachers who have received awards. If you are at any time aware of a fellow teacher, or if you have received some special recognition, please send that information to me so I can share the good news.

I'm looking forward to hearing from you. I would also welcome any suggestions you might have.

YOUR SCIENCE TEACHING RESOURCE

EVERYTHING YOU NEED TO TEACH SCIENCE



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NSTA LEGISLATIVE UPDATE

The Eisenhower Program: Block Grants vs. Ed-Flex vs. Status Quo

In the coming months, science teachers and others will in all likelihood have to besiege their senators and representatives with letters, calls, and e-mails if the Eisenhower Professional Development program as we know it now is to be preserved.

We hope that the discussion below helps explain how the two proposals for changing federal education funding that are now before Congress have the potential to dramatically affect the Eisenhower program. NSTA will, of course, continue to keep you informed about the progress of both of these proposals as they wend their way through Congress.

How the Eisenhower Program Works Now The provisions of the Eisenhower Professional Development state grants program are detailed in Title II, Part B, of the Elementary and Secondary Education Act (ESEA), also known as the Improving America's Schools Act. To read the ESEA law, go to: http://www.ed.gov/legislation/ESEA/toc.html

By law, Eisenhower state grant funds are distributed by formula to local school districts to be used for professional development activities for K-12 teachers. The first $250 million of the amount appropriated in a given year is to be set aside for science and math teachers. The remainder can be used for teachers of the other core academic subjects or for science and math teachers.

The two most important requirements of the law for science teachers are 1) the $250 million set-aside for science and math teachers and 2) funding targeted for professional development.

The proposals now being introduced in Congress that threaten the Eisenhower program are extension of Ed-Flex (by the Clinton Administration) and block grants (by House and Senate Republicans).

Ed-Flex for All States

The Department of Education is about to send legislation to Congress that would allow every state to be designated a so-called Ed-Flex state. This would permit the state to waive most federal statutory (by law) and regulatory requirements in key elementary and secondary education programs, including the Eisenhower Professional Development program, if these requirements interfere with state and local efforts to improve education.

In exchange for this flexibility, the state would have to demonstrate a sound education reform plan and to hold schools accountable for achieving high academic standards. The state would also have to be willing to waive its own rules and regulations if they interfere with a school's own approach to improving education. States would NOT, however, be permitted to waive civil rights requirements or provisions of the Individual with Disabilities Education Act (IDEA).

The Ed-Flex program began in 1994 as a demonstration project limited to 12 states that met its requirements. The following received the designation: Kansas, Vermont, Colorado, Michigan, Oregon, Iowa, Illinois, New Mexico, Ohio, Texas, Maryland, and Massachusetts.

It should be noted that just because a state is designated an Ed-Flex state does not automatically mean that the Eisenhower program's set-aside for science and math teachers is lost. Nonetheless, the possibility certainly exists.

The Ed-Flex program is an obvious attempt by the Clinton Administration to counteract and defeat the Republican majority's outcry for block grants (discussed below).

The President's Ed-Flex proposal would affect all programs in the Elementary and Secondary Education Act, including Eisenhower, Title I (help for disadvantaged students), Safe and Drug Free Schools and Communities, Technology for Education programs, Innovative Education Strategies (Title VI), Emergency Immigrant Education, and the Perkins Vocational Education Act. The Technology Literacy Challenge Fund would also be added to the list.

Block Grants

Last October by an overwhelming majority, the House passed H. Res 139, a non-binding resolution expressing the sense of the House that 95% of K-12 federal funding should flow directly to classrooms. In late January, the Dollars to the Classroom bill was introduced in the Senate (S 1589) by Senator Tim Hutchinson (R-AR) and in the House (HR 3248) by Representative Joe Pitts (R-PA). When introduced, the House bill had 64 cosponsors and the Senate bill, seven. (Another Senate bill, S 1590, introduced by Senator Paul Coverdell (R-GA), titled the Elementary and Secondary Education Bill, incorporates the Dollars to the Classroom provisions within a broader education bill.)

Among the $3 billion in federal education programs that would be folded into the block grant, in addition to Eisenhower, are Goals 2000, School-to-Work, Technology for Education, Safe and Drug-Free Schools and Communities, and more. Only one part of Title I, Even Start Family Literacy Programs, would be included in the block grant. The remainder of Title I funding would remain targeted.

The block grant bills have been referred to committee. To read the bills (search by bill number), go to
http://thomas.loc.gov/

What's the Difference?

The KEY DIFFERENCES between the ED-FLEX and BLOCK GRANT PROPOSALS are these:

First, Ed-Flex preserves targeted federal programs so that they continue to address the specific purposes for which they were designed. However, specific requirements in the programs become vulnerable to change.

For example, in the case of the Eisenhower Professional Development program, money would still have to be used for professional development for K-12 teachers, but the statutory requirement that the first $250 million be set aside for science and math teachers could be ignored if local school districts believed that the money would be better spent on professional development for non-science and math teachers.

Second, a block grant, on the other hand, would lump all the funding for a given number of programs (the current bills in Congress include the Eisenhower program, as discussed above) into a single pot that states could use for ANY purposes they wanted---no strings attached. In other words, federal money for these programs would NO LONGER BE TARGETED for the specific uses for which the programs were designed. No funds, for example, would be earmarked for professional development. [Ed. note: Funds widely used by Illinois teachers to attend the ISTA Annual Convention.]

Technology Innovation Challenge Grants

This year the Technology Innovation Challenge Grants program will focus on professional development by providing support to consortia that have developed programs, or are adapting or expanding existing programs, for technology training for teachers and other educators to improve instruction.

A consortium must include at least one local educational agency (LEA) with a high percentage of children living below the poverty line. A consortium may include other LEAs, private schools, state educational agency, colleges and universities, and others. The LEA must submit the application on behalf of the consortium. The application package for this program ise available online at

http://www.ed.gov/Technology/chalgrnt.html

The application deadline is May 29, 1998.

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

REMEMBERING ORRIN GOULD, LONGTIME EDITOR, FRIEND

Orrin Gould, 72, professor emeritus at the University of Illinois died January 19, 1998. Services were held in Bellingham, Washington. He is survived by his wife, Muriel, a son and daughter, three grandchildren, and a great-grandchild.

Orrin was born March 27, 1925 at Mankato Minnesota. He received a Bachelor's degree from Iowa State University and a doctorate from the University of Minnesota. Orrin served in World War Two and was awarded two bronze stars for heroism.

He was a professor at the University of Illinois at Urbana-Champaign from 1958 to 1995. He was committed to excellence in science education in the state of Illinois, serving on several state committees including the committee for Performance Assessment in Science. Orrin was editor of the ISTA *Spectrum* from 1983 until 1988. He was responsible for shaping the format of the *Spectrum* and for transforming it from a 4-page hand-typed newsletter into a 48-page journal.

During his career he had many friends. Wednesday science seminars at Orrin's house were a wonderful time of fellowship among students and faculty. Through the years, he and Muriel served as gracious hosts, welcoming faculty, friends, and dozens of graduate students in to their home.

In memory of Orrin, memorial contributions may be made to the Orrin Gould Memorial, Alzheimer's Society of Washington, P.O. Box 4104, Bellingham, WA 98227.

Orrin and Jenny Grogg, former ISTA President at the 1988 ISTA Convention

Orrin will be sorely missed. Here follow some reminiscences by his students and colleagues:

Orrin and I worked on a number of projects together including a biotech summer course for high school science teachers. After I did most of the teaching - this was not Orrin's field — he apologetically offered, "I owe you one." I reminded him of this often and I am still waiting for him to return the favor.

One week in late Spring some years ago, Orrin, myself, and two grad students canoed the Jacks Fork River in Missouri. Orrin and I shared the same canoe. The river was running rather full, not unusual for that time of year. Orrin - I blamed him - failed to do his part as we came around a fast-moving bend, hung up on a stomp, and almost tipped. We carried the camping gear, T.J. and Rich F. had the beer. He grabbed a low hanging branch as we glided by backwards. His expensive watch was snatched off his wrist and dropped into the water. We often wondered whether that watch continued to tick on the river bottom.

I, like a number of others, have Orrin to 'thank' for getting appointed to the Science Assessment Advisory Committee. This was back in 1993 and five years later I am still on the committee. Each time I drive to Springfield I think of the many trips we shared on our way to these frequent meetings. Orrin, we will always remember you.
George Kieffer, Associate Professor Emeritus

I was one of the fortunate ones who learned how to teach science the "hands-on way" (long before it was called that) from Orrin Gould and Charlie Weller at the University of Illinois. It was then that I began to make connections between what I was reading about theory and pedagogy to its implications in the classroom. What I learned from these two individuals have become a great part of philosophy of science education.

For over 20 years, Orrin has been my advisor, my mentor and my friend. I know that somewhere among the stacks of books, journals, papers, and notes written on napkins, which were stored in his office, was a best seller of "how to" books on science education. The conferences at ISTA will never be the same for me without Orrin's presence--his stories, his sense of humor, and the gin and tonics he prepared for his friends. I was fortunate to have known him. He will be missed by many.
Edee Wiziecki, Vice-President, ISTA

I've known Orrin in so many contexts; as teacher, graduate advisor, colleague...and even landlord. What intrigued me about him was his constant tinkering with things scientific. What inspired me was his deep commitment to science education. What encouraged me was his generosity with his time and ideas. I miss his wonderful stories, his wry sense of humor and his wealth of knowledge. I once referred to him as my "second dad." I will always remember him that way.
Tom Peters, former Associate Editor, *Spectrum*

Forwarded by Nicholas C. Burbules
Department of Educational Policy Studies
University of Illinois, Urbana-Champaign
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TIMSS 3.0 THIRD INTERNATIONAL MATH & SCIENCE STUDY 12TH GRADE

This spring, 12TH-GRADE RESULTS from the largest, most comprehensive international comparison of education ever undertaken were released by the National Center for Education Statistics (NCES). According to the results, from the Third International Mathematics & Science Study (TIMSS), U.S. 12th-graders' performance "was among the lowest of the participating countries in mathematics & science general knowledge, physics & advanced mathematics."

Secretary Riley responded, "These results are entirely unacceptable, and absolutely confirm our need to raise our standards of achievement, testing, and teaching, especially in our middle & high schools -- and to get more serious about taking math & science courses." The Secretary outlined 6 steps:

1. Build a firm foundation by having more students study algebra & geometry by 8th & 9th grade.
2. Raise state & local standards of academic performance in mathematics & science.
3. Measure student performance against rigorous standards, like the voluntary national test in 8th-grade mathematics.
4. Offer a challenging curriculum & encourage students to take demanding mathematics & science courses, such as calculus & physics by 12th grade.
5. Improve the teaching of mathematics & science through teacher training, and reduce the large number of teachers teaching out-of-field.
6. Destroy the myth that advanced mathematics & science are for only a few students.

Also, the Secretary & National Science Foundation Director Neal Lane announced a $60 million joint "action strategy" to improve middle school mathematics (executive summary at: http://www.ed.gov/inits/TIMSS/exec). Today's report, along with the Secretary's statement & other information, are available at: http://www.ed.gov/inits/TIMSS/ Previously released reports on 4th- and 8th-grade results from TIMSS -- plus actual test items (in PDF only), information for ordering the TIMSS toolkit and a "videotape classroom study" of 8th-grade teaching styles in 3 countries -- can be found at: http://nces.ed.gov/timss/ Below is the executive summary of today's report, "Pursuing Excellence: A Study of U.S. 12th-Grade Mathematics & Science Achievement in International Context."

Executive Summary of "Pursuing Excellence: A Studyof U.S. 12th-Grade Mathematics & Science Achievement in International Context" (February 24, 1998)

Introduction

The Third International Mathematics & Science Study (TIMSS) is the largest, most comprehensive, & most rigorous international comparison of education ever undertaken. During 1995, the study assessed the mathematics & science knowledge of a half-million students from 41 nations at 3 levels of schooling. The information in this report is about students who were assessed at the end of 12th grade in the United States & at the end of secondary education in other countries. It includes 4 areas of performance: mathematics general knowledge, science general knowledge, physics, & advanced mathematics. This report on students in the final year of secondary school is the last in a series of 3 public-audience reports titled "Pursuing Excellence." The first report presented findings on student achievement at 8th grade. The second report presented findings from the 4th grade. TIMSS is a fair & accurate comparison of mathematics & science achievement in the participating nations. The students who participated in TIMSS were scientifically selected to accurately represent students in their respective nations. The entire assessment process was scrutinized by international technical review committees to ensure its adherence to established standards. Those nations in which irregularities arose, including the United States, are clearly noted in this & other TIMSS reports.

Criticisms of previous international studies comparing students near the end of secondary school are not valid for TIMSS. Because the high enrollment rates for secondary education in the United States are typical of other TIMSS countries, our general population is not being compared to more select groups in other countries. Further, the strict quality controls ensured that the sample of students taking the general knowledge assessments was representative of all students at the end of secondary school, not just those in academically-oriented programs.

This report consists of 3 parts: initial findings from the assessments of mathematics & of science general knowledge; initial findings from assessments of physics & of advanced mathematics; & initial findings about school systems & students' lives.

Achievement of All Students

A sample of all students at the end of secondary school (12th grade in the United States) was assessed in mathematics & science general knowledge. Mathematics general knowledge & science general knowledge are defined as the knowledge of mathematics & of science needed to function effectively in society as adults. U.S. 12th graders performed below the international average & among the lowest of the 21 TIMSS countries on the assessment of mathematics general knowledge. U.S. students were outperformed by those in 14 countries, & outperformed those in 2 countries. Among the

21 TIMSS nations, our students' scores were not significantly different from those in 4 countries. U.S. 12th graders also performed below the international average & among the lowest of the 21 TIMSS countries on the assessment of science general knowledge. U.S. students were outperformed by students in 11 countries. U.S. students outperformed students in 2 countries. Our students' scores were not significantly different from those of 7 countries. The international standing of U.S. students was stronger at the 8th grade than at the 12th grade in both mathematics & science among the countries that participated in assessments at both grade levels. The U.S. international standing on the general knowledge component of TIMSS was higher in science than in mathematics. This pattern is similar to the findings at 4th & 8th grades in TIMSS. The U.S. was 1 of 3 countries that did not have a significant gender gap in mathematics general knowledge among students at the end of secondary schooling. While there was a gender gap in science general knowledge in the United States, as in every other TIMSS nation except 1, the U.S. gender gap was one of the smallest.

Achievement of Advanced Students

The advanced mathematics assessment was administered to students who had taken or were taking pre-calculus, calculus, or AP calculus in the United States & to advanced mathematics students in other countries. The physics assessment was administered to students in the United States who had taken or were taking physics or AP physics & to advanced science students in other countries. Performance of U.S. physics & advanced mathematics students was among the lowest of the 16 countries which administered the physics & advanced mathematics assessments. In advanced mathematics, 11 countries outperformed the United States & no countries performed more poorly. In physics, 14 countries outperformed the United States; again, no countries performed more poorly. In all 3 content areas of advanced mathematics & in all 5 content areas of physics, U.S. physics & advanced mathematics students' performance was among the lowest of the TIMSS nations. In both physics & advanced mathematics, males outperformed females in the United States & most of the other TIMSS countries. More countries outperformed the United States in physics than in advanced mathematics. This differs from the results for mathematics & science general knowledge, as well as the results at grades 4 & 8, where more countries outperformed the United States in mathematics than in science.

Contexts of Learning

It is too early in the process of data analysis to provide strong evidence to suggest factors that may be related to the patterns of performance at the end of secondary schooling described here. While secondary education in the United States differs structurally in important dimensions from that in many of the other countries, in this first analysis, few of those structural differences are clearly related to the relatively poor performance of our 12th graders on the TIMSS assessments. Although the lives of U.S. graduating students differ from those of their peers in other countries on several of the factors examined, few appear to be systematically related to our performance in 12th grade compared to the other countries participating in TIMSS. Further analyses are needed to provide more definitive insights on these subjects.

Conclusions

U.S. students' performance was among the lowest of the participating countries in mathematics & science general knowledge, physics, & advanced mathematics. TIMSS does not suggest any single factor or combination of factors that can explain why our performance at 12th grade is so low relative to other countries at the end of secondary education. From our initial analyses, it also appears that some factors commonly thought to influence individual student performance are not strongly related to average student performance at the end of secondary school across countries in TIMSS. TIMSS provides a rich source of information about student performance in mathematics & science, & about education in other countries. These initial findings suggest that to use the study most effectively, we need to pursue the data beyond this initial report, taking the opportunity & time to look at interrelationships among factors in greater depth.

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Science in the South 1998

Illinois Science Teachers Association and SIUC

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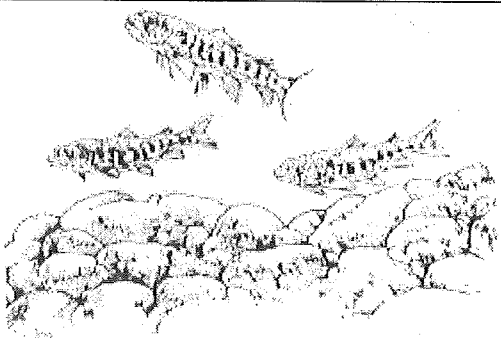

WETLANDS KEY TO $152 BILLION FISHERIES ECONOMY

Fishermen and Environmentalists Urge Federal Action to Protect Nation's Wetlands

Fishing now pumps $152 billion a year into the nation's economy and creates about two million jobs, according to Fisheries, Wetlands and Jobs.

This report, released today by members of the Clean Water Network, a national coalition of more than 1,000 organizations, documents the fact that 3/4 of the nation's fish production depends on estuaries, marshes, and other wetlands. Meanwhile, we continue to lose more than 117,000 acres of wetlands annually to development projects and other wetland-harming activities like oil exploration. The report, distributed last month by anglers, commercial fishermen and conservationists at press events across the country, is based upon scientific publications and government documents, and was prepared for the Clean Water Network by fisheries management consultant Bill Kier Associates of Sausalito, California. It shows that where wetlands have been destroyed, fisheries have declined and fishing-dependent jobs have disappeared.

Zeke Grader, director of the Pacific Coast Federation of Fishermen's Associations, said "fishermen in this country are fighting for their lives. We need to balance the race to develop our coasts and other waterways with the need to preserve wetlands, essential for our country's commercial and sport fishing industry." "The most recent threat to our ability to protect our wetlands has come from the U.S. Army Corps of Engineers," explained Steve Moyer, vice president for conservation programs of Trout Unlimited. "The Corps has proposed new nationwide general permits that would make it even easier to destroy wetlands and streams than existing nationwide permit 26, which the Corps is eliminating. At a time when the Administration is proposing a net gain in wetlands, it makes no sense to take this step backwards."

The continental United States has already lost more than half of its wetlands and currently loses more than 117,000 acres each year. Ninety-nine percent of the permit applications for wetlands destruction received each year by the US Army Corps of Engineers are granted, contributing to that loss. Last month President Clinton outlined the details of his Administration's Clean Water Action Plan, which includes the laudable goal of attaining a net increase of 100,000 wetland acres per year by the year 2005 through restoration of degraded wetlands. However, at the same time, the U.S. Army Corps of Engineers recently drafted proposed nationwide "quick" permits, which open the door for increased wetlands destruction. "We're calling on the Corps not to undermine the President's Clean Water Action Plan by pouring concrete in our remaining natural wetlands," said Richard Charter, business and government coordinator of the Clean Water Network. "We can't allow poorly-conceived regulations to destroy the critical environmental and economic values provided by wetlands."

"We need to change the process that allows destruction of natural wetlands and provides adequate opportunities for a public discussion about wetland losses and their economic impact on the community, especially on fisherman," said Drew Caputo, an attorney with the Natural Resources Defense Council. "We also need stricter enforcement of the wetlands protections policies we currently have." "Wetlands are crucial to the environment, and they also provide real economic benefits through activities like fishing, " said Kathy Nemsick, national coordinator of the Clean Water Network. "For the sake of our environment and our economy, we need to do a better job of protecting wetlands."

"Along the Atlantic coast, wetlands provide irreplaceable nursery grounds for eels, weakfish, croaker, bluefish, stripers and many other fish and shellfish from our waters around the country," explained John H. Dunnigan, executive director of the Atlantic States Marine Fisheries Commission. "Scientists have proven that there are no substitutes for wetlands as fish habitat, so we must preserve our natural wetlands. Waterways have no political boundaries, so the Administration and Congress must ensure that these valuable resources are protected by a stronger Clean Water Act."

The Clean Water Network is comprised of more than 1,000 local, state, regional and national groups in all 50 states working to strengthen federal clean water policies so that our nation's waters will be safe for fishing and swimming. Member groups include a variety of organizations representing environmentalists, commercial fishermen, recreational anglers, surfers, boaters, family farmers, faith communities, environmental justice advocates, labor unions, civic associations and recreational enthusiasts.

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LINCOLN PARK ZOO INSTALLS DYNAMIC NEW LEARNING CENTER IN GREAT APE HOUSE

Lincoln Park Zoo has revamped the Lester E. Fisher Great Ape House, one of the zoo's most popular attractions, into the zoo's first interactive learning center. New, more visitor-friendly signage, along with a computerized Great Ape Learning Center (GALC), now give visitors access to in-depth information about the zoo's collection of western lowland gorillas and chimpanzees.

"The new signage and interactive learning center were developed in response to our visitors, who helped us define the subjects they wanted to know more about," said Patsy Benveniste, director of education at Lincoln Park Zoo. "We had been missing the opportunity to tell some important stories about great ape physiology, behavior, social interaction and conservation, all things that now can be observed in the exhibit. The new installation answers common questions about great apes and introduces new, fascinating information for the visitors who want to know more."

The new installation includes new graphic signage throughout the building; three-dimensional sculptures of all four great ape species; new lighting and acoustic elements; a muraled, uni-directional barrier to improve traffic flow; and the new Great Ape Learning Center located in the main lobby. The lower viewing area, renamed the Ground Trail, offers a close-up of the animals and describes ape tool use, foot anatomy and chimpanzee display behavior. The upper viewing area, now the Treetops Trail, illustrates social behavior and social grouping. It also focuses on exhibit design. The project was fully funded by a grant from The John D. and Catherine T. MacArthur Foundation and directed by Ken Gold, Ph.D., a staff member of the zoo's education department.

The Great Ape Learning Center contains two interactive computers. One is a touch-screen video display featuring 10 video clips of apes in zoos and in the wild. The clips include historic footage of Lincoln Park Zoo's most famous ape, Bushman; a behind-the-scenes tour of the apes' habitat; and some of the first recorded footage of western lowland gorillas in the world.

The second computer is an interactive, multimedia station offering more than 40 minutes of programming. Topics range from ape intelligence, diet, anatomy, social structures, parenting and family groups. Narrated by performance artist Laurie Anderson, the program includes games, audio, video and virtual reality segments. Parts of the interactive video are slated to be incorporated into the zoo's website (www.lpzoo.com).

To maximize and broaden the value of the project, Lincoln Park Zoo also inaugurated a special training program for the docents who interpret the exhibit and support the keepers who interact with the public. "People like to learn in a variety of ways," Ken Gold observed, "and we always acknowledge this diversity in our approach."

"Lincoln Park Zoo is known the world over as a leader in the breeding of western lowland gorillas," said zoo director Kevin Bell. "The addition of a new interactive learning center and more powerful signage to the Great Ape House will enable us to more effectively convey the importance of conservation while educating the public in a more contemporary, innovative manner."

Lincoln Park Zoo currently is home to 14 gorillas and six chimpanzees. More than 40 gorillas have been born at the zoo since 1971 and 35 zoos around the world have benefitted from Lincoln Park Zoo's breeding success through relocation of individual apes or family troops as well as their offspring.

Lincoln Park Zoo is one the most visited zoos in the United States with an estimated three million visitors annually. It is a world leader in the conservation of endangered species and one of the top five zoos in the nation to fund conservation research in the wild. Lincoln Park Zoo is one of the last free zoos in the world.

NATIONAL ASSOCIATION OF BIOLOGY TEACHERS FUTURE MEETINGS

1998 Annual Convention and Exhibition
Reno, NV
November 4-7
John Ascuaga's Nugget Hotel

1999 Annual Convention and Exhibition
Fort Worth, TX
October 27-30
Tarrant County convention Center
Worthington and Radisson Hotels

2000 Annual Convention and Exhibition
Orlando, FL
October 25-28
Hyatt Orlando

St. Louis Science Center

5050 Oakland Avenue
St. Louis, MO 63110
1-800-456-slsc

CALENDAR OF EVENTS

• **"Super Speedway"**
(May 22-September 7, 1998)
Ride along with world champion Mario Andretti to learn the art and science of auto racing.
• **"Everest"**
(September 11, 1998-January 7, 1999)
Join a climbing expedition's struggle to conquer the world's highest peak.

SPECIAL EXHIBITIONS

Student group rate TBD
• **Spiders**
(November 14, 1998-February 7, 1999)

PLANETARIUM

Student group rate is $1.50.
• **"Backyard Astronomy"**
(through 1998)
Explore the cosmos from your backyard in this basic astronomy program. Learn how to locate major constellations and identify planets. See the motions of the Earth, moon and planets demonstrated by the Digistar projector. Other topics include seasons, Milky Way, Andromeda Galaxy and observing tips.
• **"No Space Like Home"**
(through 1998)
Explore the solar system while you shop for a new planet to replace the aging Earth. At each store, hear a sales pitch promoting the unique characteristics of a planet or moon. Learn where and how human life can survive in the solar system.

XPLANATION STATION

Free 15-minute demonstrations at the Xplanation Station in the Science Center Space Xploration Gallery. For information about times, call 314/289-4616.
• **"Red Planet"**
(through September 1998)
Low temperatures of -120°F? Highs of only 10°F? Just another day on the Red Planet. Get the Martian weather forecast and find out more about the conditions on the fourth planet from the sun. See the gases in Earth's and Mars' atmospheres and find out why a basketball game on the surface of Mars would be very different from one here on Earth.

NIGHT SKY UPDATE

• **What's that bright object I saw in the sky?**
This and many other questions may be answered by calling the Science Center's Night Sky Update. This free recording containing current information about the night sky and upcoming astronomical events is updated weekly and available 24 hours a day. Call 314/289-4453 or 800/456-SLSC.

ACTIVITY STATION

• **"Create a Crater"**
(sessions offered daily)
Create your own impact craters at this hands-on activity station in the Space Xploration Gallery. Try different heights and angles of impact to change the size and shape of your craters. See how meteorites have changed the landscapes of many planets and moons.

AMAZING SCIENCE DEMONSTRATIONS

On your next class visit, watch your students get intrigued by chemical color changes! See them mystified by invisible forces! Excite their curiosity with seeing water that boils as it is cooled! They learn while they **are having fun, and** they will see the relevance of science to their daily lives.
• **"Boiling Hot! Boiling Cold!"**
(through February 1999)
Imagine water at 212°F. And liquid nitrogen at -320°F. These boiling liquids set the stage for some very dramatic effects. During this show, you will witness the amazing power of temperature over all forms of matter.
• **"Now Hear This!"**
(through August 1998)
Screaming aluminum rods, singing crystal goblets and roaring sewer pipes set the stage for this science of sound demo. Join us as we enjoy and endure some unusual sounds while investigating the basic properties of sound waves.
Amazing Science Demonstrations are free 10-minute presentations scheduled daily at 10 minutes and half past the hour beginning at 10:10 a.m. (11:10 a.m. on Sundays). The last demo starts at 2:30 p.m. (4:30 p.m. on Fridays and weekends). Check with the Visitor Information Center in the lobby of the Main Building for daily schedule.
Call 314/289-4424 for reservations. For help with planning visits or for curriculum materials, call Education Programs Liaison at 314/533-8493.

SAM

COMPUTER SPECTRUM

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FAX: 540-953-0014
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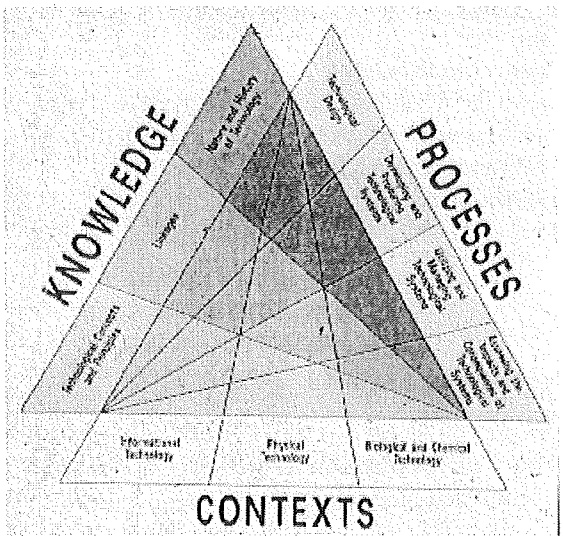
STANDARDS FOR TECHNOLOGY EDUCATION "IN PROCESS"

The review of the first draft of the Standards for Technology Education (Standards) is being declared a "success" by ITEA and project staff. "The amount of input we received is tremendous," said William Dugger, Jr., director of the project. The draft was reviewed by 222 individuals at hearings conducted across the US. In addition, the draft was posted on the projects' home page from November 5-30, 1997. During that time period the project recorded 2,277 hits to its homepage. The project staff is currently evaluating the second round of review and preparing the third draft of the Standards to be field tested in the fall 1998. The draft will then go through a final period of revision and refinement during the winter of 1998-1999 before being published. The Standards will be released at the ITEA Conference in Indianapolis on March 28-30, 1999. For more information and current updates visit our website at http://scholar.lib.vt.edu/TAA/TAA.html or contact ITEA at the above address.



The Universals and Dimensions of Technology

This the development of Technology for all Americans: A Rationale and Structure for the Study of Technology, three universals of technology were identified: knowledge, processes, and contexts. The technology content standards are being developed based on the foundation of these universals.

Dr. Bob Williams
Rivers Project
Http://www.siue.edu/OSME/river

NEW WEB PAGES

HYPOXIA WEB PAGE STARTING
The Agro-Oceanic Nutrient Flux Center, Iowa State University
http://www.public.iastate.edu/~turf2surf/

NATIONAL ENVIRONMENTAL SCORECARD
The League of Conservation Voters has compiled its 1997 evaluation of the environmental voting records of all congress persons. Check your elected officials to see how they are doing. You can call the LCV at 202.785.0730 or use the web at www.lcv.org/

THE ENVIRONMENTAL WORKING GROUP has a new set of data out on 104 midwestern towns' drinking water. You can purchase the book for $24.20 at 202.667.6982 or look free at the EWG's web site at www.ewg.org

NATIONAL SEDIMENT INVENTORY LIST 96 SEVERELY IMPACTED WATERWAYS
The list of impacted waterways is on the EPA's web page (http://www.epa.gov/OST/Events/sedlist.html) or call Nevette at Coast Alliance (202) 546-9554.

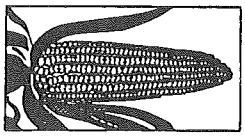
FLORIDA TORNADO CLIPS
Some great imagery detailing the history of the 3 major mesoscale storms that caused the deaths (38 at last count) and totally indescribable damage. Check it out at: http://sunmlb.nws.fit.edu/wbstorms/3meso.html

JANUARY AND FEBRUARY WARMEST AND WETTEST ON RECORD, NOAA REPORTS
Includes some good NOAA Web sites.
http://nic.fb4.noaa.gov. Click on El Nino.

CLIMATE STATISTICS
http://www.ncdc.noaa.gov. Click onto http://www.ncdc.noaa.gov/ol/climate/warmest.html for "What's Hot."

FEBRUARY PRECIPITATION RANKINGS
http://nic.fb4.noaa.gov/products/analysis_monitoring/regional_monitoring /1mpranks.gif

FEBRUARY TEMPERATURES RANKINGS
http://nic.fb4.noaa.gov/products/analysis_monitoring/regional_monitoring/1mtranks.gif



CORN GROWERS OFFER EDUCATIONAL MATERIALS ONLINE

The National Corn Growers Association Web site includes many educational activities for teachers and students. From a corn word search to an activity called "Finding Corn in Your Grocery Store," this Web site will be fun and educational for elementary school students and their teachers.

There is also information on corn for middle and high school students, including a glossary of corn terms and up-to-date news about corn. Although many of the materials are copyrighted, teachers are encouraged to print out the information and to use it in their classrooms.

Contact the Web site at http://www. ncga.com/ and click on "Korn for Kidz "

Reprinted in part from *Ag in the Classroom Notes* (Vol. 11, No. 6), Room 4307, South Bldg., USDA, Washington, DC 20250-0991; phone 202-720-7925..

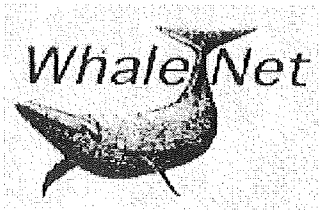
Official GED Website is Up and Running

For accurate, up-to-date information from the GED Testing Service of the American Council on Education (ACE) about:

- Test Specifications
- Minimum Score Standards
- Program History
- Interpretation of Test Scores
- Answers to the Most Frequently-Asked Questions

http://www.acenet.edu (ACE homepage)

http://www.acenet.edu/Programs/CALEC/GED/home.html (GED homepage)



Wheelock College
200 The Riverway
Boston, MA 12215-4176

Through the initiative Netscape Education Everywhere, schools submitting a licensing agreement to Netscape Communications will receive Internet-access software that students and teachers can use at home and school. For more information, call 650-937-2555.

High school and college chemistry teachers will want to check out the Chemistry Teaching Resources, a hot-list of teaching resources. http://www.anachem.umu.se/eks/pointers.htm

"WHALES ON THE WEB"

What is WhaleNet?

WhaleNet is an interactive information source offering extensive up-to-date resources, engaging hands-on activities, and exciting educational opportunities. It is students, researchers and educators sharing, through internet communication, personal field experiences, data and information.

WhaleNet is useful to everyone studying whales or the marine environment, going on a whale watch trip, using telecommunications to facilitate their learning or seeking communication with others who have similar Interests. It plugs everyone into the latest in marine science and whale research and allows interaction between students, teachers and scientists around the world.

WhaleNet's primary goals are to facilitate and coordinate learning; enhance interest in science; develop problem-solving; and other critical thinking skills; and increase environmental understanding using telecommunications. Educators use WhaleNet to enhance learning in science, geography, math, reading, writing and other subject areas.

How to Connect to WhaleNet

You can access the WhaleNet home page on the World Wide Web, using a graphic browser such as Netscape, MS Explorer or Mosaic, or text-based Lynx, at the following addrress:
http://whale.wheelock.edu/

Forwarded by Inga Karliner
karliner@uiuc.edu

The California Science Projects' page

http://education.ucdavis.edu/cspsw/index.html lists top 10 science resources. In it, for example, I found 2 sites that guide people through web page-making resources — links Filamentality, and Beyond the Son of Filamentality
http://www.kn.pacbell.com/wired/beyond/index.html

At The Solar System News Corner Stand, you'll find a one-stop shop for solar system news combined from different sources on one web page. Links include current knowledge and latest news, Space Today, Women in Space, Space Art, a reference section, Solar System 101, and more than 300 links to resources.
http://pages.prodigy.com/solarsystem

Check out Hello Dolly: A WebQuest on Cloning, developed by high school science teacher Keith Nuthall. This project for grades 7-12, says Nuthall, "requires students to ask good questions, access current information, analyze the validity of resources, apply new knowledge to evaluate a current controversy, and reach consensus with peers." http://204.102.137.135/ PUSDRBHS/science/clone/dolly.htm

You'll find hands-on science activities for young learners and lesson plans with links to units on **pendulums, acid rain, the brain, dinosaurs, and more** at this site. http://www.eiu.edu/~scienced/329asgnm.html

AccuWeather and The Associated Press have announced the formation of the AccuNet™/AP_**Photo Archive.** For a fixed annual subscription rate, teachers and librarians can view and print more than 400,000 AP photos of current major news stories or tap into the archive of people, places, and events that made history. http://ap.accuweather.com

The **Stanford Solar Center** site has educational information, resources, and educational activities about the Sun. Students can learn about the Sun's magnetic field, sunspots, and what happens inside the Sun. http://solar-center.stanford.edu

The Biology Place can "enable teachers to invest your time on the Internet wisely." Developed and maintained by Peregrine Publishers, the fee-based site includes online activities and resources, student tutorials and self quizzes, research news, a teachers forum, lesson plans, and more. Also available is The Chemistry Place. http://www.biology.com/visitors/about.html

Peregrine Publishers Launches *The Chemistry Place* Educational Web Site New, subscription-based site for high school and college teachers and students to help them effectively use the Web in introductory chemistry courses. Located at: www.chemplace.com

NCREL's Pathways to School Improvement web site specifically designed for the states in the Midwest

http://www.ncrel.org/sdrd/timely/timely.htm

North Central Regional Educational Laboratory
1900 Spring Road, Ste. 300
Oak Brook. IL 60521
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Science on the WEB!

Beakman's World Main Page for great do-at-home activities.
www.spe.sony.com/Pictures/tv/beakman/beakman.html

The MAD Scientist Network will answer science questions. medinfo.wust.edu/~ysp/MSN/

The Young Scientist Program from WashingtonUniversity in St. Louis. medinfo.wustl.edu/~ysp/

Ask Dr. Science.
Www.drscience.com/

The Physics Humor Page.
cyberspc.mb.ca/~dcc/phys/humor.html

You'll find more than 470 examples of how educators are using the web at this site. Teachers are also invited to submit an entry; all entries are reviewed and verified, and links are checked bi-weekly.
http://www.mcli.dist.maricopa.edu/tl

On The School Page, teachers will find expanded resources by subject area, speaker listings, portfolio tips, lesson plans, hot spots, commentaries and activities, book reviews, new computer programs, and more.
http://www.eyesoftime.com/teacher.index.htm

Snapshots of Medicine and Health, the science education component of the National Institutes of Health, offers a website for students that includes People Doing Science, researchers, artists, ethicists, administrators, doctors, and others involved in biomedical sciences; Research in the News, discoveries and developments in biomedicine; Hands On, a section describing how new technologies work through interactive learning; and links to other biomedical, science, and education sites.
http://ohrm.od.nih.gov/ose/snapshots

Interested in classroom projects involving building crystal radios to teach about energy, electricity, chemistry, earth science, communications, and more? Visit the two websites listed below for more information.
The Xtal Set Society: http://www.midnightscience.com
Antique Electronic Supply: http://www.tubesandmore.com

From the folks who brought you everything you wanted to know about roaches now comes Your Gross and Cool Body, the newest part of The Yuckiest Site on the Internet website. Wendell the Worm and Dora help to teach children why they burp, snort, and more. Clickable questions, funny sounds, and an interactive question-and-answer section can engage children even more. The site includes teaching pages about the digestive system, the circulatory system, and other aspects of human biology.
http://www.nj.com/yucky

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http://www.freeinfo.org/tch/
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Interest your students in the scientific concepts behind many of the special effects found in a number of popular movies at the website ScienceWeb Goes to the Movies. Movies include *The Abyss, Stargate,* and *Speed.* Students are also invited to submit science-related questions about any movie.
http://www.scienceweb.org/movies/nowshowing.html

Scholastic Inc. has announced it will give students and teachers free Internet access for three months through its new Internet Discovery Program. Schools may enter the program at any time during Jan.-June. 1998. The Scholastic Network offers more than 400 interactive projects and activities and interviews with authors, scientists, historians, and celebrities. For more information, call 1-800-296-1876.

NITI's List of Native American Links:

http://numa.niti.org/indian.htm
Authored by NITI staff, this site provides links to many others by Native Americans.

http://www.uwm.edul~mwilson
By Michael Wilson, member of the Choctaw Nation of Oklahoma who teaches Indian Literature at the University of Wisconsin, Milwaukee.

http://www.pitt.edul~lmitten/indians.html
Authored by Lisa Mitten, a mixed-blood Mohawk and a librarian at the University of Pittsburgh. This page lists Native American sites.

http://numa.niti.orglusers/dparr/lesson.htm
Authored by NITI graduate Diana Parrish, this site contains a lesson called Native American Uses for Plants.

http://numa.niti.orglusers/kroes/rainweb.htm
Authored by NITI graduate Karina Roessel, this site offers a lesson on the importance of rain in Navajo culture.

http://numa.niti.orglusers/cfran/actl.htm
Authored by NITI graduate Char Franklin, this site provides a chart that students can use to count money in Navajo.

http://bioc02.uthscsa.edu/aisesnet.html
Web site for the American Indian Science and Engineering Society (AISES).

Visit the NITI Web site at http://www.niti.org or send e-mail to Buller at karen@numa.niti.org or Hunkapiller at bill@numa.niti.org to find out more about upcoming NITI-GRITI training.

POPULAR SCIENCE EDUCATION SITES TO REVISIT

CHEMystery: An Interactive Guide to Chemistry has a new chemistry meeting forum where teachers and students can discuss chemistry and ask questions (including those connected with homework help).
http://library.advanced.org/3659

Your students will find interactive demonstrations and science links for all ages at the Beakman and Jax website, which is based on the popular television show.
http://www.beakman.com

The Eisenhower National Clearinghouse searches the Internet for the best resources for math and science. Check out ENC Digital Dozen monthly for their latest selections.
http://www.enc.org/classroom/dd/frames/htm

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AccuWeather Launches New On-Line Service Offered for Modest Annual Subscription

In a move that will open up one of the nation's richest photographic news libraries to educational use throughout the country, AccuWeather and The Associated Press announce the launch of a new on-line service, the AccuNet™/AP_Photo Archive. For the first time, schools K-12, colleges and public libraries can view and print out more than 400,000 AP photos of major news stories only minutes old, as well as thousands of pictures of people, places and events that made history.

Teachers and librarians can Internet the Photo Archive into their classrooms and libraries for a fixed annual subscription rate, regardless of how often they use the service or how many photos they view.

"This is an extraordinary development in education and is a great learning application for computers and the Intemet in the classroom," said Dr. Joel N. Myers, president and founder of AccuWeather and a long-time educator at The Pennsylvania State University.

"We realized how valuable this database would be for education and formed an association with the AP to make the Photo Archive available to schools and libraries," Dr. Myers said. "This archive is a wealth of information for research, reports, projects, and presentations. It's a goldmine."

Additional information and sample pages from the AccuNet/AP Photo Archive can be accessed on-line at **ap.accuweather.com.**

The World's Largest Database of Current and Historical Photos

The Photo Archive's ease-of-use and breadth of current and historical pictures from around the world makes it suitable for all grade levels, from elementary school to college. Students simply key in natural language queries on a Who, What, Where, When basis. A "sounds-like" feature is also available.

With more than 800 news pictures added daily, the AccuNet/AP Photo Archive allows students, teachers and library users to view major current events within moments of their occurrence. Historical photos date back from the turn of the century. All photos are displayed with a detailed descriptive caption and can be easily reproduced on a black-and-white or color laser printer.

"Up until now, these pictures have only been available at a much higher cost, and only to commercial organizations and the media," said Eva Parziale, Photo Archive Director at The Associated Press. "Now students and educators have instant access to up-to-the-minute and historical photos for research projects or just for fun."

Subscribers will receive a source book of instructions and suggested lesson plans. These materials were designed by AccuWeather, drawing on more than ten years of experience in educational and on-line publishing.

During an extensive pilot study conducted last spring, teachers and librarians were asked if they would recommend subscribing to the AccuNet/AP Photo Archive. Their unanimous answer was "YES!"

"This archive allows students to see historical events in international politics, science, sports and culture as they were recorded when they occurred and at a level of detail not likely to be found in school books," said Dr. Myers. "As for current events, students will have access to photos of breaking news almost as quickly as the news media, offering them a view of the world they simply could not find anywhere else."

AccuWeather, Inc., will develop, market and support the AccuNet/AP Photo Archive for schools and libraries nationwide. The company, best known as the world's largest commercial weather service, has more than 15,000 clients worldwide. AccuWeather also supplies schools with its award-winning On-Line With AccuWeather_ service it began nine years ago.

Founded in 1848, The Associated Press is the oldest and largest news organization in the world, serving as a source of news, photos, graphics, audio and video for more than one billion people daily. It has received 24 Pulitzer Prizes for photography, more than any other news organization.

ADDITIONAL WEBSITES OF INTEREST TO SCIENCE EDUCATORS

Plagiarism and Term Paper Mills
http://www.seattletimes.com/extra/browse/html97/inter_060897.html

http://www.cmtcanada.com/CyberSites/aug01_school.html

http://wsf2.usatoday.com/life/cyber/tech/ct123.htm

http://www.msnbc.com/NEWS/91747.asp

http://www.uiowa.edu/~centeach/newsletter/online-exclusives/term-paper-download.html

http://www.virginia.edu/~trc/grading.htm

http://www.uow.edu.au/arts/sts/bmartin/pubs/94jie.html

http://lonestar.texas.net/~mseifert/cheat.html

http://www.zdnet.com/yil/content/mag/9701/wice9701.htm

Pseudoscience
http://physics.syr.edu/courses/modules/PSEUDO/pseudo_main.html

Dinosaurs
http://squire.cmi.k12.il.us/hcs/dinosaur/index.html

http://www.nationalgeographic.com/features/06/dinoeggs

http://ericir.syr.edu/Projects/Newton/12/Lessons/dinoextn.html

http://www.dinosaur.org

http://www.clpgh.org/cmnh/discovery/main.html

http://www.powerup.com.au/~ves/flint.htm

http://www.ucmp.berkeley.edu/index.html

http://www.ZoomDinosaurs.com/subjects/dinosaurs

Lesson Plans
http://octopus.gma.org/surfing/space.html

http://www.nm.umt.edu/

http://www.pacificnet.net/~mandel/

http://www.ceismc.gatech.edu/BusyT/

http://www.education-world.com

http://ericir.syr.edu/Virtual/Lessons/AskERIC LessonPlans

http://faldo.atmos.uiuc.edu/TUA_Home.html

http://edcen.ehhs.cmich.edu/~tvantine

http://mcrel.org/connect/lesson.html

http://www.rabbitservices.com

Science Fair Projects
http://come1.gte.net/teachrpt

http://www.col.k12.me.us/bjh/203a/science.html

http://www.infotoday.com/MMSchools/NovMMS/cyberbee11.html

http://www.halcyon.com/sciclub/kidproj1.html

http://www.eduzone.com/tips/science.htm

http://www.isd77.k12.mn.us/resources/cf/steps.html

http://www.scri.fsu.edu/~dennis1/special/sf_hints.html

http://ericir.syr.edu/Projects/Newton

http://128.252.2223.239/~ysp/MSN/libs/libs.html

Homework/Reference Sites
http://www.acekids.com/homework.html

http://www.askanexpert.com/askanexpert

http://www.tristate.pgh.net/~pinch13

http://www.sisweb.com/math/tables.htm

http://www.discovery.com

http://www.startribune.com/stonline/html/special/homework

http://www.cybout.com/html.kids_hwk.html

http://wwwscout.cs.wisc.edu/scout/KIDS

http://www.npac.syr.edu/textbook/kidsweb

http://www.refdesk.com/facts.html

http://seds.lpl.arizona.edu/nineplanets/nineplanets/nineplanets.html

http://www.adventure.com/kids

http://www.itols.com/research-it/research-it.html

http://www.researchpaper.com

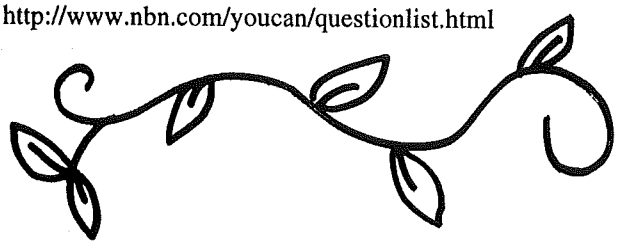
http://www.magicnet.net/~jdk/seasky.html

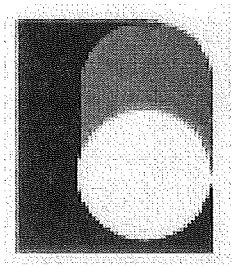
http://kidscience.miningco.com

http://www.studyweb.com

http://www.district125.k12.il.us/Renaissance

http://www.nbn.com/youcan/questionlist.html

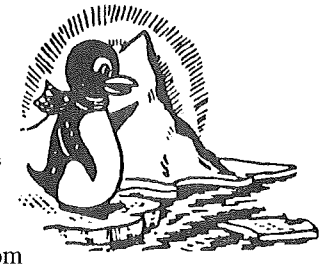




PRINCIPLED PRACTICE IN MATHEMATICS AND SCIENCE EDUCATION

The National Center for Improving Student Learning and Achievement in Mathematics and Science

http://www.wecer.wisc.edu/ncisla



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COOL SCIENCE WEB SITE

Educational Adventure at the South Pole: Hands-on Activities and an Interactive Site

http://www.southpole.com

The Center for Astrophysical Research in Antarctica presents the adventures of author Janice VanCleave and Teaching Specialist and ISTA member Randy Landsberg. Site includes an infrared satellite image.

ARTICLES

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AN OVERVIEW OF BLOCK SCHEDULING

School restructuring is a topic that is being addressed by interested parties from the federal government level to the local school board level. In an attempt to provide students with the best learning environment possible, we are experiencing major changes in the look and feel of our schools. Of all the changes, perhaps the implementation of "block scheduling" causes the most visible and operationally different modification to the public schools. As the school district in which I taught for thirty years wrestled with the question of moving to some form of block scheduling, I posed several questions for consideration which ultimately led to this article.

It seems reasonable that any decision to undertake a major overhaul of the school program should be based on sound educational research. Since restructuring is done in order to improve student performance, the research needs to address this basic point. The following questions were formulated to guide the literature review. What research exists:

- to support block scheduling?
- to support compacted/intensive scheduling?
- to support advantages of" intensive" study over "spaced practice" study?

What research exists that:

- Addresses long-term student performance (Secondary Post Secondary)
- Addresses instructional strategies vs. scheduling factors when performance improvements are reported?
- Addresses the effectiveness of block/intensive scheduling in specific curricular areas?

A search of the ERIC Database using the descriptors "block scheduling" and "intensive scheduling" identified sixty-one articles that were published since 1990. Of these, twenty-six were listed as educational documents and thirty-five were listed as educational journal documents. In order to get an quick, overall view of what the literature was reporting, the ERIC abstracts were collected and analyzed for article content. Of the articles included in the review, block scheduling was defined in several ways. The most common definitions were 4-90 minute classes, every day for a semester; 2180 minute classes, every day for 9 weeks; and 8-90 minute classes, every other day for an entire year. In addition to these common definitions, various combinations of block and "traditional" schedules were described.

Of the sixty-one article abstracts found, most reported only anecdotal survey results. The results of these surveys indicated that teachers tend to:

- Like 90 minute class time-frames,
- use more hands-on learning, and
- use a variety of teaching styles.

Some teachers, however, are beginning to express concern about the lack of time to master content and skills in the compacted schedules. Similar studies indicate that students:

- like fewer classes per day,
- feel they do better in school, and
- prefer longer classes.

Eight of the abstracts studied, indicated that the article reported research results. Of these eight, three reported that block scheduling had little to do with achievement. These results were reported for secondary English, seventh grade math and final course grades and various achievement test scores. It should be noted, however, that improvement was reported on several specific standard tests. The search also reported one study done at the elementary level that indicated that teacher stress levels and work load were increased.

When looking at grouping and scheduling effects, it was found that, at the higher education level, student grouping was more important in student performance than scheduling format. In addition, two studies looking at ESL, remedial English, and remedial math at the college level found block scheduling was effective in enhancing student performance.

The purpose of this article is not to present a complete overview of the literature on block scheduling. It is intended to raise questions that need to be answered. Everyone accepts that today's educational system is not perfect and can be improved. What we as educators need to do is make sure we are improving not adding to the problems of education. We need to base our actions on sound research, not practices we like because it makes our life easier, things our students like because it makes their life easier, or things "educational experts" propose without sound studies to back up their claims of success. The findings cited here only sample the total literature on the subject. Since earlier this year when the original literature search was completed, more has been written on the subject and needs to be analyzed. As reported earlier, this overview only used abstracts of articles published since 1990. A complete review cannot be based on abstracts and must include pre-1990 literature as well as literature from other educational databases.

NOTE: An annotated bibliography of the ERIC document abstracts used in developing this article can be obtained by contacting Don Kline at kline@lvc.edu
A more complete analysis of the current literature on block scheduling is currently in process.

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WHY SHOULD LANGUAGE ARTS TEACHERS HAVE ALL THE FUN?

I tell my preservice teachers that they shouldn't call it whole-language, but whole-science. The reason for this is that science, taught in a hands-on, discovery approach is one of the most highly motivating subjects in the curriculum. Use this motivation as the hook to instruct the language arts. Combining science and the language arts creates a more interesting and meaningful learning environment in the classroom. Subject integration uses class time more efficiently, encourages dialogue, and improves outcomes.

Children learn more effectively when instruction is integrated into several subjects of the curriculum; at the same time this technique helps solve the teacher's problem with subject avoidance. There is always one subject that is slighted more often than others--the one, perhaps, that teachers feel the least comfortable to teach is science. This is unfortunate since it is estimated that 90 percent of all problems today are based in science and technology (Yager, McLure, and Weld, 1993).

Science provides a real-world context for tasks in basic skill areas. More reading and writing occurs as students seek out and report information about today's problems. Science taught within a framework of social dynamics piques curiosity and interests and makes learning very lifelike.

Hands-on activities are perfect for integrating science and language arts. Just after a hands-on activity, children usually bubble over with enthusiasm. They want to tell others about what they have seen and found out; and they should, with writing. With pencil and paper, students can share their experiences with others, learn more about themselves, and hone their writing skills.

Science includes certain cross-curricular attributes: the curiosity to explore, the ability to create explanations, and the capacity to test a hypothesis and determine its validity. Science content supplies natural situations to apply reading, writing and research skills. The skills themselves lack these situations.

Science programs based on manipulative materials give rise to firsthand experiences which expand pupil's vocabularies and reading comprehension. Regardless of social, economic, academic, or ability differences, students share the same learning experiences during a science activity. They have a common knowledge base upon which to build and develop language arts skills.

Developmentally, primary grade children learn best when concrete experiences are part of an activity. Relate the information and concepts presented with books that illustrate the points they have learned. There is little textbook support in science, but look to the library and trade books. Find books to complement the activities in your science program.

Incorporating trade books into the science curriculum helps children develop the basic skills to read more difficult books. By the fourth grade, as much as one-half of student reading may be from expository books.

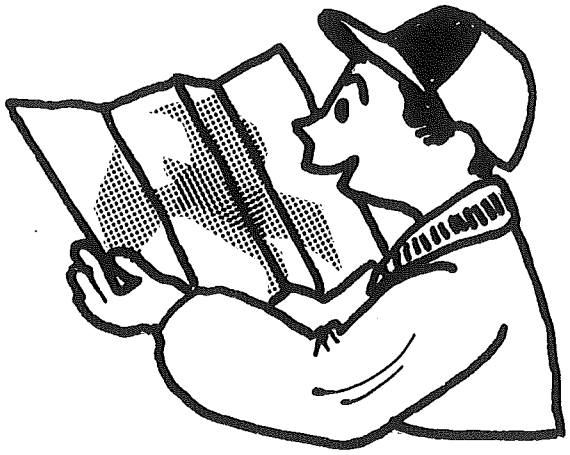
When selecting books keep a few factors in mind, such as interest level, readability, and ease in designing a related hands-on science activity (Carlile, 1992). Make sure the books are visually appealing so students will look forward to reading them. (science books seldom are) Have books of varied reading levels to keep both slow and advanced readers interested. Choose books so that students can immediately transfer their knowledge gleaned from the science activity.

Most primary grade science trade books are organized into five basic patterns: descriptive, sequence, cause and effect, comparison and contrast, and problem and solution (Piccolo, 1987). Teachers can use these patterns to reinforce specific content and to familiarize students with different ways of organizing information.

With science and proper techniques, teachers can help children read, appreciate, and learn from literature. Olson and Gee, 1991, suggest five practices in utilizing trade books:

1. develop concept and vocabulary.
2. use concrete manipulatives to reinforce learning.
3. encourage retelling.
4. develop class summaries.
5. develop mental imagery.

Encourage children to think aloud and discuss mental images as they read science trade books. Researchers have suggested that making vivid mental images as students read enhances comprehension (Gambrell, Kapinus, and Wilson, 1987). The payoff in using trade books is that not only does it develop language arts skills but also stimulates further interest in science.



From the fifth grade onward, more writing occurs in science than in any other subject area, because recording observations, and reporting on laboratory experiences are part of the basic methodology (National Council of Teachers of English, 1982). The discrete science inquiry skills (observation, classification, communication, measurement, inference, prediction) enhance writing because children write best about what they know. A child who observes an animal, such as a worm or crayfish, will produce a written report that will far surpass the effort written form reference materials.

Integrating science and language arts is easy as long as the teacher keeps in mind the four purposes for writing (description, explanation, narration, and persuasion) and recognizes the relationship between writing and science skills (Scarnati and Weller, 1992). Writing can be a meaningful classroom activity if it focuses on these purposes and there is no better subject to utilize these purposes than in science.

The four purposes of writing are not mutually exclusive; combined, they create a more colorful and interesting composition. Teachers should emphasize the primary purpose when assigning a writing task. Once students understand the purpose, they can use science inquiry skills to develop their writing assignments.

Incorporate journal writing as a permanent part to the science program. Many students, even those too young to know the terms for what they are observing, become highly motivated to write and share after they have finished a science activity.

Guide younger students in making their journal entries by asking them "what" questions:

What did you do?
What did you observe?
What happened?
What was the most interesting thing that happened in science class today?

Older students can be guided with "what if" questions and incomplete phrases to stimulate further thinking:

What I do not understand is
This relates to
I wonder if
What puzzles me is
In lab, I tried to figure out

One strategy that works particularly well for primary students relates to students' prior knowledge to their new vocabulary. In 'what I know, what I want to learn, and what I learned' (K-W-L), the teacher asks the students what they know about a science topic and to develop questions they would want answered. After they have completed the activity, the students can record their findings in journals.

Journal writing can be utilized by first graders or younger children. They can dictate to a classroom helper. As they progress students can use inventive spelling and drawings. The teacher can collate these written observations and drawings into class big books that allow children to work together cooperatively and help them learn from each other.

Sharing journals is an integral part of the science lesson. During sharing time the teacher should probe students with questions that extend their thinking and open new avenues of thought for the entire class. Journals and sharing time are also a big help in evaluating student progress.

The main problem with teaching science across the curriculum has been the way we have defined science. Science has not been seen as a subject rich in skills that could be applied in other areas, but solely as a set of concepts unifying a particular discipline such as physics. Thinking about science in this concept bound way produces shockingly poor results, even in our best students. They can not relate their scientific knowledge to real life situations or utilize their scientific skills in other subjects.

Allow students to think, describe, and apply what they have learned. Bridge the gap with language arts. Make both curricular areas come alive by bringing the thrill of reading, writing to science. Why should language arts teachers have all the fun?

RESOURCES

Carlilie, C. (1992). Bag it for science! *Science and Children,* 29(6), 15-16.

Gambrell, L., Kapinus, B.A., and Wilson, R.M. (1987). Using mental imagery and summarization to achieve independence in comprehension. *Journal of Reading*, 30, 638-642.

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Olson, M.W., and Gee, T.C. (1991). Content reading instruction in the primary grades: Perceptions and strategies. *The Reading Teacher,* 45(4), 298-307.

Piccolo, J. (1987). Expository text structure: Teaching and learning strategies. *The Reading Teacher*, 40(9), 838 - 847.

Scarnati, J.T., and Weller, C.J, (1992). The write stuff. *Science and Children*, 29(4), 28-29.

Yager, R., McClure, J., and Weld, J. (1993). Applying science across the curriculum. *Educational Leadership*, 50(8), 79-80.

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Reprinted from the *PSTA Exchange*

PROJECT 2061: A CURRICULUM WRITING TOOL

Change is now the norm in education in general and in science education in particular. One of the key break throughs to reform was the initiative by the American Association for the Advancement of Science. In 1985, the AAAS launched its effort to reform science, math, and technology the same year that Halley's Comet last visited. The project originators felt that by the Comet's return in 2061, the systemic reform toward scientific literacy for *all* would be accomplished. I was attracted to this long term approach rather than the variety of quick-fix three year programs that we have all experienced. *Science for All Americans* (1989) followed in 1993 with *Benchmarks for Science Literacy* specified learning goals for grades 2, 5, 8, and 12. The Project 2061 Benchmarks was the major reference for the science content standards found in the National Science Education Standards. While I read the National Standards with interest, I found the Project 2061 Benchmarks to be more "curriculum-reform-writing- friendly". In addition, I need to stress the multidisciplinary nature of this reform movement. Interconnections of natural and social sciences, mathematics, and technology form the basis for the knowledge and skills necessary to become scientifically literate. The Project 2061 Benchmarks are not curriculum. The implementation is up to the "science committee", whoever they may be in your district.

My first exposure to the AAAS initiative came through Dr. William Irwin, retired Armstrong chemist and Science Advisor to the Lancaster-Lebanon I.U. 13. Through his leadership we used Project 2061 in writing process and content indicators for the state outcomes. After our Strategic Plan work was completed, I turned my attention toward infusing the energy of the reform into specific curriculum work. The process I have outlined below has been used to revamp the science curriculum K-12 at Conestoga Valley and at three other school districts where I have served as a consultant.

Phase One - Preparation

The first phase of the process is to familiarize the science committee with *Science for All Americans* and *Benchmarks for Science Literacy*. I issued a copy of both documents to everyone involved in the curriculum review. The following four steps provided the needed background to begin the action plan:

1. Read SFAA
2. Small group review of SFAA
3. Read the Benchmarks
4. Lengthy group review of Benchmarks chapter by chapter, using several of the following formats:
   a. by grade level (or subject matter)
   b. by level primary-intermediate-middle school, and high school
   c. K-12 review in groups of 10- 12 persons (very important to the process)

Phase Two - Action Plan

Phase two moves the committee toward an action plan. Armed with the background of the process, the committee may begin selecting a text and writing curriculum:

5. Insist that any materials under review be correlated to the Benchmarks by the textbook company
6. Write curriculum based upon the Benchmarks by citing where in the course a specific benchmark is met along an assessment for the benchmark
7. Incorporate the Benchmarks into the State Standards

Phase Three - Assessment

After rewriting the curriculum, it is essential to assess how many of the Benchmarks are found in your science courses and where they are found. Not all Benchmarks will be met in science classes. Historical perspectives may be met in social studies classes. Many of the mathematical connections will be met in mat classes. The science committee may also decide that a particular Benchmark is not appropriate for an age level such as middle school. One side benefit of the process is, you may discover "holes" in your curriculum. Much to our surprise, we found, at Conestoga Valley, that we were not doing a thorough job with magnetism and electricity. After the assessment, an immediate change was instituted. The committee reviewed each of the Benchmarks and tried to place them in a specific course using the list below:

8. Determine exactly where each of the Benchmarks will be met.
   a. specific science course (example - 9th grade earth science)
   b. technology courses
   c. social studies courses
   d. health courses
   e. incidental teaching
   f. is not found in current courses - it needs to be included
   g. In our professional opinion, this benchmark is not appropriate for the grade level or should not be included for other reasons

In keeping with the long term nature of Project 2061, one group of people are an essential element in the reform; the preservice teachers. As a parttime instructor in the Educational Foundations Department at Millersville University, I have the pleasure of teaching the "Teaching of Secondary Science" a required course for prospective science teachers. We have two required textbooks in the course: *Science for All Americans and Benchmarks for Science Literacy*. It is my purpose to acquaint as many emerging science teachers as possible with the tenets of Project 2061: science literacy for *all*.

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NSTA REPORTS!
February/March 1998

WHAT DO EDUCATION PROFESSORS THINK? SURVEY FOCUSES ON TEACHERS OF TEACHERS

One-Year Progress Report Issued on Teaching and America's Future

Nearly 8 in 10 teacher educators surveyed last summer for a new report by Public Agenda believe the public's approach toward learning is "outmoded and mistaken." These professors of education consider it "absolutely essential" that they convey to prospective teachers the importance of lifelong learning (84%), that students should be active learners (82%), and that teachers must have high expectations of all students (72%).

Only 37% of the teacher educators believe maintaining discipline and order in the classroom is "absolutely essential." Nineteen percent said stressing grammar, as well as correct spelling and punctuation, is "absolutely essential," and 12% of the teacher educators said expecting students to be on time and polite are "absolutely essential" qualities to impart to prospective teachers. These views, say Public Agenda officials, are in sharp contrast to the concerns expressed by typical Americans in other studies.

"Professors of education have a particular vision of what teaching should be—one that has some appealing features," said Deborah Wadsworth, executive director of Public Agenda. "But the disconnection between what the professors want and what most parents, teachers, business leaders, and students say they need is often staggering. Their prescriptions for the public schools may appear to many Americans to be a type of rarefied blindness given the public's concerns about school safety and discipline, and whether high school graduates have even basic skills."

Six in 10 respondents believe that when a public school teacher has a disruptive class, it means the teacher has failed to make lessons engaging enough. Nearly 9 in 10 said that when K-12 teachers assign math or history questions, it is more important for kids to struggle with the process of finding the right answers than to know the right answers. Two-thirds believe too little is expected of students in today's public schools, and the vast majority (68% versus 29%) opted for additional financial resources when asked to choose between standards and discipline or more money for smaller classes and equipment.

When asked about their own students, 72% say they often or sometimes come across a student whom they feel lacks what it takes to be a teacher. Many (75%) say their prospective teachers have trouble writing essays that are free of mistakes in grammar and spelling. Eighty-six percent believe education programs need to do a better job of weeding out unsuitable prospective teachers, and 67% support requiring teachers to pass proficiency tests.

Seventeen percent of those surveyed report they have never been a K-12 classroom teacher; of the remaining 83%, 51% have not been a K-12 teacher in 16 or more years.

More than 900 randomly selected professors of education were interviewed this past summer for the report, titled *Different Drummers: How Teachers of Teachers View Public Education*. Public Agenda also interviewed 10 experts in the field of teacher education prior to the survey and conducted four focus groups with professors of education. For more information on this and other Public Agenda reports, call 212-686-6610 or visit its website at http://www.publicagenda.org.

WHAT MATTERS MOST, ONE YEAR LATER

Also on the teacher education front, the National Commission on Teaching and America's Future has issued a one-year progress report to follow the scathing study it issued last fall, which called for a dramatic overhaul of the way the nation prepares, recruits, and rewards its teachers.

In *What Matters Most: Teaching for America's Future*, the blue ribbon-panel commission found the teaching profession had "suffered from years of neglect," and, most importantly, what teachers know and can do makes the crucial difference.

The report called for sweeping changes that "put teaching and teachers at the heart of school improvement": more attention to standards for both students and teachers, redesigned teacher preparation programs, an overhaul of teacher recruitment, encouraging and rewarding teachers' knowledge and skills, and restructuring schools to become learning organizations for both teachers and students.

Since then, the commission's follow-up report indicates it is pleased but not satisfied with efforts to meet its recommendations. Twenty-four states have passed legislation that addresses teaching, and several legislative proposals to improve teacher education and provide additional support to teachers are now before Congress.

The commission also found that 72% of teachers have full certification and a major in their teaching subject.

Only a handful—slightly more than 900—of the nation's nearly three million teachers are certified by the National Board for Professional Teaching Standards. President Clinton has called for 100,000 master teachers by the year 2006.

The follow-up report, *Doing What Matters Most: Investing in Quality Teaching*, is available for $15 from the National Commission on Teaching and America's Future, Kutztown Distribution Center, 15706 Kutztown Rd., PO Box 326, Kutztown, PA 19530-0326; or call 1-888-492-1241.

Copies of *What Matters Most: Teaching for America's Future* cost $18; orders must be prepaid and sent to this address: The National Commission on Teaching and America's Future, PO Box 5239, Woodbridge, VA 22194. See also the commission's website, http://www.tc.columbia.edu/~teachcomm.

NSTA REPORTS!
February/March 1998

REFORM EFFORTS SHOW SIGNS OF SUCCESS

A new report from the Council of Chief State School Officers (CCSSO) analyzes the effects of state education policies and reform initiatives. *State Indicators of Science and Mathematics Education 1997: State-by-State Trends and New Indicators from the 1995-1996 School Year* presents data on improvements in elementary and secondary science and math public education. The report examines, by state, trends in student achievement, learning content, and conditions for teaching. It focuses on the following categories: student outcomes, instructional time/participation, curriculum content, teacher quality, equity, and school conditions.

From 1982 to 1994, science scores for 17-year-old black students improved 22 points to 257, compared with a 13-point rise to 306 for white students. A 20-point rise on the scale can be interpreted as an improvement of two years of school, according to the report. Overall, the number of minority teachers in math and science increased slightly between 1990 and 1996. Southeastern states, California, and Hawaii had the highest proportion of minority teachers compared to the number of students per state.

Nationally, 10% more students had taken three years of high school science in 1996 than in 1990 (55% over 45%). Almost 40% of middle school students studied general science courses in 1996, while 29% studied life science and 15% studied earth science. In Arkansas, Montana, Idaho, and New York, more than 60% of ninth-grade students took earth science classes in 1996. Only Puerto Rico had more than 60% of its students taking general science in high school.

The number of women teaching math and science has significantly increased since 1990. Women now comprise 54% of all high school math teachers and 43% of high school chemistry teachers. States with the highest number of new science teachers last year were Idaho (12%), North Carolina (10%), and Utah (13%).

The average elementary school spends about 50 cents a year per student, and the average middle school less than $1 a year per student, on consumable science supplies like chemicals, batteries, and glassware, according to the report. The average school spends only $50 on science computer software and $100 on math software. Only one computer was available for science and math instruction in 35% of fourth-grade classrooms in 1996.

The 1995-1996 certification statistics showed that in half the states, most high school science and math teachers had obtained certification in their assigned fields. Nationally, 63% of middle school science teachers were certified in science. One-fourth of the states had shortages of teachers specifically certified in science or math.

The National Education Goals Panel provided input for the report, which was supported by the National Science Foundation. "State Profiles of Education Indicators", four-page summaries per state, are available on the CCSSO website, as is the complete report. See http://www.ccsso.org.

To order copies of the report, call CCSSO's publications office at 202-336-7016.

2061 *Today* — Fall/Winter 1997
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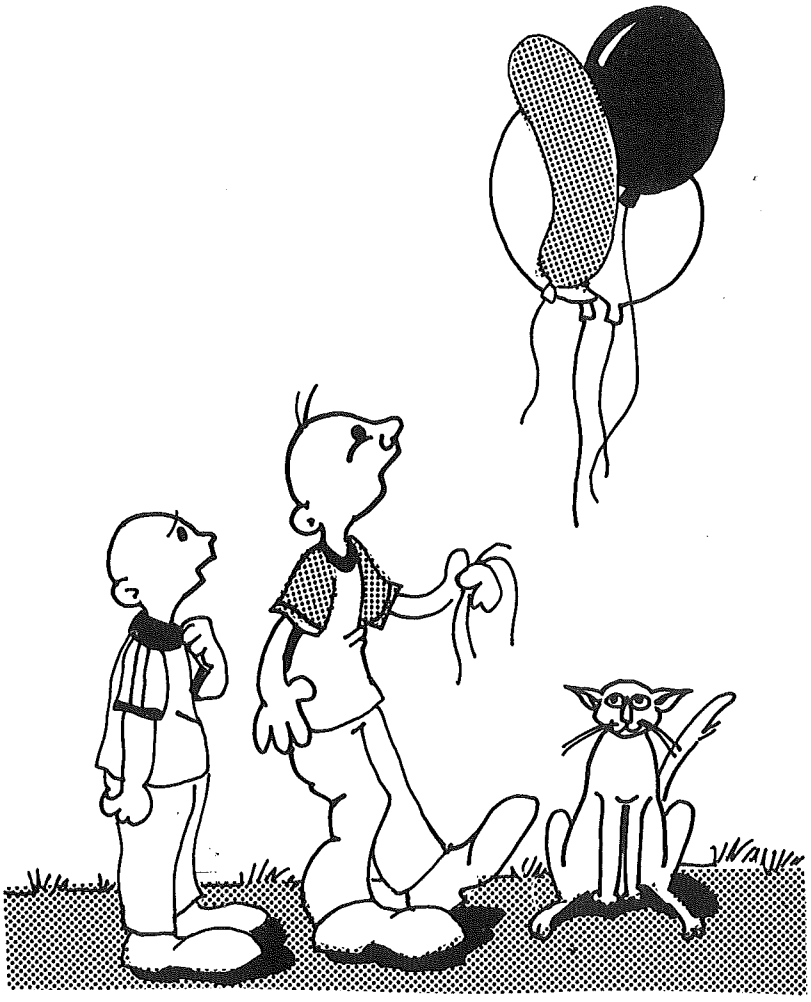
Washington, DC 20005

SPUTNIK AT FORTY

What an incredible forty years we have had in science and technology, thanks in no small measure to Sputnik. We were stunned when the Soviet Union successfully launched Sputnik on October 4, 1957, and exhilarated less than a dozen years later when, on July 20, 1969, an American landed on the moon. We might have reveled in the glory of it all and turned our attention away from space to other matters, for at the time there was no shortage of problems here on this planet. But we didn't.

Instead we created ever more sophisticated and powerful tools for exploring the universe, as we set our sights on Mars, Jupiter, Saturn, and beyond, on Venus and Mercury and the Sun itself, and even the itinerant comets. In four decades we have surely learned more about the solar system than we had in all of the past centuries put together. Nevertheless, we have tens of decades of exploration ahead of us. Moreover, thanks to modern information and communications technologies (for which, indirectly at least, Sputnik can claim some of the credit), ordinary citizens can be in on the adventure as it happens, day by day. It is as though Columbus, say, or Lew and Clark, had been able to send back video accounts for us to watch on the nightly news or download from the Web.



A New Frontier

The story is much the same in astronomy as a whole. Sputnik ushered in a forty-year period of sustained and stunning progress that has radically changed our understanding of the size, make-up, history, and behavior of the physical universe. But the story is not the same in science education.

It is true that Sputnik provided a huge increase in the education reform efforts that had begun a few years earlier. In higher education, the race to the moon stimulated the nation to produce the scientists and engineers who would assure U.S. dominance in space. In the schools—due largely to the National Science Foundation and the National Defense Education Act—the development of new science and mathematics courses proceeded on a scale unprecedented in our history, as did the expansion of summer institutes and other opportunities for teachers to improve their knowledge and skills. In many ways it was a golden age in the history of science education, one that was exciting and productive.

A Powerful Reminder

But reaching the moon was not followed, as in science, by an intensification and broadening of the science education reform effort. On the contrary, we acted as though the game was over and turned away from reform for nearly fifteen years. It wasn't until 1983, after losing many of the gains of the Sputnik years, that we were again goaded into action, this time by *A Nation at Risk* and concerns about our ability to compete in a global economy. While much has been accomplished in this most recent reform movement, imagine where we might be today if we had been as steadfast in seeking universal science literacy as we were in exploring the universe.

On its fortieth birthday, Sputnik can serve as a powerful reminder: If we are serious about reforming science education in our schools and colleges, we must be driven by long-term educational goals—by what we want all of our students to learn—not by the crisis of the decade. And because there are no simple solutions, we must be prepared to stick with the effort for a long time to come. Fifteen years, or twice fifteen, is simply not enough time to bring about significant and lasting changes in that vast, complicated, and incredibly disaggregated non-system called American education.

National Center for Improving Student Learning and Achievement in Mathematics and Science
Jan DeLange, Freudenthal Institute,
The Netherlands

AN INTERNATIONAL PERSPECTIVE ON IMPROVING MATHEMATICS AND SCIENCE EDUCATION IN THE UNITED STATES

The performance of U.S. students in the Third International Mathematics and Science Study (TIMSS) has caused quite a stir. Although on a par with other major industrialized nations (Canada, England, and Germany), the United States was outperformed in mathematics and science by birds of a very different feather: three Asian countries (Singapore, Korea, and Japan), five Central and Eastern European countries (Czech Republic, Hungary, Austria, Slovenia, and Bulgaria), and one industrialized country (The Netherlands). The variety of this group makes it difficult to formulate recommendations about improvement of mathematics and science education in the United States, but some of the problems, focusing here on assessment, can be identified.

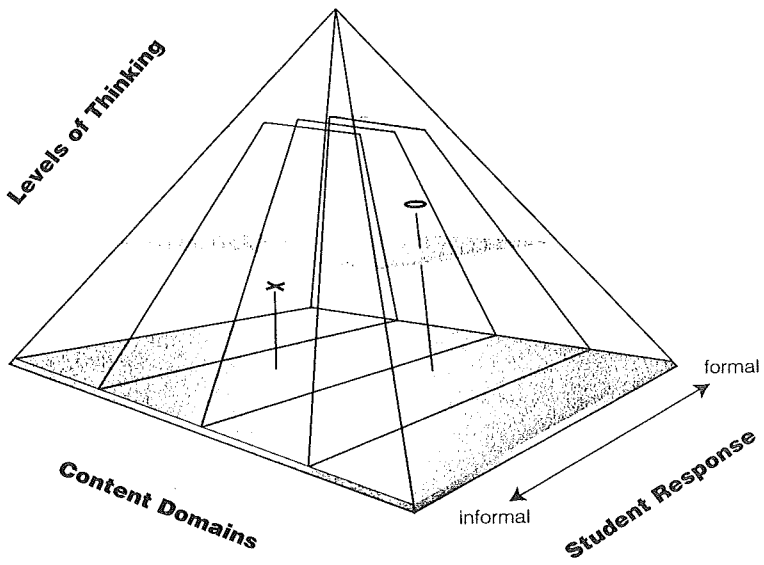
First, can any single test (in this case, TIMSS) measure the quality of mathematics and science education in all countries and across vastly different cultures? It is now generally agreed that mathematics is neither value nor culture free, as was long assumed. We cannot, however, quantify the *fit* between the TIMSS test items and a country's implemented or intended curriculum. A question meaningful in one culture might make no sense at all in another culture. This can affect both the results and the conclusions drawn from those results.

The Netherlands addressed this issue by designing a "national option" test, which more closely matched Dutch students' cultural experience and understanding. The national and international test versions included a carefully selected set of anchor items, which appeared on both tests. Those items were selected on quality criteria and, as modeled by the assessment pyramid (see figure), included questions from all four mathematical domains and at all three levels of thinking. Methodologically speaking, students' performance on the anchor items should have been the same for either version of the test, international or national. In reality, however, students seemed to fare much better on the anchor items when they took the national version. Until further research is done, we can only surmise that students felt more comfortable and more motivated when taking the national, culturally compatible, version of the test.

Second, standardized tests (including TIMSS) are *not balanced* in what and how they test: They have an overabundance of questions that require only lower-level thinking and they rely heavily on multiple-choice questions. For example, in the eight TIMSS rotation booklets used in The Netherlands, there were 429 multiple-choice questions, 43 short-response questions, and 29 extended-response questions. The bulk of the questions required little more than Level I thinking.

Finally, in the United States, changing the content and format of assessment may prove very difficult because it will mean changing what is valued. To an outside observer, many parents appear more data driven than child driven, and both parents and school boards seem to value students' scores on standardized tests more than students' intellectual development. As a result, when innovations are implemented, their effects are generally measured by the wrong instruments. Standardized tests, *as they are currently designed*, use multiple-choice questions to measure, primarily, low-level thinking. Such assessments should be avoided as much as possible. Parents, school boards, and administrators need to be educated about the strengths and weaknesses of any assessment program.

In 1989, then-President Bush and 50 governors articulated a national goal: that the United States would be first in the world in mathematics and science achievement by the year 2000. The time line for this goal seriously underestimates the problems involved and the time needed to make solid educational change. Curricula, textbooks, teacher preparation, classroom instruction, professional development, and assessment *all* must change, and many players are involved—parents, school boards, state and national policymakers, teachers, and the general public. Only if all players are willing to consider fundamental changes in U.S. mathematics and science education will change be possible. The process will take 20 years, *but it must start today.*



From the American Nuclear Society to
Teachers Interested in the Nuclear Sciences
E. Michael Blake

HOW RADIATION IS DETECTED AND MEASURED

The American Nuclear Society has for many years made radiation detection equipment available to teachers, so that teachers and students alike can learn about the presence of radioactivity in the world around us. Perhaps, however, it would be best if a radiation detector were not merely a black box, which gives readings that the user can interpret only through scales developed by unknown experts. While it is not possible for everyone to become a health physicist, people can at least become more informed about what actually happens when a detector gives a reading.

First of all, radioactivity refers to emissions from an atomic nucleus. The most significant emissions are:

•*Alpha* radiation, which is a particle made up of two protons and two neutrons. This is itself an atomic nucleus, the one for the element helium. Alpha particles are emitted from radioactive elements (both natural and artificial) that are heavier than lead, as part of their process of "decay" to stable, non-radioactive forms of other elements.

•*Beta* radiation, which is an electron that can have an electrical charge that is either positive or negative, depending on the decay scheme of the radiating nucleus. Beta emission, like alpha emission, is part of the decay process of heavy radioactive elements, but also occurs in the decay of *fission products* (elements left behind after nuclear fission occurs in heavy radioactive elements) and *activation products* (atoms that have been made radioactive by exposure to other forms of radiation, primarily *neutrons*).

•*Gamma* radiation, which is a high-energy packet of electromagnetic radiation, and part of the energy spectrum that includes radio waves, radiant heat, visible light, and x-rays. Gamma emission can be a part of any of the radioactive decay schemes mentioned above. Some radioactive materials emit intense gamma radiation as part of their decay; other radioactive materials emit no gamma rays at all.

•*Neutrons*, which are uncharged particles that are released during nuclear fission or fusion. They are not a part of radioactive decay. Free neutrons would only be encountered in the presence of a substance undergoing nuclear fission or fusion, and thus are not the direct concern of attempts to detect and measure radiation in the world at large, far from sources of nuclear fission or fusion. Because alpha, beta, and gamma emission can take place over much longer periods (up to millions of years), and without the obvious effects of ongoing fission or fusion to indicate that something unusual is taking place, the problem of radiation detection and measurement has always been to find emissions from radioactive decay, which are not directly detectable by human senses.

Incidentally, the designations "alpha", "beta," and "gamma" were assigned by scientists in radioactivity's discovery era, roughly 100 years ago. The names should not be taken to mean that these kinds of radiation are closely related or have similar effects. They mean only that different types of emissions were observed at about the same time under similar circumstances. There is clearly no similarity between helium nuclei, electrons, and packets of pure energy, beyond the fact that radioactive nuclei emit them—and, as we will see, being able to differentiate among the types of radioactivity is important in detecting, measuring, and assessing the potential hazard of a radiation field.

In most assessments of radioactivity in the environment, alpha particles play a fairly small role. Because of the circumstances that produce them in radioactive decay, alphas have relatively little momentum, and can be blocked by a piece of paper. The main concern here would come from the ingestion of an alpha-emitting substance. The chemistry of many alpha emitters is such that the human body would treat them like bone material, and move them to the bones. Here, even the low-momentum alphas can damage the production of bone marrow and lead to cancer. The most common portable radiation detectors are designed to detect only betas and gammas, but alphas are emitted by substances that also emit betas as part of their decay, so if a detector indicates no beta activity in a certain sample, it may be safe to conclude that there is no alpha activity in the sample either.

Activation and fission products have nuclei that are not stable, and their decay through beta and gamma emission is how they reach stable, non-radioactive states. One example is potassium-40 (K-40), which has 19 protons and 21 neutrons in its atomic nucleus (19+21=40, hence the number in the designation). This naturally-occurring radioactive substance has a half-life of 1.28 billion years, so perhaps about five% of the K-40 that originally existed on earth when the planet was formed still exists today. It amounts to more than one hundredth of one% of all the potassium on earth, making it one of the most abundant radioactive materials in nature. Despite its long half-life, a K-40 nucleus must still emit a beta and a gamma to reach its stable state, as calcium-40.

Note that the stable state is not the same element as the unstable state. When a nucleus emits a beta, it is actually converting a neutron into a proton while releasing an electron (or, less commonly, a proton into a neutron while releasing a positron). An element is determined by the number of protons in its nucleus (1 for hydrogen, 2 for helium, 19 for potassium, 20 for calcium, etc.), so beta decay actually transmutes one element into another. Calcium-40 has 20 protons and 20 neutrons, and it happens that 20 is a very stable number for both protons and neutrons gathered in a nucleus. In some cases, gamma ray emission is also involved, to bring the nucleus to the lower energy of the stable state, but this does not amount to transmutation, because a gamma is pure energy without electrical charge, and does not involve one type of nucleon changing to another.

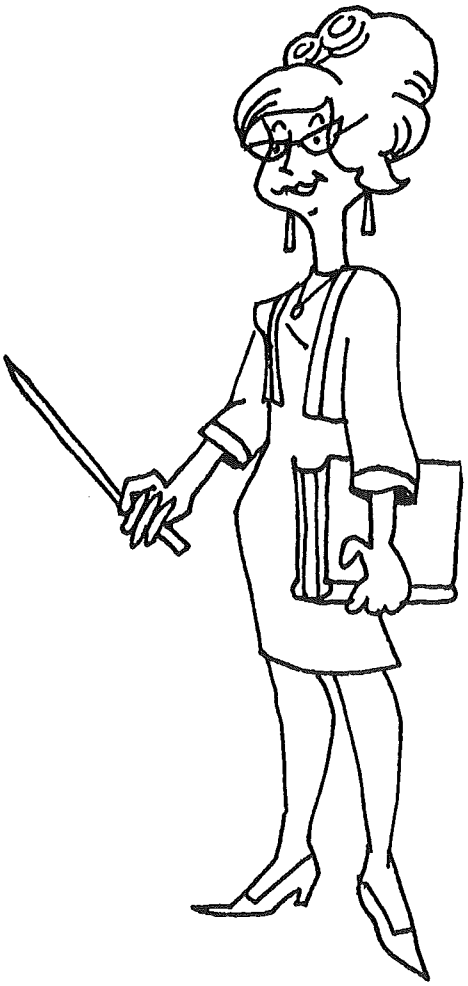
It has been found over the years that the most practical way to detect radiation is by looking for the effects on surrounding materials. Both betas and gammas move with such great energy, for their size and surroundings, that when they encounter atoms they knock loose some of the electrons orbiting the atoms, creating ions—electrically charged nuclei. The general approach to radiation detection remains the same as it has been for decades: bring a sealed tube of gas into proximity with ionizing radiation, then get readings on the number and energy of gas particles ionized by the radiation. What the detector is actually detecting is the movement of charged particles, by letting them interact with an electric circuit that incorporates the gas tube.

Although beta particles are themselves charged particles, their movement is so rapid and their duration so brief that detecting them directly would pose a formidable technical challenge. Because the once-removed process of detecting ions is both relatively simple and (after several decades) quite refined, there is no need to seek direct beta detection in common instruments such as hand-held survey meters. Besides, gamma rays are not charged, and can be detected in a practical sense only through the ions they create, so interpreting ionization remains the best way to gain a complete picture of the radiation environment.

A variety of terms are used, sometimes interchangeably, for radiation detectors. You might run across terms like *survey meter* or *beta-gamma detector*, and generally they refer to the same kind of thing: the kind of device known for decades as a *Geiger counter*, or *Geiger-Müller tube*. When beta or gamma emissions enter the gas in the tube, the ions produced by collisions with gas atoms are organized in a high-voltage field to produce a pulse in the circuit connected to the tube, and thus a reading on the meter. Higher readings indicate the presence of more intense radioactivity, most of which obviously is not being intercepted by the detector; the detector merely interprets the sample it happens to be detecting. The detectors in use today are built with internal shields that can be moved into place around the gas tube to screen out betas but let gammas pass—thus allowing there to be one set of readings for betas and gammas together, and another for gammas only.

Curiously enough, part of the detector itself is radioactive, though not to an extent that it poses a hazard of its own. As a way to allow the detector to be calibrated and adjusted, a small emission source—often a natural, low-intensity radioactive material near the end of a decay chain, such as lead-210 or bismuth-210—is placed in a shielded container within the detector. This shield also can be moved, to allow the user to determine if the detector responds to the ions that should be produced in the gas by the emissions from this check source. After the detector is tested this way, the check source is shielded again, and the actual task of detecting radiation in the environment can begin. To reiterate, the check source presents no hazard to anyone using, or observing the use of, the detector. Like any other radioactive material, it might produce adverse health effects if it were ingested, which in this case clearly could not happen purely by chance.

Once the detector is ready for use, you might be surprised by the results: readings of radiation virtually all around us. As ANS has frequently pointed out in other publications, radiation is a part of nature. Some of the background radiation in the environment can be attributed to human activities, including long-past events like atmospheric nuclear weapons testing and the Chernobyl-4 accident in Ukraine in 1986. But the earth is always showered by radiation from the sun and from cosmic rays, and some of them get through the magnetic field and reach the surface. And then there are the natural radioactive materials that have been here all along—including the aforementioned potassium-40, which is present to some extent in every human being. This planet's biosphere evolved in a radioactive environment, and while it is clear that too much radiation is bad for any living thing, a small but detectable amount of radiation appears to be something that living things in general can live with.



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PERCEPTIONS — IN PROCESS

Last weekend I had a visitor in my study. I didn't see him come in; rather, he just seemed to be there. I was hunched over my book- and paper-strewn desk, working on a lesson plan for a classroom population unit. Completely engrossed in my work, I was oblivious to the rest of the world. But I felt his presence across my desk, as though he had been following my writing as intently as I had. I looked up into his eyes. He smiled.

I jumped. "Buahhh!" I said, scattering papers.

He winced. "van Loon," he replied, thrusting his hand across the desk.

"M-Mr. Loon—" I began. "—"

He chuckled. "No, no. van Loon. Hendrik Willem van Loon. At your service." He smiled again and nodded his head in greeting. He pointed at my papers. "What are you doing?"

I had questions for him, too, but other geography teachers will empathize with my lucky predicament. I was taken off guard at my good fortune of having an audience to whom I could explain my latest classroom idea. Only after I finished and answered his questions about my plan did I remember I had questions for him: "Who are you? " I demanded. "What are you doing here? How did you get into my study?"

He was a time traveler, he said, from the early 20th century. He wanted to see the changes that had occurred since the book he wrote in 1932. He dug into the old leather satchel at his feet and produced a well-worn copy of *van Loon's Geography*. Corners of pages were folded over, and it bristled with scraps of paper on which notes had been scribbled. He tapped the cover lightly with a finger. "I think we have a problem," he said.

"Oooooh! van Loon! You're van Loon!" I said, in awe. He smiled. "You're the box-of-people-in-the-Grand Canyon guy!" At this point, van Loon rolled his eyes. The world's population of two billion people, he had written in 1932, could be fitted into a large box measuring one-half mile in each direction. If pushed off the rim of the Grand Canyon, nature would soon disguise the fact that humans ever existed. Today's population would require three such containers—or maybe four if you wanted to allow for the increased size of modern-day humans, but that space would allow for a bit of rattling around by its occupants. A teaching colleague across the hall from my classroom has used this argument to illustrate that the world has no population problem. My students are not receptive when I introduce ideas about overpopulation. "Mr. ____ says there is plenty of room for everybody," they say. More recently, they've explained that the whole six billion could be housed in New Mexico.

"I've been fighting that for years," I said, staring at my guest. van Loon sighed. "Had you bothered to look beyond the first page, you would realize that my argument was not about overpopulation. The purpose was to illustrate how one species has so significantly altered the earth's landscape." He paused, studying my face. "I must remind you that large numbers do not equal overpopulation. Overpopulation is a ratio of people to the resources they have at their disposal." He paused again, awaiting some response. I was dumbfounded, so he smiled and added: "It's in the book."

"B-bu-buh—" I burbled. My mind was flashing overload alert; I was still working on the image of a sea of people in classroom-sized "ranchettes" in the Southwest. The entrance sign read: "welcome to the Land of Enchantment!" At last, I managed: "So, what's the problem?"

He sat for a moment, as though debating with himself. He looked as I must look when trying to decide whether to introduce to a student a concept which will take him to the next level of understanding. He didn't answer but instead rose from his chair and beckoned me to follow him to the back porch. There sat a curious contraption which turned out to be a sort of magic carpet, fitted with a clear dome. "Hop in," he said, lifting the hatch. I took one of the comfortable swivel seats, the kind I see on the fishing boats that zip by my house on the way to the river. "Wow," I said. "Cool."

"I want to show you something," he said as we swooshed up into the air—and he did. What a view! It was fall—harvest season—and farmers were busy with the soybean crop. Dust trailed their red and green machines, and large trucks sat at the ends of the fields, waiting to carry more than 400 million bushels to the elevators. The golden-brown corn—more than a billion and a half bushels—awaited its turn. The spectacle was awe-inspiring.

"Wow," I said. "Illinois: The Prairie State!"

" 'Prairie State?' " asked van Loon. "Where is the prairie?" He directed the craft to a small patch of green, maybe an acre in size, where we hovered momentarily. "This is a typical remnant of what's left in a state that was nearly two-thirds prairie only 200 years ago—total high-quality prairie remaining: about one-one-hundredth of one percent." I gawked. He smiled, wryly. "A bug could walk across it and back before breakfast. And wetlands? Mostly gone. Forests? Only one-third of the original area, and it is almost all second-growth. In a very short time, the natural environment has been changed to a human one."

I tried to mount an argument in defense of my state. "Well, it's a farming state. Just look at the food being produced! We feed a lot of people! And something you may have overlooked, Mr. van Loon: the values of those farmers down there are important to our society—family, hard work, love for the land—"

"These values? These farmers?" he asked, maneuvering us in front of an abandoned farm house. It was dilapidated and vacant; its curtainless windows stared blankly past us at the landscape. "Do you pretend the family farm still exists because you want those values to exist? Farms are no longer the small family farms in your mind. They are businesses. Fewer than three percent of your people are farmers," he said. "But please excuse me. I forget you live in a generation which insists that self esteem must be promoted at all costs. Accentuate the positive, and ignore the negative? I'd better not show you the rest."

He was baiting me, of course, but my blood pressure was rising. "Bring it on," I said.

"As you wish," he replied. "But you won't like it."

A whirlwind tour followed. We zipped past subdivisions at the edges of cities, we glimpsed new highway construction, suburban sprawl, industrial parks, shopping centers, and we hovered high above the Chicago metropolitan area. By this time it was evening, and the view was a luminescent map—a monstrous spider web emanating from a bright blur at the edge of Lake Michigan. It seemed alive—I could see lights being switched on far from the city center in communities which merged with one another, connected by lines that were the highways radiating in all directions except into the lake itself. It appeared to grow! Words caught in my throat, and I was unable to speak.

"Farming state?" van Loon asked gently. "Since 1950, farmland decreased by 10%, mostly due to urban growth. Here— " he gestured to the sight on which my gaze was still transfixed, "—population grew four percent between 1970 and 1990, but urban land uses grew 51%. Three hundred sixty thousand acres that were cornfields and dairy farms."

He paused again, as a patient teacher will do with a student who is slow on the up-take. "Sometimes an historical perspective is useful for comparison—would you like to see what it looked like in 1900?" van Loon asked, flipping a switch on a console I had not even noticed before. Lights went out. Chicago and its immediate suburbs became disconnected from the space around them except for tiny dots of light which led to the lights of Elgin, Aurora, and Kankakee. Eyes wide and mouth agape, I marveled at the simpler landscape. I leaned forward; peering down, I could pick out tiny clusters of lights which were towns I could name: Des Plaines, Geneva, Elmhurst—.

"—only two million in the entire metropolitan area at the turn of the century," van Loon was saying. "In a hundred years, the population has more than quadrupled and urban land uses have increased exponentially." He paused for a moment to allow my brain to make the connections. "Has this created a condition of overpopulation?" he quizzed me, then answered himself: "Well, not technically, at least for the most part." He pondered his answer for a moment, then proceeded with the lesson: "Finally, a projection—that is, our best guess for the future—is appropriate. What you will see next is northeastern Illinois in 2050." He flipped another switch, and the entire landscape beneath us exploded in light; I was momentarily blinded. As I fought to regain my sight, I could feel that we were swooping low into the sea of lights toward an enormous building surrounded by thousands of cars in an airport-sized parking lot. It was only one of a multitude of such concrete and steel and glass buildings I could see stretching endlessly along the highways in all directions. Now our tiny craft streaked south, following the traffic-choked multiple lanes of I-57 as it led away from the center of the conurbation. As we passed by what had once been the small town of Onarga—now at the fringe of the metropolitan area—farmland reappeared in small patches. Mesmerized by the panorama of light and the flood of traffic, I sat on the edge of my seat. "Careful—" warned van Loon—too late. I awoke with a start, my nose very close to my desk-top of papers. My pen was still in hand, but it appeared to have taken it upon itself to create a cross section of a hypothetical landscape, trailing off the edge of the paper.

I blinked. I raised myself slowly until I was sitting erect, and I looked round my study. I was quite alone.

I suppose you have already guessed that I would find van Loon's book on the corner of my desk. It had been marked with numbered scraps of paper. I read them in the order prescribed: (# 1) "We no longer live in a world the future of which we can leave to itself." (#2) "There is little use in sitting in high judgment upon the Errors of the Past." and (#3) "We are all of us fellow-passengers on the same planet and we are all of us equally responsible for the happiness and well-being of the world in which we happen to live."

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Don't forget to check the IGA web page (http://coe.ilstu.edu/iga) for more news and workshop/travel/grant opportunities.

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THE CHICAGO/MILWAUKEE HEAT WAVE OF 1995

- Unprecedented heat and high humidity killed 525 people in Chicago, and 85 in Milwaukee from July 12 to 16, 1995
- Some closed apartments and houses had air temperatures between 130° and 150°F (60° and 87°C)
- The majority of the population affected was over 65 years old, living alone, and not part of a family or social network

INTRODUCTION

The year 1995 was disastrous with regards to the loss of life caused by excessive heat and high humidity. A record number of 1,021 people died nationally from these causes. On the average, the Centers for Disease and Prevention report that 384 people die each year because of high heat and humidity (hyperthermia). In contrast, there were 22 cold-related fatalities in 1995 hypothermia).

Between July 12 and 16, 1995, Chicago experienced unprecedented heat and high humidity, while other portions of the country were affected before and after these dates. The cities of Chicago and Milwaukee were especially hard hit when 783 people died; this was probably the most intense heat wave in Chicago since 1916. The majority of the 1995 fatalities occurred in the metropolitan areas of Chicago (525) and Milwaukee (85) before the heat wave lessened and moved eastward.

The number of heat-related deaths in these two cities during this period exceeded the national average of lives lost annually to floods, lightning, hurricanes, and tornadoes combined. By comparison, the Great Chicago Fire of 1871 killed 250 people.

This paper is intended as a resource for teachers and students. It is also a source of information for schools, hospitals, community organizations, long-term care facilities, and retirement centers. It provides a brief review of the 1995 Heat Wave characteristics, its development, and identify characteristics of the age group of the population most at risk.

EXCESSIVE HEAT AND HUMIDITY

As many as 70 daily maximum temperature records were set in mid-July from the central and northern great plains states to the Atlantic coast. Associated with the 1995 Heat Wave were high relative humidities of 50 to 60% that resulted in a heat index between 110° and 120°F (43° and 48°C) during the day. Relative humidity in percent is a comparison of how much water vapor is in the air to the concentration of water vapor at saturation.

During the 1995 Heat Wave, late evening humidities were above 90% when temperatures were in the eighties. Some closed apartments and houses had air temperatures between 130° and 150°F (54° to 65°C). Automobiles exposed to direct sunlight had inside air temperatures between 140° and 190°F (60° to 87°C).

A more stable measure of moisture in the air is the the dewpoint. When dewpoints are over 60°F, about half of the population feels discomfort. When dewpoints exceed 70°F, everyone feels discomfort. Dewpoints during the 1995 Heat Wave were in the upper 70s to lower 80s (26-28°C) from parts of Iowa through southern Wisconsin to northern Illinois and Indiana.

There were also heat-related damages and losses to highways, railroads, livestock, poultry, and crops in the Corn Belt. It was reported that over 100,000 chickens died and about 25% of the mink production in Wisconsin was lost. It became apparent that the combination of extreme heat and high humidity is one of the least understood of deadly weather phenomena.

Unlike violent severe weather that can cause immediate death and destruction, extreme heat and humidity are dramatically less apparent, especially at the onset. Excessive heat and humidity is a cumulative process, sometimes not showing its effects for two or three days, so the heat wave is a slow silent killer. In 1995, the heat wave became a public health concern, as well as a meteorological problem.

HISTORICAL BACKGROUND OF HEAT WAVES

The United States has periodically experienced heat waves. These have been observed to occur in a random manner since meteorological records have been kept. During this century, they have occurred in almost every decade. When comparing heat waves, one must consider the air temperature and moisture content, and duration.

The 1995 Heat Wave was brief and had intense temperatures and humidities (Figure 1). The 1911, 1916, 1934, and 1936 heat waves were the only ones of comparable intensity in Chicago.

Problems arise when comparisons are made with earlier heat waves. Since some of the earlier records did not list humidities, correct conclusions cannot be drawn. Some heat waves were accompanied by droughts and were not as oppressive as those with higher humidities. At lower relative humidities, the heat index can be lower than the actual temperature because sweat readily evaporates and allows the body to cool itself. In addition, dry air radiates heat more easily and allows the atmosphere to cool more at night than humid air which traps heat.

Concerning the relationship of heat waves to long-term weather trends such as El Nino, Southern Oscillation systems, and global warming, no significant link has been identified. Therefore, heat waves are mainly due to natural meteorological variability.

FORECASTING

Heat waves are easier to forecast than localized severe short-lived weather events. Severe thunderstorms and tornadoes cover a small area, while heat waves cover a large area and last longer than other types of extreme weather. The 1995 Heat Wave was accurately forecast by the National Weather Service several days before the actual event occurred. Because heat waves are regarded by the public as being inconvenient, uncomfortable, and nonviolent, they are not perceived as a threat. Warnings by the National Weather Service about the developing heat wave were quickly broadcast and printed by the local media. But the information did not reach the intended audience, it failed to reach people who could have prevented heat-related deaths, or was not taken seriously.

In Chicago and Milwaukee, where most of the lives were lost, officials did not have the experience, emergency response capabilities, or a plan for how to respond to a heat wave emergency of this magnitude. Also, public and local officials did not recognize the extreme heat as being so potentially lethal, so they were not prepared to handle a disaster of this scale.

DEVELOPMENT

Heat waves are often the result of meteorological and climatological factors operating on different time and space scales. The 1995 Heat Wave was caused by a slow-moving, hot, and humid air mass produced by a strong upper-level ridge of high pressure. High pressure areas are often associated with fair weather during summer in the midwestern United States.

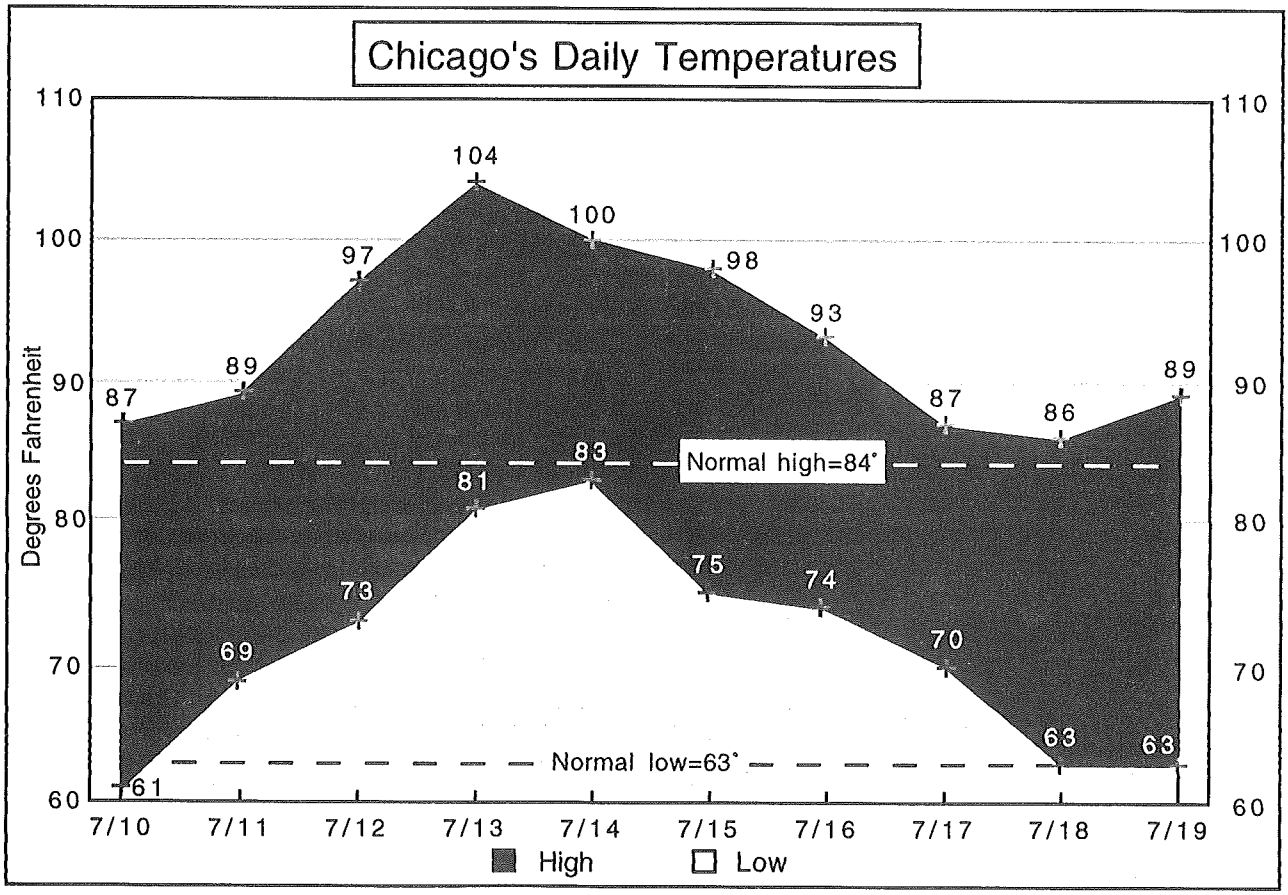

Figure 1. High and low temperatures in Chicago compared to normal from July 10 to 19, 1995 during the heat wave (from National Weather Service Survey Report., 1995).

Population	Description
Elderly	Especially those living alone.
Chronic illness	People with chronic medical conditions, particularly those with cardiovascular or pulmonary disease.
Mental illness	Individuals taking psychotropic medication.

Table 1. Medical conditions of people most at risk from heat.

Reason	Description
Awareness	Do not seem to receive warnings and forecasts in a normal fashion.
Understanding	May not fully understand significance of warnings and forecasts.
Response	May be uninformed about proper precautions to take.
Air conditioning	May not be able to afford air conditioning. 20% of elderly deaths had air conditioning but were afraid to use it due to cost.
Windows	May not open windows for fear of crime.
Disabilities	May be too weak, inform, or frightened to seek public shelter.

Table 2. Reasons why elderly are at high risk from heat waves.

In July 1995, this high-pressure system moved eastward with tremendous amplification, slowed across the middle of the country, and produced extremely hot and humid weather across the northern half of the United States. Fortunately, the high-pressure ridge moderated as it moved eastward into the mid-Atlantic region. The slow movement of the high provided for ample heating each day and an increase in moisture. In this way, both regional and local factors contributed to the extreme weather situation in the Chicago/Milwaukee area on the hottest days of July 12 to 15.

The excessive moisture in the air during this heat wave was not brought in by strong southerly winds originating from the Gulf of Mexico, as occurs quite frequently. Instead the high humidity came from evaporation from moist soils in Iowa, Illinois, Missouri, and southern Minnesota. Earlier flooding during the spring was directly responsible for the high soil moisture content. Additional low-level moisture is likely to have originated from corn and other crops growing in this area and time of year. In addition, winds were first from the south, then shifted to the southwest. Due to wet soil conditions, winds originating from and moving over Kansas, Missouri, Iowa, and Illinois carried high dewpoints between the upper 60s and lower 70s (15 to 21°C).

It is not surprising, then, that the combination of intense solar heating of the ground, evaporation from wet soils, and transpiration from crops resulted in a tongue of air with high humidity on the evening of July 11 over eastern Iowa and southern Minnesota. This moisture-laden air passed directly over the Chicago/Milwaukee area, and eventually translated over Philadelphia before moving over the Atlantic Ocean.

At Chicago, the normal depth of the boundary layer, which holds much of the significant moisture in the atmosphere, is 3,000 to 6,500 feet (0.9 to 2.0 kilometers) thick. On July 13 it was 2,600 feet (800 m) deep, then on July 14 it was only 984 feet (300 m) deep. This very shallow boundary layer trapped pollution and ozone, and resulted in additional alerts and warnings to the public about unhealthy air. Since St. *Louis* was south of the moisture-laden air, there were less severe conditions in that region.

THE POPULATION AT RISK

A problem with identifying and labeling a death as being related to heat is the lack of a clear definition of hyperthermia. Identifying a heat-related death requires the body core temperature to be at least 105°C (40°C) at the time of death. Many of the bodies had core temperature of 107° to 108°P (41° to 42°C). Because most bodies were not discovered for hours or sometimes days, hyperthermia was not a definitive cause of many deaths. Hence, a less restrictive definition can include the circumstantial evidence used by medical examiners to identify a hyperthermia death. This evidence varies with each city's medical examiner, and caused difficulty in identifying the deaths as being related to heat during the 1995 event. It has been recommended that a national definition for hyperthermia be adopted.

The majority of the population affected by the 1995 Heat Wave was over 65 years of age and living alone. It is interesting to note that Chicago has the third highest concentration of elderly people in the nation. The body's ability to perspire and regulate body heat deteriorates with age. This

problem aggravates heart problems and other ailments common to the elderly. Also, it is common for elderly people to take medication, such as diuretics, to reduce body fluids, and thereby become more vulnerable to dehydration.

It is becoming recognized that extreme heat and high humidity contribute to more illness and death in the US than any other weather-related cause. During the 1995 Heat Wave in the Chicago metropolitan area, 525 people perished. The elderly in Chicago (65 and over) accounted for 73% (381) of all heat wave deaths. On a daily basis, an average of 72 people of all ages die from a variety of causes in Chicago, and 30 die in Milwaukee. But there were 733 excess deaths in mid-July. For example, in Chicago on July 15, 162 heat-related deaths were reported by the medical examiner. More males died of heat than females, and race was not a factor. Less than 6% of the deaths occurred within the Hispanic population. Reasons for this situation are not clear, but it is speculated that strong community or family networks within the Hispanic communities may have played a protective role.

An elderly person without air conditioning had a 50% greater risk of dying because of the oppressive heat and humidity. In short, the elderly are often isolated, not part of a family or social network, and may be unknown to social agencies (Tables 1 and 2).

CONCLUSIONS

The 1995 Heat Wave brought to the attention of the nation the fact that high temperatures and humidity can take many lives, especially among the elderly, if proper precautions are not taken. The effects of high heat and humidity are a cumulative process in the human body. Heat waves are silent and less-recognized killers compared to other forms of severe weather. Towns and cities are often prepared for violent weather, but not for heat waves. Even though National Weather Service forecasts are timely and accurate, people must become aware of the threat to all sectors of the population. It should be emphasized that heat waves have become more of a social problem than a meteorological issue.

The Chicago mayor assembled a commission comprised of community leaders to develop a heat plan. National Weather Service meteorologists looked at climate records and mortality records to determine what weather conditions lead to heat deaths in Chicago. From this information, local heat warning criteria were identified, and the city developed a plan that takes effect when a heat warning is issued. Media and community groups then will spread information about the warning, open cooling shelters, monitor hotlines, and use police, fire, and emergency services to check on the poor and/or elderly.

The National Weather Service will improve public awareness of heat waves by targeting the elderly, especially those with medical problems. This awareness will be given in future NOAA weather radio broadcasts, radio and television features, and in newspapers and other printed media. Contact your local National Weather Service office, American Red Cross, or local emergency management agencies for additional information.

ACKNOWLEDGMENTS

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MINI IDEAS

COLONIAL NESTING BIRDS

Suggested Grade Levels: 5-9

Subjects: English Language Arts, Mathematics, Science, Social Science

Skills: analysis, generalization, graphing, inference, listing, public speaking, reporting, research, small group work, writing

Correlation To Illinois Learning Standards: English Language Arts I C, 3C, 4A, 4B, 5A, 5C; Mathematics 10A; Science 12B, 13B; Social Science 17A, 17B, 17C

Objectives

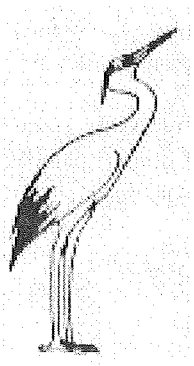
Students will: 1) become familiar with the practice of colonial nesting, its advantages and disadvantages; 2) recognize some Illinois wetland colonial nesting birds; and 3) analyze trends in a graph.

Method

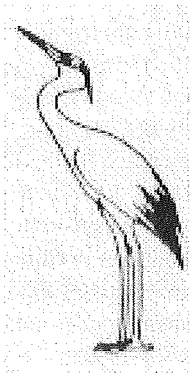
Students prepare a short report and complete a graphing exercise.

Background

About 13% of the world's birds are colonial nesters. These birds each require a nest site that is surrounded by nests of other similar birds. The place where these clustered nests are found is called a rookery. Ordinarily, colonies are made up of a single species of bird, but sometimes two or more species may be present. This is particularly true of species like herons and egrets that require similar nesting sites. Nests may be at any height, but often are placed in the tallest trees in the area. The number of nests in a colony varies greatly. For instance, great blue herons nest in colonies ranging in size from a few pairs to 1,000+ pairs. In all true colonies, each nesting bird owns and defends a small territory around its nest--a territory that usually corresponds to the reach of its owner's wings or beak.



Birds in these sites have the advantage of cooperative defense against predators. As a general rule, the larger the colony, the more successful this defense is. Large numbers of nests may lead to "predator saturation." Eggs and nestlings are a good food source for many predators, but they are present for only a short time. For example, great blue heron nestlings can stand at three weeks, walk on tree limbs at five weeks and fly at seven weeks after hatching. Predators may not have time to build or maintain populations large enough to take full advantage of the resource.



Social interactions related to foraging may be a reason for colonial nesting in species with unpredictable food supplies that are patchy but locally abundant. Some birds, however, nest colonially and forage alone. Herons, for instance, use stealth to hunt food and forage alone. Herons seem to learn a great deal about how productive remote feeding sites are from other birds in their breeding colonies. This gathering of information seems to aid young birds greatly.

In Illinois, great blue herons, great egrets, snowy egrets, little blue herons, cattle egrets, black-crowned night herons and double-crested cormorants are all colonial nesting birds. They are not the only colonial nesting birds in our state, but they are large, easy to identify and their population trends have been tracked to some extent. They are also wetland birds. The number of individuals of each of these species in Illinois has varied over time. Natural predators include crows, raptors and raccoons. Human actions like deforestation, draining wetlands and applying pesticides have been devastating. Humans can also create wetlands, preserve natural wetlands, apply pesticides with caution and follow other good conservation practices that will benefit the birds.

Materials

Colored pencils or crayons; graph paper; copies of the "Colonial Nesting Birds Graphing Exercise"; writing materials; bird field guides and research/reference materials.

Procedure

1. Discuss colonial nesting birds with the students. Introduce the terms "colonial nesting birds" and "rookery." Be sure that students are familiar with the meaning of these terms.
2. Talk about some of the wetland colonial nesting species that may be found in Illinois (great blue heron, great egret, snowy egret, little blue heron, cattle egret, black-crowned night heron, double-crested cormorant). Show the students pictures of these species. Use bird field guides and other reference books to find illustrations.
3. In small groups, have students briefly research each of these species and make a report to the class. Include food habits, migration habits and other information about life history in the report. Include historical information that the students may find about the species (particularly, human use of feathers). A good resource to use for life history information is the Illinois Natural History Survey's page on the World Wide Web. The address is http://www.inbs.uinc.edu/chipub/ifwis/birds/ .

4. Assign the graphing activity that follows. Students may work in small groups or as individuals. Review basic graphing information with them.
5. Discuss results with students. Have them explain any obvious trends.

Extensions

1. Have students write a short story describing life in a rookery. Each student should pretend to be a nestling or adult in the rookery and write from the point of view of that bird. Be sure to include how the place looks, smells, feels and sounds. Tell about your food and where it comes from. Remember, chances are you are in the top of the tallest trees. Other points to consider: waste disposal; weather; predators; insects; sturdiness of nest.
2. Some rookeries contain thousands of nests. Propose ways that individual birds may find their own nests.
3. Compare a rookery to an apartment complex. How are they alike? How are they different?
4. Research other colonial nesting birds found in the world. Compare/contrast to the seven species studied here.
5. Report on Harriet Hemenway (185X-1960) and Minna Hall (1859-1951) who started the Massachusetts Audubon Society over a bird hat protest movement. Read the book *She 's wearing a dead bird on her head!* by Kathryn Lasky from Hyperion Books for Children, New York (1995), which offers a tale about these two ladies and their efforts.

Evaluations

1. Most rookeries are found in bottomland forests along rivers. Why do you suppose this statement is true?
2. What are two advantages and two disadvantages of living in colonies?
3. Students should successfully complete and submit their graphing exercise.
4. A rookery that has been present at a single site for many years may be completely gone the next year. List three reasons that a rookery might disappear.
5. Students will be evaluated on their report/presentation.
6. Students should be able to identify the seven birds discussed when shown photographs or illustrations of them.

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Aquatic Illinois is a new, supplementary, interdisciplinary resource tool from the Illinois Department of Natural Resources' Division of Education. Grades 5-9 are targeted for the lessons, activities, posters, video tape, audio tape and other materials found in this education kit. For more information about Aquatic Illinois, see the Educational Materials section of this issue of the *Spectrum*. The following activity is a sample of the many Illinois specific items found in this education kit.

COLONIAL NESTING BIRDS GRAPHING EXERCISE

Since 1983, surveys have been taken by the Illinois Department of Natural Resources, Division of Natural Heritage, to determine the size and composition of colonial waterbird rookeries in Illinois.

The number of nests in a rookery is determined by aerial estimates and/or ground counts. Aerial estimates are taken by flying in a twin-engine airplane past the rookery once or twice about 500 feet above tree-top level. The observer counts nests and records numbers and types of birds present. During these brief flights it is difficult to tell which nests are active and which are inactive. It is also hard to see nests that are below the tree canopy. Ground counts are more accurate than aerial counts, since the observer can stand under the trees, watch the birds and count the nests for a long period of time. Both methods, however, are treated as estimates since errors do occur. Using the same methods year after year does allow comparison of data.

1. Use the following information to prepare two graphs. See graphs on next page.

Title the first graph "Rookeries." Label the x-axis (horizontal line) "Years." Label the y-axis (vertical line) "Number of Rookeries." Look at the data that you will graph, then divide each axis into the appropriate units of measure. Title the second graph "Nests." Label the x-axis (horizontal line) "Years." Label the y-axis (vertical line) "Number of Nests." Look at the data that you will graph, then divide each axis into the appropriate units of measure.

2. Graph the following data. Use this color scheme.

great blue heron (GBH) = blue great egret (GE) = yellow snowy egret (SE) = green little blue heron (LBH) = purple cattle egret (CE) = orange black-crowned night heron (BNH) = black double-crested cormorant (DCC) = red

3. Which species had the greatest number of rookeries in Illinois each year? Is the number of rookeries increasing or decreasing over time?

4. Which species had the greatest number of nests in Illinois each year? Is the number of nests increasing or decreasing over time?

5. Which species had the second highest total for number of rookeries each year? Is the number of rookeries for this species increasing or decreasing over time?

6. The species with the second highest total for number of rookeries did not always have the second highest total for number of nests.

A. Which species had more nests than the species named in question 5 for 1983, 1985 and 1987 but fewer nests in the rest of the years?

GRAPH 1--Number of Rookeries

	1983	1985	1987	1992	1993	1994	1995	1996
GBH	29	33	35	48	58	50	55	59
GE	15	18	24	22	25	19	21	25
SE	1	1	0	1	1	1	NA	NA
LBH	2	3	1	2	2	2	1	1
CE	3	4	2	2	5	3	2	4
BNH	6	6	8	9	8	6	8	8
DCC	0	0	2	5	5	4	6	8

GRAPH 2--Number of Nests

	1983	1985	1987	1992	1993	1994	1995	1996
GBH	2494	3460	5340	8970	9121	11636	10070	10129
GE	295	450	630	1424	1605	1793	1895	2108
SE	5	10	0	5	5	5	NA	NA
LBH	258	125	250	115	10	10	5	10
CE	237	180	265	3	287	6	10	157
BNH	887	1460	1900	1342	852	140	761	1200
DCC	0	0	21	343	386	355	719	475

B. How could increasing numbers of nests of one species lead to decreasing numbers of nests of another species? Give at least two reasons.

C. Do you think that there is any relationship to the idea in question 6B and the results from question 6A? If so, how? If not, why not?

7.The average size (height) of these seven birds is as follows: great blue heron 42-52", great egret 38", snowy egret 20-27"; little blue heron 24", cattle egret 20", black-crowned night heron 23-28", double-crested cormorant 33". (Peterson, R.T. 1980. *A field guide to the birds east of the Rockies.* Houghton Mifflin Company, Boston. 384 pp.)

A. Do you find any relationship between the size of the birds and the number of rookeries? If so, what is the relationship?

B. The survey results first listed double-crested cormorants nesting in Illinois in 1987. Using the size relationship above where should they rank in terms of number of rookeries? Does the graph show this trend?

C. Why would the size of the bird have anything to do with the number of rookeries built?

D. What besides size of the bird could affect the number of rookeries constructed?

8. Looking at the graphs you see that over this time period, snowy egrets, little blue herons, cattle egrets, black-crowned night herons and double-crested cormorants have remained relatively steady or shown slow declines in number of rookeries and nests. Why do you think these species have not shown the same steady increase in number of rookeries and nests that has been observed in the great blue heron? Give at least two reasons.

9. What are some problems with the survey methods described above? List at least two. Could there be more rookeries that may not be recorded? What could be done to improve the survey methods and obtain more accurate data?

10. The cattle egret is a recent immigrant to Illinois. Using your graphs, describe how the cattle egret's presence has affected the other species represented.

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THE ROAD ATLAS; A GREAT WAY TO DISCOVER YOUR ROUTES

Overview: Maps! Basic tool of the geographer. One of the most familiar types is the road map, folded and stored in the glove compartment of the car—or bound into an atlas. Reading road maps helps students master a wide range of practical skills as they decode the symbols, apply the scale to deter mine distance, and use the grid to locate unfamiliar places. In addition, road maps contain clues to the physical and human characteristics of a place, past and present

Grades

Grades 4-12

Material

Road atlases (Ask students to borrow one from their parents.)

Topics

Geography, social studies, Earth science

Geography Standards

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.

2. The physical and human characteristics of places

Starting Out: Divide the class into groups of 2 to 4 and distribute copies of a road atlas. Have the students examine the atlas to identify the various components of the maps (e.g., legend of symbols, distance diagrams, scale, map index, detailed inset maps of large cities and towns). Have students locate their hometown on the map of their state.

Questions and Activities

1. Direction: Refer to a map of the United States. Examine the numbers used to identify the major interstate highways. Can students discern a pattern in the assignment of numbers? (Even: east-west; odd: north-south.) Locate St. Louis, Mo. If you traveled south on 1-55, you would approach 1-40 near Memphis, Tenn. If you wanted to head *west,* would you turn left or right? (Traveling south, you would turn right, even though west is to the left on this north oriented map.)

2. Distance: Refer to a map of New Mexico and West Texas. Use a length of string or coarse thread and the map scale to determine the distance from Albuquerque to El Paso. Now use the mileage chart to check the measurement.

3. Map Symbols: Refer to a map of Maryland and the legend of standard symbols to answer these questions. Notice the different uses of point, line, and area symbols to represent different types of information.

a. In what county is the town of Drum Point?
b. Describe the location of Drum Point relative to Washington, D.C.
c. Drum Point lies near the juncture of what two bodies of water?
d. What is the county seat of Calvert County?
e. What major government facility is south of Drum Point?
f. Much of Dorchester County (east of Drum Point) is what type of land?
g. What is the only major highway that passes through Dorchester County?
h. Determine the distance between Cambridge and Salisbury, following Route 50, without using the map scale. (Students should use the small numbers printed beside the highway between symbols such as stars, dots, darts, or diamonds.)

4. Routes: Refer to the map of the state of Washington. Ask students to place themselves at Seattle-Tacoma International Airport. They want to drive from the airport to the state capital; to Mount Rainier National Park; to the Leavenworth ski area; and back to Seattle. Have them identify the best routes.

Alternative Strategies

Adapt activities to your local area or to areas of special interest to students. If atlases are not available, state road maps can be obtained from the local department of transportation.

To order the new *National Geographic Road Atlas 1998,* call (888) 6476733. Price: $14.95, plus shipping and handling; $13.95 for Society members.

OPPORTUNITIES

HELP SHARE THE CARE AT BROOKFIELD ZOO!

The Brookfield Zoo Parents Program is a great opportunity to help your students appreciate and learn more about animals. When you adopt an animal from our special school list, you will receive a four-color poster with science information, classroom activities, and a reading list. You will also receive a color 5x7 photograph of your animal with a personalized certificate in a display holder. The adoption packet also includes a detailed fact sheet on the species. Later in the year you will receive an update on the animal and an invitation to the annual Parents' Evening event. All of this is available for a $25 contribution. Adopt a group of animals to help explain adaptations or taxonomy. Or choose a group of endangered creatures and explore the different threats to each species. Organize a read-a-thon to encourage students to learn about their favorite animals and ask parents to contribute for each book their child completes. Ask the students to vote for the animal(s) they want to help care for. Next, come to Brookfield Zoo for a field trip to visit your adopted animals and learn even more.

When you contribute $45 for a Shared Care Plus adoption, each student (up to 35) will receive a baseball card with a color photo and facts about their animal. For each Shared Care Plus contribution you will also receive six free tickets to Parents' Evening. Baseball cards and posters are only available for the animals on the school list. Call the Brookfield Zoo Parents Program today for a brochure and school adoption list at (708)485-0263 ext. 341 or write us at 3300 Golf Road, Brookfield, IL 60513.

Janet Babb
Project LAVA
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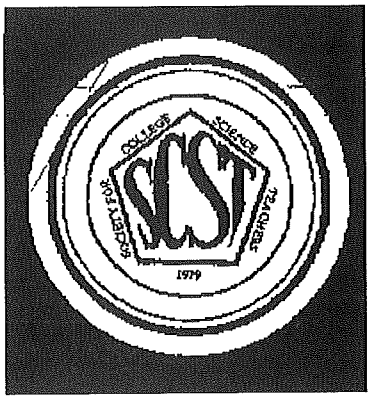
Tel/Fax: (808)985-9901
E-mail: jbabb@aloha.net

PROJECT LAVA— COURSE ANNOUNCEMENT

Spend a week in Hawaii exploring Kilauea, one of the most active volcanoes on Earth, in Project LAVA (Learning About Volcanic Activity), a summer course for K-12 science teachers conducted in Hawaii Volcanoes National Park on the Big Island. Three sessions are scheduled for 1998: July 8-14, and July 29-August 4. Classroom sessions consisting of demonstrations, hands-on activities, and lectures are followed by field excursions and hikes that provide "real-life" experience on an active volcano. The cost of the course is $650, which includes seven nights housing in rustic cabins near the summit of Kilauea Volcano, ground transportation to and from the Hilo airport and during all field trips, two catered dinners, instructional materials, and tax. Optional academic credit is offered for an additional fee. Airfare and meals (except for the two catered dinners) are not included.

Registration is limited to 20 teachers and is on a first-come, first-served basis. The deadlines to register are May 8 for the July session, and May 29 for the July/August session. For registration materials or more information, contact Janet Babb at the above address.



THE SOCIETY FOR COLLEGE SCIENCE TEACHERS

Purpose

To provide a forum for interdisciplinary interaction among teachers of science at all institutions of higher education.

History

The need for an organization such as this was identified by a group of concerned individuals within the National Science Teachers Association. Significant to their concerns was the lack of a forum through which college science teachers could interact in an interdisciplinary manner with colleagues from other institutions. The Society for College Science Teachers was established on March 24, 1979 in Atlanta, GA, by participants attending an NSF-sponsored program on undergraduate education.

In April, 1981, the SCST became an official affiliate of the NSTA. The merger provides increased services for college science teachers by assisting them to reach their personal objectives as well as those of the profession.

SCST affiliated with AAAS Section Q in 1991. In addition, SCST has supported other national and international organizations such as Triangle Coalition and ICES.

Goals

- Improvement in the teaching of college science courses via interdisciplinary interactions among teachers of college science.
- Provision of a profession-wide identity for teachers of college science.
- Promotion of a societal and cultural awareness of the significance of science to the modern world.
- Sponsorship of appropriate projects such as local and regional conferences and workshops.
- Promotion of collective self-interests.

Membership Categories SCST Membership

Members have the opportunity to present their views regarding the teaching of science to their peers at all SCST functions, as well as to publish these as scholarly achievements in the JCST, the SCST Newsletter, and SCST Monographs. Interest groups and Society committees provide additional contact and opportunities for input.

SCST/NSTA Joint Membership

In addition to those items listed above, a joint membership with the 50,000+ member NSTA includes an involvement with all elements of science education at nationals and local activities, opportunities for NSTA committee service, lower conference fees, special publications, low cost group insurance, distinguished service awards, employment registry, and more.

Join SCST today and be part of the growth and development of this exciting teaching association. Get involves—help direct the future of SCST!

For further information, please contact the SCST membership chairman at the following address:

Dr. Brian Shmaefsky
Biotechnology/Biology
Kingwood College
20000 Kingwood Dr.
Kingwood, TX 77339-3801
(281)359-1609

Benefits

Conferences

During the Fall and Spring of each year, convention programs and paper sessions are held as part of the NSTA Convention. Other regional and local SCST conferences have been organized for the exchange of ideas and experiences, and discussion of local issues.

Journal of College Science Teaching

SCST members receive the JCST which is published by NSTA six times a year.

SCST Newsletter

The SCST Newsletter provides a regular source of information about Society business, projects, and membership activities. It is a source for keeping up-to-date with the Society and new developments in college science teaching.

Outstanding Undergraduate Science Teaching Award

This award, sponsored by Kendall Hunt Publishers, is given annually at the national convention and is based upon Teaching, Scholarship, and Service.

SCST Monograph Series

To date, the Society has sponsored several monographs: Innovations in College Science Teaching and Enhancing Critical Thinking in the Sciences, and others. These are distributed to members free of charge upon publication.

SCST Programs and Abstracts

Each year the Society publishes the abstracts of all papers presented at SCST paper sessions at the regional and national conventions. This publication also includes the program for the current national meeting and a listing of current officers and local area membership coordinators.

SCST Mini-Grants

Mini-grants up to $1,000 may be awarded to members to foster projects consistent with the goals of the Society.

MEETINGS AND WORKSHOPS

IMAST SUMMER WORKSHOPS MIDDLE SCHOOL TEACHERS AND ADMINISTRATORS Residential Workshops Illinois State University, Normal June 22-26, 1998 or August 3-7, 1998

• Have you considered integration but don't quite feel ready to take the plunge?

• Has your team started some formal integration but finds itself struggling with curriculum design? Is your team ready to promote hands-on learning and engage students in frequent group work while integrating innovative mathematics, science, and technology concepts in a coherent them-based curriculum?

• Are you ready to utilize authentic assessment practices to measure your student's abilities to meet national benchmarks, standards, or your state's curricula frameworks?

The IMaST Mathematics, Science, and Technology Project is a two-year (10 module) program funded by the National Science Foundation. IMaST strives to integrate mathematics, science, and technology into a coherent them-based curriculum, promoting experientially based, hands-on learning. Students are offered an opportunity to apply the concepts and skills to new situations using problem-solving strategies.

For information and workshop registration contact:**Richard Satchwell, 309-438-3089, FAX: 309-438-3592 e-mail: resatch@istu.edu**

Dr. Bob Williams
Rivers Project

RIVERS PROJECT 1998 SUMMER TRAINING SCHEDULED FOR CHICAGO AND EDWARDSVILLE

The Rivers Curriculum Project is conducting its sixth annual summer training on the campus of North Park University in Chicago, IL (July 19-24) and Southern Illinois University at Edwardsville (Aug 2-7). Teachers will focus on one of six curriculum areas while receiving

interdisciplinary training in all. The six units, now published by Addison Wesley, are: biology, chemistry, earth science, geography, language arts and mathematics. The units were developed under a grant from the National Science Foundation. Trainers for the week-long session are practicing Rivers Project teachers who are supported by university and other professionals.

Teachers and other professionals interested in working with water testing education can attend the training scheduled for July 19-24 at North Park University in Chicago or August 2-7, 1998 at Southern Illinois University in Edwardsville, IL. For the second summer, the Friends of the Chicago River will co-sponsor the Chicago area training that will focus on urban rivers. Tuition (two semester hours credit, Summer, 98) and curricular materials will be available. A non credit option is available. Lodging and food will be available at a low cost. Interdisciplinary teams from the same school are encouraged. Call for information on the training or the curriculum units at the Rivers Project. 618-692-3788, FAX 618-692-3359, by e-mail at rivers@siue.edu, or via the World Wide Web at URL: http://www.siue.edu/OSME/river

EXPANDING HORIZONS — The Bronx Zoo Education Department 1998 Summer Workshop Schedule

Workshop Schedule and Fees

• *Pablo Python Looks At Animals* - Grades K - 3
June 22 - 26, 1998
Registration and Materials Fee: $285

• *Habitat Ecology Learning Program* - Grades 4 - 6
July 13 - 17, 1998 - *Temperate Forests; Rain Forests; Deserts*
August 3 - 7, 1998 - *How Nature Works, Grasslands, Wetlands*
Registration and Materials Fee: $285

• *Diversity of Lifestyles Team Workshop* - Grades 6-8*
August 10- 14, 1998
Registration and Materials Fee: $285

* Only teams of a science teacher, math teacher, social studies and/or language arts teacher may apply.

• *Survival Strategies* - Grades 7 - 12
July 6 - 10, 1998
Registration and Materials Fee: $285

• Need more information? Call Ann Robinson, Manager of National Programs at (800) 937-5131.

Thank you for your interest in our National Programs!

EXOTIC SPECIES DAY CAMP 1998
AN INTERACTIVE TRAINING EXPERIENCE FOR EDUCATORS

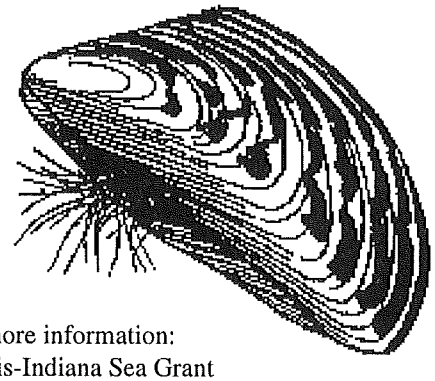
The Exotic Species Day Camp is an exciting introduction for classroom and nonformal educators to harmful aquatic exotic species. During 1998 five regional, one-day workshops, or 'camps' will be offered.

Teachers and educators participating in workshops will be introduced to new resources to teach students about how exotic species relate to issues of water and sediment pollution, food webs, threatened and endangered species, global climate change, and water-related economic impacts.

Area Sites

John G. Shedd Aquarium
Chicago, IL
August 13, 1998

University of Minnesota Duluth
Duluth, Minnesota
June 15, 1998



For more information:
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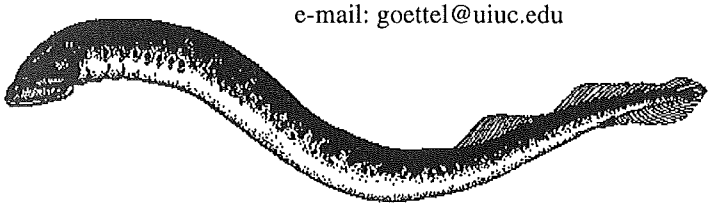
Urbana, IL 618-1
217-333-9448
FAX: 333-2614
e-mail: goettel@uiuc.edu



AWARDS AND RECOGNITION

GLENCOE'S CENTRAL SCHOOL WINS NATIONAL ENGINEERS WEEK FUTURE CITY COMPETITION

A city of the future - "Seolforis" - built by colonists from Earth to exploit the tremendous resources of pure silver on the ice-covered planet of the same name, has won the sixth annual National Engineers Week Future City CompetitionTM. The students -- a team of three seventh- and eighth-graders from Central School in Glencoe, Illinois, extract the silver from pockets in the ice, then export it to Earth for use in electronic devices, replacing modern alloys. Since there is no natural soil on the surface, hydroponics plantations provide fruits and vegetables for Seolforis.

Thousands of students from hundreds of schools throughout the United States participated in the competition. The winning teams from 12 regional competitions held in Buffalo, Chicago, Detroit, Los Angeles, Louisiana, Milwaukee, New York City, Omaha, Philadelphia, Phoenix, St. Louis, and Washington, D.C., participated in the national finals, held February 24 at the National Building Museum in Washington. The Glencoe team was honored at the Illinois Engineers Week luncheon on Friday, February 27, 1998.

The competition asks students from around the nation to create -- first on computer and then in three-dimensional models -- their visions of the city of tomorrow. Students work with volunteer engineer mentors who help guide the youngsters through the rigors of building a functioning city. Using the award-winning SimCity 2000TM and the Urban Renewal Kit add-on software -- donated by Maxis, a software firm based in Walnut Creek, California -- the youngsters must tackle politics, transportation, budgeting, energy needs and other difficulties.

The winning Glencoe team included students Brian Freedman, Matthew Keenan and Adam Patinkin, along with teacher Barbara Janes and volunteer engineer mentor Craig Smith. The national winning team receives $5,000 cash. Second prize in the competition went to Scottsdale (Ariz.) Middle School, while Our Lady Help of Christians in Abington, Pa. took third prize honors.

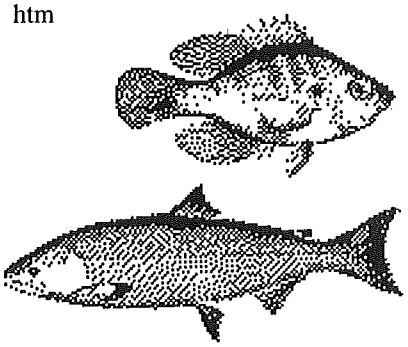
The Future City Competition is sponsored by National Engineers Week, founded in 1951 by the National Society of Professional Engineers to increase public awareness and appreciation of the engineering profession and of technology. Co-chairs for 1997 are the Construction Specifications Institute and Phillips Petroleum Company.

EDUCATIONAL MATERIALS

AQUATIC ILLINOIS —DIVE IN!

Aquatic Illinois is an exciting, new, supplementary, interdisciplinary resource tool from the Illinois Department of Natural Resources' Division of Education. Grades 5-9 are targeted for this fifth in a series of conservation education kits. Lessons are designed to instill an appreciation for, understanding of and commitment to upholding Illinois' aquatic heritage. Units on Illinois water, the ecology of aquatic communities, water issues and taking action are included. Materials are Illinois specific. All activities have been correlated to the Illinois Learning Standards of the Illinois State Board of Education.

Aquatic Illinois is being distributed in the winter of 1998 to all public and private schools registered with the Illinois State Board of Education and which have any of grades 5-9. Kits may be borrowed from the Illinois Department of Natural Resources' regional offices, state parks which have interpreters, the Chicago office and the Springfield office. Aquatic Illinois will be loaned through the Illinois State Library system and several other sites. For more information, contact the Illinois Department of Natural Resources, Educational Services Section, 524 South Second Street - Room 530, Springfield, IL 62701-1787 (phone 217/524-4126; FAX 217/7825177, E-mail: teachkids@dnrmail.state.il.us). Lessons are available from our web page. http: //dnr.state.il.us/nredu/nredpage.htm



Features

• Lessons and activities cover such topics as wetlands, rivers and streams, ponds and lakes, surface and groundwater, exotic species, organisms' aquatic adaptations, aquatic history, water as a resource and watersheds.

• A 15 minute videotape gives a look at many aquatic topics including where water is found in Illinois, its uses, problems and solutions. Explore aquatic habitats in our state and some of the organisms in them. Learn about the importance of aquatic related careers and recreational opportunities.

• Hear the calls of 12 species of Illinois frogs and toads on the audio tape or select water sounds suitable for use with several of the activities.

• The full color Illinois Frog and Toad Fact Sheets provide information and visuals of 12 species to use with the audio tape.

• Seven posters are included. *Aquatic Invertebrates, Common Fishes of Illinois, Illinois 1818--Today, Illinois Mussels, Northern Illinois Wetlands, Southern Illinois Wetlands* and *Streams of Illinois* may be used alone or to support activities. Poster guides for four of the posters are included.

• Research aquatics with the Illinois specific fact sheets (aquatic species, exotic species, rivers and lakes) and *Illinois Fishes Cutouts.*

• *A Guide to Illinois Lake Management* provides valuable resources for student projects.

• Learn about some Illinois endangered/threatened aquatic species.

• Take a break and complete the giant *Illinois Aquatic Resources: A Crossword Puzzle.*

• *River Navigation Today: Locks and Dams and WILD Math: How Many Fish are in This Lake?* may be used alone or in conjunction with other activities.

GEMS OFFERS STANDARDS HANDBOOK

The Architecture of Reform: GEMS and National Standards, a new publication from Great Explorations in Math and Science, charts a course through the maze of new national and state standards, benchmarks, and frameworks. It discusses the common vision of science education reform programs. You can use it as a roadmap for applying these documents to your own science education curricula.

The author, Cary I. Sneider, served on the Working Group on Science Content Standards for the National Science Education Standards and recently received an NSTA Distinguished Informal Education Award

To order the 112-page handbook (ISBN 0-912511-43-5), mail $9 plus $3 s/h to GEMS, Lawrence Hall of Science, University of California, Berkeley, CA 947205200. Or call them at 510-642-7262; fax 510-6430309; or e-mail gems@uclink.berkeley.edu.

You can buy the following items from the Association for Supervision and Curriculum Development. Call 1-800-933-ASCD, ext. 2723 (press 2), or call 703-5499110.

As Tough as Necessary by Rick Carwin and Allen Mendler, authors of *Discipline with Dignity,* examines effective prevention, action, and resolution strategies for hostile classroom situations. This 145-page guide costs $15.95 ($12.95 for ASCD members). (stock#197017N25)

Mapping the Big Picture: Integrating Curriculum and Assessment K-12, an ASCD Premium Member book of 1997, has 110 pages and costs $16.95 ($13.95 for members). (stock #197135N25)

A New Vision for Staff Development discusses trends and shifts in staff development practice. This ASCD Premium and Comprehensive Member Book of 1997 was co-published with the National Staff Development Council. It contains 108 pages and costs $17.95 ($14.95 for members). (stock #197018N25)

The Language of Learning: A Guide to Education Terms contains terms from "action research" to "teacher portfolios," giving examples and follow-up resources for many of the terms. More than a dictionary, it shows important trends in education. You can order this book from ASCD for $13.95 ($11.95 for members). (stock #197155)

The State of America's Children Yearbook 1997, compiled by the Children's Defense Fund for parents, educators, volunteers, and anyone in youth services, includes text, graphs, charts, and tables of statistics on youth issues. To order this 120-page booklet, send $17.95 to CDF, 25 E St. NW, Washington, DC 20001, or call 202-628-8787.

Team Up To Save Lives: What Your School Should Know About Preventing Youth Suicide is a CD-ROM presenting a suicide prevention curriculum piloted by the Institute of Iuvenile Research at the University of Illinois at Chicago. An accompanying brochure, "Five Minutes of Your Time Can Mean a Lifetime to a Suicidal Adolescent," includes questions and answers on firearm disposal. Copies are free with a $4.70 s/h fee. For more information or to order copies, contact the McDonald House Charities Resource Center at 1-800-627-7646.

The following items are available for $10 from the Children's Safety Network. CSN, a national resource for prevention of child/adolescent injury and violence, is funded by the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services. Make checks payable to Education Development Center, Inc. To order ***Taking Action To Prevent Adolescent Violence: Educational Resources for Schools and Community Organizations*** **and the** ***Directory of Faculty and Courses in Injury and Violence Prevention,*** contact Ellen Mushlin and Michelle Stober, respectively, at CSN, Education Development Center, Inc., 55 Chapel St., Newton, MA 02158-1060; 617-969-7100.

Bruce Fuchs
Office of Science Education
Public Health Service
National Institutes of Health
Bethesda, MD 20892
(301) 402-5225

NIH TO DEVELOP HEALTH SCIENCE CURRICULUM SUPPLEMENTS FOR THE NATION'S SCHOOLS

The National Institutes of Health (NIH) is launching a major new science education initiative—development of curriculum supplements for the nation's elementary through high school science classrooms. Designed to improve students' understanding of the relationship between basic biology and human health, three new supplements will be available to teachers each year, beginning in 1999.

The first three supplements, which are designed for high school biology courses, will focus on cancer, genetics, and infectious diseases. They are being produced through a contract with Biological Sciences Curriculum Study (BSCS) of Colorado Springs, Colo., and Videodiscovery of Seattle, Wash. The NIH Office of Science Education (OSE), which is overseeing the project, will partner each year with three of NIH's institutes. For the first set of supplements, the OSE collaborated with the National Cancer Institute (NCI), the National Human Genome Research Institute (NHGRI), and the National Institute of Allergy and Infectious Diseases (NIAID).

The first supplements address three major content areas. NCI's unit deals with basic cell biology and focuses on cancer as a cellular and genetic phenomenon. NHGRI's unit covers the importance of human genetic variation, with a focus on genetic screening and testing for singlegene and multifactorial traits, and disease risk. NIAID's unit deals with the dynamics of emerging and reemerging infectious diseases and methods of disease prevention.

BSCS and Videodiscovery will design the materials for use by a wide array of students and instructors across the United States. To promote the supplements' integration into existing science curriculums, the content will be correlated to match that of the most widely used textbook programs. Each unit will have an interactive CD-ROM as well as print modules that have inquiry-based activities and support materials for teachers.

The curriculum supplements will also be among the first life science materials specifically designed from start to finish to meet the *National Science Education Standards.* The standards, which were released in 1995 by the National Academy of Sciences, outline what all students should know and be able to do in the field of science by the time they graduate from high school. To meet the standards, the supplements will focus on major scientific concepts including those related to the nature and methods of science and on inquiry as a central pedagogical strategy.

Until the modules become available, periodic updates on the project will be available on the OSE home page *(science-education.nih.gov).* Updates will also be available after the units are implemented in classrooms across the country. BSCS's semiannual newsletter—*BSCS: The Natural Selection*—and its Web page *(www.bscs. org)* will also provide information on the project.

The OSE coordinates, plans, and develops a comprehensive science education program to strengthen and enhance efforts of the NIH to attract young people to life science careers and to improve science literacy among both children and adults. NIH is an agency of the U.S. Department of Health and Human Services.

YES, I WOULD LIKE TO CONTRIBUTE TO THE ISTA SPECTRUM

I have a good idea that I'd like to share!

Name: _____

School or Business: (name) _____
(address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Home: (address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Title of Contribution:_____

I would like may article to appear in:

___ARTICLES
___IN FOCUS
___SPECIAL INTERESTS
___MINI IDEAS
___REVIEWS
___POTPOURRI
___OPPORTUNITIES
___MEETINGS
___AWARDS/RECOGNITION
___FIELDTRIPS/WORKSHOPS
___EDUCATIONAL MATERIALS

Please print my contribution in the following issue(s):

___**Fall** (due June 1)
___**Winter** (due September 1)
___**Spring** (due December 1)
___**Summer** (due March 1)

SPECTRUM welcomes black and white glossy photographs. We can sometimes use color pictures but they must be sharp with high contrast. Please enclose a stamped self-addressed envelope if you want your photos returned.

ISTA REGIONAL DIRECTORS

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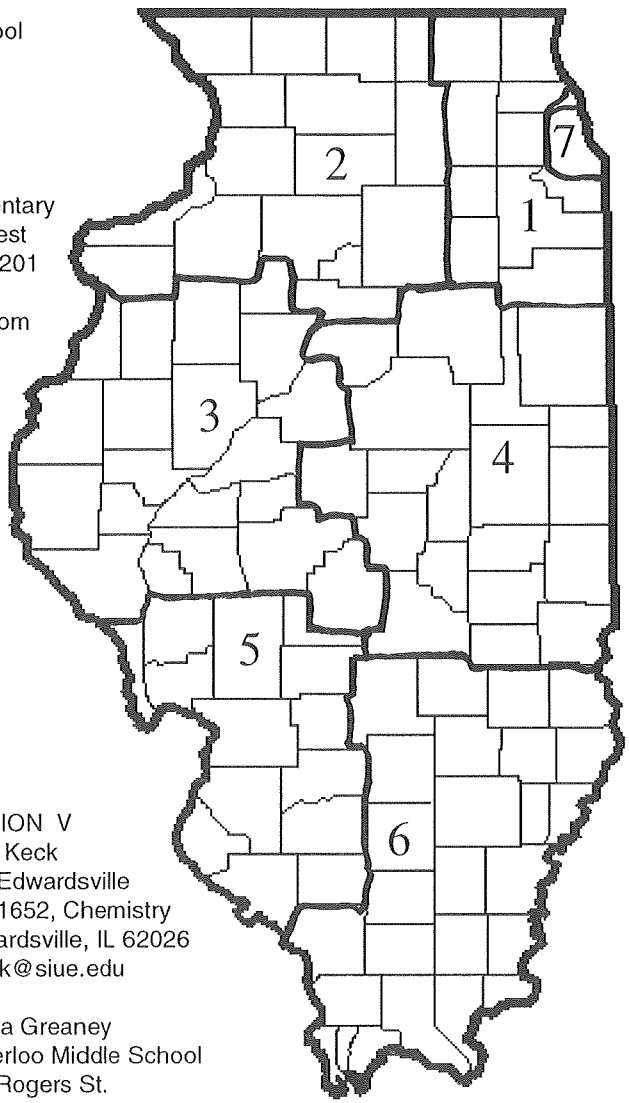

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FAX (618)549-1686
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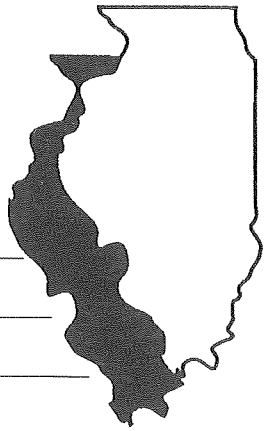
Region I	McHenry, Lake, Kane, Cook, DuPage, Kendall, Will, Grundy, Kankakee
Region II	Jo Daviess, Stephenson, Winnebago, Boone, Carroll, Ogle, DeKalb,Whiteside, Lee, Rock Island, Henry, Bureau, LaSalle, Putnam, Marshall, Mercer
Region III	Henderson, Warren, Knox, Stark, Peoria, Hancock, McDonough, Fulton, 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



PLEASE PRINT OR TYPE AND FILL OUT COMPLETE FORM

Name	Day phone
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CHECK APPLICABLE CATEGORIES IN EACH COLUMN

o Elementary Level	o Elementary Scinces	o Teacher
o Middle Level	o Life Science/Biology	o Administrator
o Senior High School	o Physical Sciences	o Coordinator
o Community College	o Environmental Science	o Librarian
o College/University	o Earth Science/Geology	o Student
o Industry/Business/ Governement	o Chemistry	o Retired
	o Physics	
o Other_____	o General Science	
	o Intergrated Science	
	o Other_____	

Send form and check or money order made payable to ISTA to: Diana Dummitt, ISTA Membership, Coll, Education, University of Illinois, 1310 S. Sixth Street, Champaign, IL 61820

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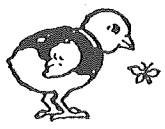

SPRING/SUMMER 1998