National Institute
of
Environmental Health Sciences

Environmental Health Science as an Integrative Context for Learning
Annual Grantee Meeting

Baylor College of Medicine
Houston, Texas
April 4-6, 2001

Background and Introduction

The National Institute of Environmental Health Science (NIEHS) is playing an increasingly important role in numerous public health issues because of the desire of the public to understand the effects and risks to human health from exposure to physical and chemical agents. Although the public is challenged to make decisions on the risk and benefits of agents which permeate society, there have been few, if any, programs which prepare the public to meet this challenge. For example, in the past few years there have been media reports concerning the hazards of electromagnetic radiation, chemicals in drinking water, and pesticides in food. While the scientific community has been tasked with making scientifically based recommendations on the safety of chemicals and physical agents, the general public has become increasingly involved in the regulatory decision-making process. Therefore, there is a critical need to develop a mechanism for educating the general public about environmental health issues. To address this need, the NIEHS has initiated a K-12 education program. Environmental Health Science as an Integrative Context for Learning (EHSIC) awards represent the third component in National Institute of Environmental Health Science's (NIEHS) K-12 extramural research program in environmental health science education.

The NIEHS seeks to enhance dissemination, utilization, and effective implementation of materials and curricula pertaining to environmental health science. A necessary step in achieving this objective is the provision of teachers with requisite disciplinary and pedagogical skills. Through NIEHS supported programs, curricula materials addressing multiple environmental health issues have been generated that are grade level appropriate for K-12 students. Moreover, teacher training at sites around the nation, that include teachers from New Jersey to Alaska, has been done to help implement environmental health science education at the K-12 grade level. These goals have been addressed by the first two K-12 environmental health science education initiatives developed by the NIEHS in 1993 and 1996. Additional information and details on the awards and projects developed in response to these solicitations may be found at:
http://www.niehs.nih.gov/dert/programs/translat/k12/ted.htm and
http://www.niehs.nih.gov/dert/programs/translat/k12/imd.htm

The NIEHS recognizes the need for all students in our nation to perform/learn at levels that are compatible with the National Science Education Standards, as well improving overall academic performance. Based upon programmatic accomplishments, the NIEHS has implemented the most comprehensive and successful K-12 education program within the NIH. The EHSIC Program expands upon this foundation by broadening the scope of NIEHS K-12 activities to include new partners, e.g., school districts and new curricula, e.g., non-science courses. The specific intent of the EHSIC program is to organize environmental health science activities into a variety of curricular areas, that will improve overall academic performance as well as enhance students' comprehension of and interest in environmental health sciences. For additional information see K-12 website at:
http://www.niehs.nih.gov/dert/programs/translat/k12/ehsic.htm

The purposes of this first annual meeting of EHSIC Grantees are to introduce investigators to each other and the various different projects being pursued in this program; to hear from nationally recognized leaders in K-12 science education on topics such as curriculum standards, assessments and professional development; learn about potential roles for state departments of education; and promote opportunities for collaboration between projects, institutions and states in developing as well as implementing cutting edge K-12 environmental health science curricula.

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Wednesday April 4, 2001

12:30 – 1:30 **Registration**

1:30 **Opening remarks**
Frederick L. Tyson, Program Administrator, Chemical Exposures and Molecular Biology Branch, Division of Extramural Research and Training, National Institute of Environmental Health Sciences

2:00 **Distance Learning and Technology in the Classroom**
Jon J. Denton Executive Associate Dean, College of Education, Texas A&M University

3:00 **Integrating Environmental Health into Mathematics and Science**
Irene Pickhardt, Assistant Director for Science, Texas Education Agency

4:00 **Break**

5:30 **Reception**
The Children's Museum of Houston

Welcome
Cheryl McCallum, Director of Education, Children's Museum of Houston

Tour
Interactive Ecostation Exhibit

7:00 – 9:00 **Dinner**
The Children's Museum of Houston

Welcome
William A. Thomson, Director of the Center for Educational Outreach and Professor of Family and Community Medicine, Baylor College of Medicine

Keynote Address
Gerald F. Wheeler, Executive Director of the National Science Teachers Association

Thursday April 5, 2001

8:00	**Welcome** James W. Patrick, Vice President and Dean of Research, Baylor College of Medicine
8:15	**Efficacy of Environment-Based Programs** Linda L. Hoody, Professional Development Coordinator, State Education and Environment Roundtable
9:15	**Curriculum, Standards and Assessment** Angelo Collins, Executive Director, Knowles Science Teaching Foundation
10:15	**Break**
10:30	**EH-STEP (Environmental Health Sciences Training and Education Program)** Laura Hemminger, EOSHI, Rutgers University
11:30	**Lunch**
11:45	**RICE School Briefing** Nancy P. Moreno, Center for Educational Outreach, Baylor College of Medicine
12:30–2:30	**Visit the RICE SCHOOL** **(Observe EHSIC implementation in grade 1,3 and 4 classrooms)**
3:30	**Integrating Inquiry, Equity, and Technology: Issues to Consider** Marsha Lakes Matyas, Education Officer, American Physiological Society
4:30	**Professional Development in Science Education** Norma Neely, Associate Director for Regional Projects, Texas Rural Systemic Initiative, Charles A. Dana Center, The University of Texas at Austin
5:30	**Dinner Break**
7:30 – 9:30	**Poster Session** , Medical Center Marriott, Houston, TX

Friday, April 6, 2001

8:00	**Panel Discussion** **Integration of Cross-disciplinary Courses in EHSIC** (Texas A&M, Oregon, Miami, NJ)	
9:15	**Panel Discussion** **State Department of Education Roles in EHSIC Programs** (Rochester/Maryland/Washington/Texas/Bowling Green)	
10:45	**Closing remarks**	Frederick L. Tyson
11:00	**Adjourn**	

Evening Program

Wednesday April 4, 2001

5:30 **Reception**
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7:00 – 9:00 **Dinner**
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Keynote Address
Gerald F. Wheeler, Executive Director of the National Science Teachers Association

Professional Development in Science Education

Norma Neely, Professional Development Director on the board of the National Science Teachers Association, will outline current strategies and techniques for quality professional development in science education. Examples of innovative professional development models will be shared as well as ideas for follow-up activities to further enhanced professional development learning experience.

Norma Neely Biosketch

In addition to serving as Professional Development Director on the board of the National Science Teachers Association, Norma Neely is active in math and science reform in Texas. She is Associate Director for Regional Projects with the Texas Rural Systemic Initiative. As such, she coordinates activities of twelve regional specialist around the state of Texas and designs professional development experiences for Teacher Partners in 61 rural districts. She was formerly Building a Presence for Science State Coordinator and has received a Presidential Award for Excellence in Science Teaching. Norma has written grants and collaborated on several innovative professional development learning experiences. She is currently completing her dissertation in Educational Leadership from the University of Texas at Austin.

Curriculum, Standards and Assessment

As you develop materials, programs and projects intended to increase student understanding of environmental science, no doubt you have asked yourselves questions about what topics to include and how you will know if your project has been successful. Curriculum, as an area of study, provides principles to decide what topics to consider; Standards provide both a vision for curriculum and a bar to measure progress toward that vision; Assessment provides a framework and tools to determine if the goals of the project are being met. Together, Curriculum, Standards and Assessment mutually reinforce one another and increase internal consistency in a project. A brief overview of Curriculum, Standards and Assessment will be presented followed by practical tips and examples for aligning them.

Angelo Collins Biosketch

Angelo Collins currently is the Executive Director of the Janet H. and C. Harry Knowles Foundation that was recently established to influence the quantity of high quality high school science teachers. She was the Director of the Project of the National Research Council that produced the National Science Education Standards. She also was the Director of the Teacher Assessment Project at Stanford University that conducted seminal research on performance assessment for teachers [and informed the deliberations of the National Board for Professional Teaching Standards and the Interstate New Teacher Assessment and Support Consortium.] She has taught high school biology, served on the faculty of several universities, and directed an award-winning, NSF-funded teacher professional development program for middle grades science teachers. She has written extensively on curriculum, standards, assessment and professional development. Her doctoral degree is from the University of Wisconsin and she is a fellow of the American Association for the Advancement of Science.

Distance Learning and Technology in the Classroom

This presentation will begin by examining technology infrastructure and distance learning applications in Texas and across the United States to convey the context for delivering distance learning programs. Distinctions between synchronous and asynchronous distance learning programs will be presented. The presentation will conclude with a presentation of the asynchronous program materials being developed for the National Institute of Environmental Health Sciences at Texas A&M and possible extensions of that work.

Jon Denton Biosketch

Jon J. Denton, Ed.D., is Executive Associate Dean of the College of Education at Texas A&M University. As the research administrator, he is responsible for pre-award and post-award research grant management in the College. He currently serves as the P.I. or co-P.I. on six funded projects (five federal grants and one state grant) involving the integration of technology into classrooms. Dr. Denton is a professor in Teaching, Learning and Culture and has published over one hundred forty publications and technical reports on different instructional design strategies and their effect on student achievement. Cost-effectiveness of these instructional strategies, technology applications in classrooms and evaluation of teacher preparation programs have been his primary research and academic interests.

Integrating Environmental Health into Mathematics and Science

This session will share the latest research on the effectiveness of using the environment as an integrating context (EIC). What do we know about student performance in mathematics and science in EIC programs? How does this model fit into state standards and high-stakes testing? We'll review success stories from a variety of states.
Tools for success include rubrics developed by the State Education and Environment Roundtable included as handouts.

Irene Pickhardt Biosketch

Irene Pickhardt is assistant director of science at the Texas Education agency. Her responsibilities include providing guidance to Texas' statewide, standardized science test program, the adoption of K-12 textbooks in science, and state-funded professional development initiatives in science. She is executive producer of the T-Star network's premier television program, *Eye on Earth* and represents Texas on the State Education and Environment Roundtable, a national cooperative program that helps state education agencies improve learning by integrating environmental education in K-12 curricula and systemic reform efforts

Efficacy of Environment-Based Programs

Ms. Linda Hoody will present a brief overview of national studies reporting the educational efficacy of environment-based programs. This research, conducted by the State Education and Environment Roundtable (SEER), documents improvement in students' academic achievement and behavior when involved in school programs that use the local community as the context for interdisciplinary learning.

The original nationwide study of 40 schools, reported in Closing the Achievement Gap, was the basis for development of SEER's education reform model called EIC (Using the Environment as an Integrating Context for Learning). The presentation will primarily focus on how SEER helps educators adopt the EIC school improvement model. Ms. Hoody will outline SEER's professional development program and delineate the program evaluation procedures. She will also describe the tools SEER has developed to analyze the EIC implementation process.

Linda Hoody Biosketch

Ms. Hoody is SEER's professional development coordinator. She has been in the field of education for 24 years, serving in a variety of administrative and teaching positions. Ms. Hoody holds a lifetime California teaching credential (kindergarten though adult) and has taught at elementary through university levels, and designed and directed staff development for school and outdoor education programs. Ms. Hoody received her M. A. from San Diego State University, and her teaching credential and B.A. from California State University-San Jose.

Integrating Inquiry, Equity, and Technology: Issues to Consider

In the past decade, significant changes have taken place in our vision of what precollege science education should include. The National Science Education Standards have been developed and widely disseminated, and numerous states have developed and/or revised their standards, often in line with the national standards. Terms such as “inquiry-based learning,” “constructivist teaching approaches,” and “authentic assessment,” have switched from being innovative approaches to being mandated standards in many districts. And the use of technology in the classroom has progressed from calculators, filmstrips, videotapes, and drill and practice programs to graphing calculators, multimedia simulations, remote sensors, web searches, and interactive online curricula. What implications do these significant changes in science education -- or even simply in our views about and goals for science education – have for students from both genders, from diverse racial/ethnic groups, and with diverse learning styles and needs? This presentation will focus on inquiry-based learning, technology use in science education, and issues of equity and diversity. First, a brief overview of “where we are” will be presented, followed by highlights of recommendations from recent reports. Finally, the presentation will offer questions to consider for teachers, project directors, and policy makers as they seek was to integrate inquiry, equity, and technology in classrooms on a daily basis.

Marsha L. Matyas Biosketch

Marsha Lakes Matyas serves as the Education Officer for the American Physiological Society (APS). Her research fields include factors affecting science and engineering interests and participation rates among women and minorities at the precollege, undergraduate, and graduate levels. She earned her master's degree in cell biology and her doctorate in science education at Purdue University. For eight years, she directed the Projects on Women in Science at the American Association for the Advancement of Science (AAAS). At the APS, she currently directs a variety of programs, including: minority recruitment and retention programs at the precollege, undergraduate, and graduate levels; summer research experience programs for middle and high school science teachers (including teachers from Native American reservations); and a mentoring program for graduate and postdoctoral women in physiology. She also has extensive experience as an external evaluator for science education programs, especially those focusing on girls and women. Under her direction, the APS Education Office has developed an interactive web site of resources for the life sciences educator and is currently developing a searchable Archive of Teaching Resources for preK-professional education.

Integrating Environmental Health into Mathematics and Science

What is the Role of Integration in a High Stakes Environment?

What are the realities facing schools today?
This session will examine the realities facing schools today and why we need integration. The realities include high stakes testing, state and national standards, changes to graduation requirements, student turnover, and teacher shortages.
Why do we need integration? We'll look at the benefits to teachers, school districts, parents, and students.

EH-STEP
(Environmental Health Sciences Training and Education Program)

Grant No: R25 RR15621
Grant Funder: National Center for Research Resources, National Institutes of Health under the Science Education Partnership Award Program
Principal Investigator: Audrey R. Gotsch, DrPH, CHES, Interim Dean, UMDNJ-School of Public Health and Director, Public Education Risk Communication Division, Environmental and Occupational Health Sciences Institute

The University of Medicine and Dentistry of New Jersey-School of Public Health (SPH) and the Environmental and Occupational Health Sciences Institute (EOHSI) are managing EH-STEP (Environmental Health Sciences Training and Education Program), a nationwide K-12 educational initiative. Seven National Institute of Environmental Health Sciences (NIEHS) Centers of Excellence, through their Community Outreach and Education Programs (COEPs), have been selected and are collaborating to serve as teacher training sites. The goal of this project is to enable more than 40,000 students nationwide to improve their basic science and math skills while learning to reduce their exposure to potential pollutants and possibly prevent environment-related diseases and illnesses. As such, over 2,000 educators will be integrating environmental health sciences (EHS) curricular materials into their science and math lessons through teacher professional development opportunities.

COEPs at Oregon State University, University of Arizona, University of Southern California, University of Texas Medical Branch at Galveston, University of Wisconsin-Madison, Vanderbilt University and Wayne State University are participating in EH-STEP. Each COEP has established a Regional Education and Training Center (RETC) at its site to provide professional development opportunities for teachers. Partners also include scientists from these centers and the Toxicology Education Foundation (TEF). This broad-based partnership will ensure that the project is translatable nationwide.

A *curriculum dissemination through professional development* model is utilized. This model comprises four main components–EHS curricula, train-the-trainer workshops, teacher trainings and scientist involvement–and will expand on two of EOHSI's successful nationwide professional development and curriculum dissemination programs: the *ToxRAP ™* (Toxicology, Risk Assessment and Pollution) *Network*, a joint program with the University of Arizona, supported by NIEHS, and the *ToxRAP ™ Education and Training Program* supported by TEF. EH-STEP will use curricular materials for this initiative that focus on EHS issues relevant to students' lives. *ToxRAP ™*, an award-winning EHS curriculum series developed by EOHSI with support from NIEHS, will serve as the initial curriculum for dissemination. A Curriculum Selection Board is identifying additional materials/ programs that will be incorporated into EH-STEP.

RETC-designated teams attend train-the-trainer workshops on implementing the selected curricula, as well as designing and delivering effective teacher training programs. Each RETC is then responsible for providing trainings and curricular materials to K-12 teachers in its region. A Scientist Involvement Advisory Board is developing strategies for scientists to interact with teachers/students and to encourage students to pursue careers in biomedical and behavioral sciences research. Ongoing support is provided through Internet-based technologies. Formative and summative measures are used to analyze project

effectiveness.

Using Problem-solving Adventures to Integrate Environmental Health Science into Rural Middle-School Curricula
1R25 ES 10735
Texas A&M University
Principal Investors: L. Johnson, J.F. Hunter, W.R. Klemm, J.B. Kracht, D.T. Kochevar, J.J. Denton, K.C. Donnelly, I.N. Ramos, C.C. Farnsworth, and V.B. Hardy

The long-term goal of the Partnership of Environmental Education and Rural health (http://peer.tamu.edu) is to develop an engaging model for integrating environmental health science into math, English language arts, social studies, and science of rural grades 6-8. Rural is emphasized because of public concern for increased numbers of environmentally-related diseases in rural Texas (birth defects, lead poisoning, etc.). Rural schools are less likely than metropolitan schools to receive state-of-the-art information on environmental health, but may need it most. Rural schools have less interaction with college professors that might influence a child's career choices. Middle school was chosen, as it is the prime developmental period for social skills and is central to channeling young adolescents into the mainstream of American life by making vast improvements in their academic and personal competence (and resulting societal contribution). Our ultimate goal is to change the culture in Texas middle schools by getting teachers of all subjects to work together to use Environmental Health Science topics to teach more science and to help motivate students in all subject matter. Moreover, because state-mandated testing has reported that students in this age group perform poorly in problem solving and critical thinking, we are building the curriculum around problem-solving and analytical tasks.

For the first year, there will be six modules (each representing a flexible 1- to 5- day lesson plan) reflecting the Texas standards for 6^{th} grade social studies, English, math, and science. The subject contents are integrated around a short (20 minute) adventure story written by a professional writer of children's literature about 6^{th} grade students who travel in time.

In the story line, students go on a series of adventures, each tied to a curricular theme. For example, in Texas, children study the world at large in the 6^{th} grade, the state of Texas in the 7^{th} grade, and the United States in the 8^{th} grade. This framework allows us to construct adventures involving different eras in different locations. The social studies direct the location (world, Texas, or U.S. history locations) and time (ancient or contemporary). However, the environmental health problems at these locations and times in history are amplified examples of problems found in the U.S. such as contaminated water, air pollution, radioactive damage and waste clean-up, contagious or environmentally transmitted diseases, etc.

The first adventure is at the ancient burial chambers in Luxor and in pyramids in Egypt. The students encounter the pyramid construction Overseer, who hopes they can help him solve the problem that most of his workers have developed, vomiting and diarrhea, which causes construction to stop. This setting allows us to integrate academic content into the story line. The students learn to read carefully (to be able to answer questions, write character sketches, persuasive essays, etc.), learn how to read maps, determine longitude and latitude, review relevant geography about rivers and ground-water formation, review the culture of ancient (and modern) Egypt, learn how to perform many of the calculations used to build or decorate the pyramids, learned how to use scientific

reasoning to diagnose the sickness and suggest a prevention for it. The instructional unit also includes an experiment on chlorine treatment of water. Once the children tell the Overseer how he might deal with this problem, they happily return home ready for the next adventure. The next adventure will involve air pollution hazards in modern China as they travel through polluted cities and the country side to a site that soon will be flooded by the construction of the Three Gorges Dam.

The adventure is presented in two ways. The primary approach involves an extensive computer slide show that orients the students to the setting, and serially presents questions or short problems in each of the subject matter areas. Two versions of the slide show are created, one without answers, and a teacher version with answers, explanations, and added options that the teachers may choose to present themselves. While most of the slides follow a sequence of social studies, math, English, and biology, specific slides may be placed in a different sequence to promote learning objectives. To assist students in performing tasks, links are made from the slides to a slide-show library, which contains information on skills needed in each subject matter area. In order to achieve maximum flexibility, the slide-show material can be made available over the Web, via CD, or via traditional hard copy. The electronic form offers the opportunity for teachers to take ownership of the content and customize it for their own purposes. Reviews from middle-school teachers made it clear that schools have widely different technology capabilities. Some schools can support team, interdisciplinary teaching, but others cannot. Schools that still must teach English, social studies, etc., as separate subjects, can select the relevant portions of the slide show, while still retaining the adventure story line connection. The intent is to provide maximal flexibility to allow teachers to tailor the material to their needs and to take ownership of the integrated learning experience. For schools that can only devote a few days each year to our curriculum, we are developing a pre-packaged one-day, interactive computer program of integrated content for each adventure.

Five two-day intensive workshops are planned throughout rural Texas with 100 to 200 teachers representing the four subject areas from given schools. These workshops will teach technology and help the teachers to integrate the material in their school classrooms. Also, scientists' visits to classrooms are being used to tie environmental health science to science and non-science classes.

The curriculum is supported by on-line Environmental Health Science materials that we are developing under another NIEHS grant, by scientists' visits to schools, by teacher training in rural Texas, and by a week of intensive training at our university during the summer.

Reviews from teachers thus far support our belief that integrating environmental health science themes across disciplines will help reduce barriers to learning, improve student enthusiasm and ownership for learning, and improve overall academic performance.

Supported by National Institute of Environmental Health Sciences Grant NIH ES 10735, "Integrating Environmental Health Science in Rural Schools".

LEARNING THROUGH ENVIRONMENTAL HEALTH SCIENCE SCENARIOS
R25ES10721A

Principal Investigator: Nancy I. Kerkvliet, Ph.D., EHSC COEP Director, Oregon State University Corvallis, OR 97331
Molly Bloomfield, M.A., Project Director
Kathleen Vanderwaal, Ph.D. , Science Education Specialist, Oregon Dept of Education
Kendra Mingo, M.S., Assistant COEP Director, OSU EHS and MFB Centers
Jon Bridges, M.A., Mathematics Education Specialist, Oregon Department of Education
Eda Davis-Butts, SMILE Program Director, OSU

This project seeks to improve the academic performance of high school students by developing their knowledge and skills in science, math, and humanities using context-based environmental health science scenarios. The project uses the Hydroville Challenge Problems, an existing set of environmental health science scenarios developed under NIEHS grant ESA-96-001, to improve the critical thinking skills of high school students and to engage them in developing solutions to real-life environmental health science problems. The project includes the following activities:

- adapting the highly successful Hydroville Challenge Problems into integrated classroom modules, enhancing them with additional scientific and humanities content (including risk assessment and risk perception) and aligning them with state and national education standards;
- conducting Summer Institutes to train teams of teachers in environmental health science, team teaching, and implementation of the Hydroville Challenge Problem modules;
- evaluating the impact of environmental health science as an integrative context for learning using the Hydroville Challenge Problems;
- disseminating the Hydroville Challenge Problem modules nationwide.

Approximately 150 science, math, and humanities teachers will be trained to use the Hydroville Challenge Problem modules in each year of the project. Teams of teachers will then incorporate the modules within the existing high school curricula. School districts with high dropout rates and high numbers of minority and disadvantaged students will be preferentially recruited into the project. As a result of this project, it is expected that students will demonstrate improved academic performance, decision-making skills and attitudes toward science and school, as well as increased knowledge of environmental health issues.

SUC_2ES_2
(Students Understanding Critical Connections between the Environment, Society and Self)
1R25 ES10697
Principal Investigator: Audrey R. Gotsch, DrPH, CHES, Interim Dean, UMDNJ-School of Public Health
Collaborating Institutions:

- **Woodbridge Township School District**
  (Represented by Louis Estok, Principal, Lynn Crest Elementary School)
- **University of Medicine and Dentistry of New Jersey-School of Public Health and the Environmental and Occupational Health Sciences Institute**
  (Represented by Laura Hemminger and Barry Schlegel, Project Co-Directors)
- **New Jersey State Department of Education**
  (Represented by Arthur Mitchell, Science Coordinator)
  Graduate School of Education, Rutgers, The State University of New Jersey

The Woodbridge Township School District, the University of Medicine and Dentistry of New Jersey-School of Public Health (SPH) and the Environmental and Occupational Health Sciences Institute (EOHSI) have partnered to design a model for learning entitled SUC_2ES_2 (Students Understanding Critical Connections between the Environment, Society and Self) that uses environmental health (EH) as an integrating theme. Through the development and application of three integrated EH curriculum units, this model will enhance students' comprehension of and interest in environmental health sciences and improve their academic performance and workplace readiness skills.

Woodbridge Township, the ninth largest district in New Jersey, was selected as the project school due to the diversity and size of the district. The district's demographics represent a microcosm of the state and the nation with a 13,000+ student population with 33% representing minorities. SUC_2ES_2 also incorporates the collaborative efforts of the New Jersey State Department of Education, environmental health scientists and the Robert B. Davis Institute for Learning and the Center for Program Evaluation and Measurement at the Graduate School of Education, Rutgers, The State University of New Jersey.

The EH curriculum units are being developed by project working groups, comprising educators, school administrators, scientists and health educators, for second-, fifth- and eighth-grades in adherence with the New Jersey Core Curriculum Content Standards' subject-specific and cross-content workplace readiness standards and national education standards. Materials will be appropriate for integration across subjects, emphasizing health, language arts, math and science, and will build upon *ToxRAP ™* (Toxicology, Risk Assessment and Pollution). *ToxRAP ™* is an award-winning curriculum series developed by EOHSI with support from the National Institute of Environmental Health Sciences (Grant No. R25 ES06930).

During the first year of this initiative, project groups are developing the second-grade EH curriculum unit to be pilot-tested in one school in the 2001-2002 school year. District-wide implementation will begin the following year. A similar approach will be used to develop curriculum units for grades five and eight, so that by August 2007, all three grade level curriculum units will be implemented district-wide. Teacher professional development initiatives will complement the SUC_2ES_2 program, ensuring the successful implementation of the units in the classroom. Ultimately, approximately 11,000 students and 180 teachers will benefit from this initiative.

All aspects of the project are being monitored and documented using process and outcome evaluation methods and qualitative and quantitative data. Two curriculum evaluation tools will be utilized to determine the effectiveness of the EH curriculum units. First, a pre/post environmental health survey is being developed

by the project groups that will be implemented to measure student knowledge and attitudes. Second, project managers will analyze the results of current standardized student test scores to determine the overall impact of EH learning on subject-specific areas. Upon completion of the initiative, both this model for collaboration as well as the integrative EH curriculum units will be applicable nationwide.

AMBIENT Project (Atmospheric and Marine-Based Interdisciplinary Environmental health science Training)
1R25ES10713-01
Principle Investigator: Patrick Walsh, Ph.D.
Collaborating institutions/agencies:

- **NIEHS Marine and Freshwater Biomedical Sciences Center at the University of Miami**
- **University of Miami**
  - **Rosenstiel School of Marine and Atmospheric Sciences**
  - **School of Medicine**
  - **School of Engineering**
  - **School of Arts and Sciences (Chemistry)**
- **Miami Dade County Public Schools**
- **Miami Dade County Dept of Health**
- **Florida International University**
- **Wheeling Jesuit University**
- **Technology for Learning**
- **Miami Museum of Science Upward Bound Program**

Description of project activities:
Miami-Dade County is home to more than 2.1 million people. Ethnic diversity is extensive, with a population that is 52% Hispanic, 34% African American, 13% White, and 1% American Indian/Asian/Other. As with any community of this complexity, there are significant environmental health issues of concern to the community and government. The Miami-Dade County Public Schools is the 4th largest district in the country with more than 350,000 students, more than 93,000 of which are in grades 9-12. There is significant need within the public high school system to involve students with research scientists and members of the community in an interdisciplinary approach to learning about local environmental health science issues.

The AMBIENT Project (Atmospheric and Marine-Based Interdisciplinary Environmental health science Training) is a systemic approach to environmental health science education. Focused around the four environmental themes of air, water, soil and food, a health-science problem-based learning approach will be delivered by trained teachers to the ethnically diverse population of high school students in Miami-Dade County. The teachers will work together to enhance understanding of environmental and ethical issues through a hands-on summer workshop with research scientists from the University of Miami, Florida International University, and County Department of Health. Best practices from existing environmental curriculum materials will be assembled for use in the training. An important emphasis of the project will be to provide team teaching strategies for incorporating interdisciplinary activities into the large classes of more than 35 students at the high schools.

The project is modeled after three highly successful environmental teacher training models, GLOBE, INSTAR and the SECME Summer Institutes, and draws the best from each. Classroom activities and assessment tools will be incorporated by the Center for Educational Technologies at Wheeling Jesuit University into a problem-based learning Web site similar to the NASA Exploring the Environment series. Technology for Learning will provide formative and summative assessment of the project.

This project addresses the need defined by Priority 8.2 of Healthy People 2000: Educational and Community-Based Programs, which is to increase high school completion rates to 90%, especially with regard to Hispanic and Black American students.

To date, the AMBIENT Project has assembled its Team of Miami Dade County Public School Educational Specialists, and Researchers with the Evaluators. The modules are targeted initially at 9^{th}-12^{th} Graders. The modules being created by the Educational Specialists with input from the particular Environmental Health Researcher, an Ethicist, the WebMaster, and the Evaluator. Educational Materials from other NIEHS K-12 curriculum are being incorporated. Currently the Team is working on the development of 2 of the 4 proposed Curriculum:

- Water Module: This module focuses on the real event of Sanitary Contamination of Recreational Marine Waters
- Soil Module: This module focuses on the impact of lead contamination of soil in a play ground and in other substrates on environmental health

Module materials are being evaluated as an ongoing process including piloting of materials with the Miami Museum of Science IMPACT Program for high risk youth. These modules will be taught to interdisciplinary teams of Miami Dade County teachers in an interactive hands-on Summer Workshop run by the Educational Specialists and Reseachers with an evaluation component. An AMBIENT Project Website is being created, and will be posted at the NIEHS Marine and Freshwater Biomedical Sciences Center at the University of Miami.

The Environment as a Context for Opportunities in Schools (ECOS) Project
1R25 ES10698-01
Principal Investigator: Nancy P. Moreno, Ph.D., Baylor College of Medicine Center for Educationl Outreach, 1709 Dryden, Suite 545, Houston, TX 77030
Texas Education Agency
William E. Jones, Executive Dir of Elementary Schools, N Forest Independent School District, PO Box 23278, Houston, TX 77228-3278
Richard Griffin, Ed., D, Dir of Office of Governance, Harris County Dept of Education, 8300 Irvington Blvd., Houston, TX 77022-5618

Baylor College of Medicine (BCM), the North Forest Independent School District (NFISD) and the Harris County Department of Education (HCDE) propose to use environmental health science as an integrated context for learning in six urban elementary schools. The Environment as a Context for Opportunities in Schools (ECOS) Project, will use the NIEHS-funded, interdisciplinary My Health My World educational program as the backbone of a comprehensive curriculum that integrates science, health, reading/language arts, mathematics and social studies. Initially, ECOS is expected to impact more than 3,900 students and 180 teachers in six NFISD elementary schools (grades 1–4). However, we aim to produce and evaluate a scalable and replicable model for integrating environmental health sciences content across the elementary curriculum that can be applied in many different settings. Project activities will involve partnerships among researchers, educators, parents, community members and administrators. Specific Aims are to: (1) collaboratively design, implement and evaluate an instructional program for all six North Forest elementary schools that integrates science, health, reading/language arts, mathematics and social studies around environmental health science themes, while promoting development academic achievement through development of student content knowledge and skills, especially related to problem-solving and critical thinking. (2) Improve teacher practice through intensive summer and year-round professional development on content and teaching strategies related to the proposed instructional program and encouragement of team work, reflection, collegiality and self-assessment. (3) Support school-wide reform of teaching and learning through workshops and collaborative activities (such as science festivals) involving teachers, parents, administrators and community members. (4) Implement rigorous, hypothesis-driven evaluation strategies that examine student content knowledge and problem-solving skills, student attitudes, teacher development (particularly factors contributing to the development of expert vs. novice teachers) and whole-school reform. (5) Disseminate the curricular/instructional model, evaluation instruments and methodologies, and other research findings to schools in Houston, Texas and throughout the nation and to community stakeholders using multiple strategies.

"Connections: A Collaborative Exploration of the Environment & Human Health"
1 R25 ES10700-01
Principal Investigator: Gail Porter Long, M.Ed., Vice-President, Community Learning Ventures, Maryland Public Television
Maryland Public Television (MPT) and partners: the Johns Hopkins School of Hygiene and Public Health, Maryland State Department of Education (MSDE), Johns Hopkins Center for Technology in Education (JHU CTE), and four of Maryland's largest school districts: Prince George's County Public Schools, Montgomery County Public Schools, Baltimore County Public Schools, and Baltimore City Public Schools have joined together in this new seven- year NIEHS-funded initiative to develop, implement, evaluate and disseminate an innovative model for using environmental health as an integrative context for learning (EHSIC).
Dr. Michael Trush, Ph.D., Deputy Director & COEP Co-Director, Johns Hopkins Center in Urban Environmental Health
Cynthia Mutryn, M.Ed., Manager, Technology Professional Development Projects, Maryland Public Television

Specific aims of "Connections" include:

1. Development and cutting edge dissemination of high-quality hard-copy, video and online educational resources for middle school teachers and their students, based on Maryland State Performance Assessment Program (MSPAP) Outcomes, that can be used to deliver interdisciplinary lessons based on EHS curricular content and high quality education technology resources.
    - An extensive revamped and upgraded NIEHS grant funded *EnviroHealth Link* Web site, including online lesson plans, teacher conferencing, online video clips, etc. http://www.mpt.org/learningworks/teachers/ehl/ ,
    - An *EnviroMysteries II* video (sequel to the NIEHS grant funded *EnviroMysteries*) http://www.mpt.org/learningworks/teachers/envmyst.shtml
    - An environmental health and technology teacher training video.
2. Development of intensive teacher training programs in environmental health and technology to enhance the ability of Maryland middle school teachers to:
    - Develop and deliver interdisciplinary instructional units based on environmental health concepts, to integrate quality technology resources (i.e., videos, quality educational software, Internet resources, digital cameras, multimedia software, and graphing calculators), and to improve technology delivery (*TeamTech*) to students.
    - Address learning needs of all students about relevant environmental health science issues, concepts and career opportunities, in order to develop skills students need to perform successfully in all academic subjects and on the MSPAP Outcomes.
3. The provision of scientists working in the field of environmental health, with whom Maryland middle school teachers and students can interact and learn.

The "Connections" Project will unfold in three phases:

- Phase I – Enhancement of Teacher Capacity and Development of Needed Curricular Materials: Fall 2000 - Summer 2003
- Phase II – Implementation in Middle Schools: Fall 2003 – Spring 2006
- Phase III – Evaluation and Dissemination of EHSIC Model: Fall 2005 - Spring 2007

Integrated Environmental Health Middle School Project Research Plan Abstract
1R25 ES10738
Principal Investigator: David Eaton
University of Washington, University of New Mexico
Thomas Burbacher, Craig Marcus

The Integrated Environmental Health Middle School (IEHMS) Project is a collaboration between K-12 outreach experts and research faculty at the University of Washington's NIEHS Center for Ecogenetics and Environmental Health and the University of New Mexico's NIEHS Developmental Center.This project builds upon our previous seven successful years of NIEHS-supported curriculum development and teacher training experiences. The central hypothesis is that implementation of the proposed IEHMS Project will result in increased student understanding of the Environmental Health Sciences (EHS) as well as improved performance in overall academic achievement, higher-level thinking and problem solving skills, behavior, and attitudes. The seven-year goal of this project is to train educators in grades 6 through 8 to use our existing as well as newly developed materials to plan, implement, and assess projects that use EHS as an Integrating Context (EHSIC) for learning. A major Specific Aim will be to assemble a working group of scientists, teachers, and community leaders to modify and assess the efficacy of Project Greenskate as a multi-disciplinary, integrative learning tool. Project Greenskate is our prototype, web-based, interdisciplinary Student-Centered Problem-Based Learning exercise that was developed with previous NIEHS support. A second major Specific Aim will be to create the Health and Environment Activities Research Tool (HEART). This instructional development tool will guide teachers to identify, plan, implement, and assess their own EHSIC projects by providing them with outlines, checklists, concepts and curriculum resources. A third major Specific Aim will be to develop, evaluated, and revise six model EHSIC modules using the HEART tools. All IEHMS materials will be distributed to teachers during an annual workshop. This workshop will be based on the NIEHS-supported Environmental Health for Educators workshop offered every year at the University of Washington since 1996. The workshop will include lectures on EHS topics by NIEHS Center faculty researchers, presentations by scientists and regulators, and hands-on training on the use of all project materials. Workshops will take place both in Washington State and New Mexico. Partner school districts in Washington include two school districts from northwestern Washington: Mukilteo (13,585 students, of which 3,019 are in Middle School) and Ferndale (5,209 students, of which 1,196 are in Middle School). Partner districts and schools in New Mexico include the Pojaoque School District (150 teachers; 1,980 students K-12; 70% Hispanic, 15% Native American, 15% Anglo) the Espanola (5,000 students) School District, and Southwestern Indian Polytechnic Institute (80 students/yr; 100% Native American). They will provide the unique opportunity to work with predominantly Native American and Hispanic student populations. With this consideration, all materials will be adapted for cultural appropriateness and assessed accordingly. Multiple assessment tools will be employed to determine the projects impact, including norm-referenced standardized test results, specially developed surveys, and qualitative data. Project impact on teachers professional skills, self-efficacy perceptions, and job satisfaction will also be evaluated. All the project results and materials will be published and/or disseminated nationally and a Train-the-Trainer seminar will be conducted in the final year to further facilitate distribution of the developed model to other sites around the nation.

Project EXCITE
Environmental Health Science eXplorations through Cross-disciplinary & Investigative Team Experiences
1 R25 ES1075-01
Principal Investigator: Charles B. Keil, Bowling Green State University
Collaborating Institutions/Agencies: Toledo Center for Science and Industry, the Ohio Department of Education, the Ohio Environmental Protection Agency

Project EXCITE is a 1.8 million dollar, seven-year grant with the goal of using locally relevant Environmental Health Science (EHS) topics to engage students in valuable learning experiences across disciplinary areas. The project reflects current thinking about effective teaching and learning and is aligned with national and state education goals. Project EXCITE emphasizes critical thinking and problem solving skills, interdisciplinary connections, collaborative learning and the use of technology. Students will investigate local EHS issues, explain fundamental conceptual understandings of these concepts, and apply the knowledge and skills generated to improve performance on standardized achievement tests.

Project EXCITE will be assisting teacher teams (5th - 9th grade) in creating, facilitating, and disseminating interdisciplinary EHS units using problem-based learning (PBL) approaches. There will be six teacher teams participating in each of the project's two-year cycles. The primary members of each team will consist of four teachers drawn from different academic disciplines who will work side-by-side with a school administrator, an undergraduate science education major, a university faculty member, and a community partner. During the first year of EXCITE, teams will create an EHS problem-based learning module and teach it in their classrooms. The following year, teams will revise and instruct the amended unit, with the goal of ultimately publishing their work.

Throughout the next seven years, over 120 teachers and 5400 students in northwest Ohio will be directly impacted by Project EXCITE, and many more will benefit by utilizing the instructional units that are developed by the teacher teams.

This grant is directed by Bowling Green State University principal investigators Chris Keil, Associate Professor of Environmental Health, Jodi Haney, Associate Professor of Science Education and William Armaline, Director of the Center for Innovative and Transformative Education. Collaborating agencies include the Ohio Department of Education, Ohio Environmental Protection Agency and Toledo COSI (Center of Science and Industry).

Problem-Based Learning for Environmental Health
1R25 ES10717
Principal Investor: Dina Markowitz, Ph.D., University of Rochester, Dept. of Environmental Medicine
University of Rochester, Margaret Warner Graduate School of Education and Human Development
New York State Education Department

The "My Environment, My Health, My Choices" program will facilitate the development, by middle and high school teacher teams, of new curricula that incorporate environmental health education into science, social studies and health classes. Fifteen teams of middle school and high school science, social studies and health teachers will take part in this program over the course of the 7-year grant period. Each team will be composed of a science, a social studies, and a health teacher. Five teams of high school teachers have been recruited for the first phase of the program, which will begin this summer. These schools represent urban, rural and suburban areas. Five middle school teams will enter the program during Summer 2003, and five additional teams of middle and high schools will enter the program during Summer 2004.

Details of the "My Environment, My Health, My Choices" program include the following:

- Teacher teams will participate in a 1-week summer training workshop at the University of Rochester. The workshop will introduce participants to relevant environmental health and curriculum development issues by experts in these fields. Follow-up workshops will be held several times each school year.
- Teachers will work with faculty from the University of Rochester's Environmental Health Sciences Center and the University of Rochester's Margaret Warner Graduate School of Education and Human Development to develop curriculum units around a specific environmental health topic or problem that is chosen by the team. Each team will focus on a different topic. All curriculum units will align with New York State education standards.
- Teachers will receive stipends for attending the workshops and for developing and implementing the curriculum in their schools. Funding will also be provided for classroom materials, for the duration of time that each school participates in the project.
- University of Rochester faculty will provide significant follow-up and evaluation of the program during the entire grant period.
- Curriculum units from all participating schools will be combined into a "workbook" that will be published for national dissemination.

The goals of this project are:

- To organize environmental health science activities into a variety of curricular areas that will improve academic performance as well as enhance students' comprehension of and interest in environmental health sciences.
- To enable students to synthesize knowledge and experience across several academic disciplines.
- To increase students' understanding about the relationship between the environment and human health.
- To provoke students to take actions to address environmental problems and to share information with others.

Enhancing Rural Middle-School Science Education via an On-line Environmental Health Science Curriculum
1R25 ES10443
Principal Investors: L. Johnson, J.J. Denton, J.F. Hunter, W.R. Klemm, K.C. Donnelly, I.N. Ramos, C.C. Farnsworth, T.J. Davis, B.L. Smith, and V.B. Hardy
Texas A&M University

The long-term goal of the Partnership for Environmental Education and Rural Health; (http://peer.tamu.edu), is to develop and disseminate an engaging model for enhancing environmental health science education of grade levels 6-8 in rural settings. Environmental health science in the rural setting is being emphasized because of public concern for increased numbers of environmentally health-related diseases in certain rural areas (cancer, birth defects, lead poisoning, etc.). Rural schools are less likely than metropolitan schools to receive state-of-the-art information on environmental health issues, but may need it most. Also, rural schools have less interaction with college professors that might influence their career choices.

Environmental health information and research experiences provided by faculty from the Center for Environmental and Rural Health will be integrated into middle-school science curriculum. Content is developed by professors in the College of Veterinary Medicine and the College of Education. The Texas Rural Systemic Initiative provides infrastructure to recruit and train teachers and to disseminate the integrated curriculum into rural settings via existing mass-media distance learning methods, teacher development programs, and scientist visits.

Specific aims are: 1) to develop engaging multimedia learning materials tailored for rural middle school students, 2) to provide professional staff development programs, and 3) to provide a human interface to establish direct partnerships between public middle school students and scientists. The program publicizes new discoveries, shows the power of basic research to help solve public health problems, and increases public awareness that certain behaviors/situations can increase risk of disease and that basic research is needed to improve public health. The goal includes encouraging a large number of students to enter and remain in science academic tracks.

Curriculum: Three modules, each lasting for two to three weeks of daily lessons and experiments, have been produced and are being tested in schools. These are: "Water's the Matter", "Cells Are Us", and "Toxic or Not." Modules include tutorials on common hazards, experiments and learning activities, short biographies of famous scientists, what we know about the subject, how we know, and why it is important to know, and teacher pages (with pre- and post tests, explanations, procedures, resources). Also, a game learning activity (Slime Sleuths at Toxic Island) provides a self-paced fun activity. Development has now begun on two more modules on organ systems and properties/sources of hazards.

Professional Development: Last Summer, 15 teachers came to Texas A&M for a week to receive technology training, to review the curriculum, and to perform the experiments. Also, 46 additional teachers received certification for 12 hours of training in water quality testing and classroom experimentation at regional locations throughout the state. A repeat intensive workshop (one week at Texas A&M) and four regional workshops for 64 interested teachers are planned for this summer.

School Visits: Scientist visits to public middle schools have provided over 4,200 students in over 30 rural school districts an opportunity to learn about experimentation and environmental health science first hand. Likewise, over 600 teachers, teacher aides, and parents have attended these presentations on health and the environment. Scientist visits are on-going throughout the school year. Evaluations from teachers and/or students from rural middle schools have indicated that curriculum products, teacher training, and scientist visits have been well received.

Supported by National Institute of Environmental Health Science, Grant NIH ES10443, "Environmental and Rural Health Education Partnership (Phase 1)".

The Environmental Cyber Schoolhouse
1-R25-ES09881-04
Principal Investigator: Mary O. Dereski, Ph.D.
Environmental Health Sciences Center
Wayne State University, Detroit MI

The Environmental Cyber Schoolhouse curriculum is an effective way to introduce and educate students and teachers about environmental health topics that have an impact on their daily lives. The major topic areas for the Environmental Cyber Schoolhouse units are: Lead poisoning exposure and prevention (Health Quest); and environmental triggers of asthma (Sports Quest). Through dissemination of this curriculum, educators and their students become aware of current and relevant research about environmental public health issues. Each unit also has a culminating activity that allows students to make educated choices about changes to the main character's environment that will have a positive impact on his/her health and well-being. Through these final activities the students are assessed on the understanding of the material that has occurred throughout the unit, and allows the students and educators to understand lifestyle choices that will eliminate or lessen the impact of various environmental diseases on human health for themselves as well as others. Dissemination is occurring locally through graduate classes offered in the College of Education at Wayne State University and continuing education classes at the intermediate school district level.