Teachers as researchers: Educators make the leap from chalkboard to lab bench

Research experiences allow teachers to do laboratory science, then share the enthusiasm, career information, and hands-on investigations they generate with their own students. Through a grant from Howard Hughes Medical Institute and support from the National Science Foundation, seven area teachers participated in research fellowships at Washington University’s main and medical campuses this summer.

The fellows investigated a range of subjects, including plant diseases, gene sequencing, and pond life communities. Teachers agreed that their experiences have given them insights that will help engage students’ interest in science and scientific careers.

Cheryl Stephens teaches a class in forensic science at Washington High School. She says, “This experience gives me more confidence to develop lab activities for my students. I plan to expand my unit on forensic DNA to include lab experiments.”

Stephens was a member of Barbara Kunkel’s research team, which is leading efforts in finding disease resistance genes in plants. Kunkel and Stephens plan to keep in touch during the coming year. “We can help her develop and troubleshoot mock crime scenarios, and provide classroom-friendly lab protocols,” explains Kunkel.

Ann Van Rhein, science teacher at Hardin Middle School (St. Charles), participated in Jon Chase’s studies in population biology at Tyson Research Center. Van Rhein said her experience gave her a taste of the life of an ecology researcher. “I met with Dr. Chase and participated in the lab meetings,” she says. Van Rhein studied a zooplankton in simulated ponds at Tyson, and will use her findings to adapt lessons for her middle school science classes in the fall.

Juanita Chambers’ research experience took place at Washington University’s Genome Sequencing Center. Chambers, a teacher at Gateway Institute of Technology (St. Louis Public), got to know how genes are sequenced by working with Elaine Mardis and other GSC staff through all steps of the process. Next summer, she will work with consultants to develop a virtual tour of the GSC for high school students.

Four other teachers also participated in research experiences. Two joined labs at the School of Medicine: Mike Grupe, Lutheran High School North, worked with Wayne Barnes; and Dolly North, Gateway Middle School (St. Louis Public), worked with Susan Dutcher. Two teachers were placed with biology faculty on the main campus: Elmer Kellmann, Parkway Central High School, worked with Sarah C.R. Elgin; and Maria Khademian, Normandy High School, worked with Eric Richards.

For middle and high school teachers, continued on page 2
The Tyson Field Science Program offers a variety of outdoor education experiences to preK-12 school and scout groups. The two- to five-hour interactive programs stimulate interest in the natural environment, emphasize observation skills, develop analytical thought processes, and encourage teamwork. Program contents are aligned with Missouri and national standards. Educators and scout leaders can choose programs that meet curriculum guidelines and badge requirements. Our staff can also help teachers tailor field trips that integrate science content across the curriculum.

Field science educators, ecologists, and teachers have developed new programs for 2003-04. For more listings and program details, visit www.biology.wustl.edu/tyson.

For preK and early childhood students, programs integrate language arts, history, and science, and include a take-home craft. Programs include: Adopt-A-Forest, All Abuzz, Batty for Bats, I’m a Rock Hound, In the Hollow, Insects are Everywhere, Moves and Clues, and On the Trail.

New K-12 programs include Watersheds and the Water Cycle, Archaeology Alive, and Wilderness Survivor. Programs in Animal Adaptations, Food Web Interactions, Aquatic Ecosystems, and Insects and Arthropods are also available.

Programs are held at Washington University’s Tyson Research Center, a 2,000-acre nature preserve located 25 minutes from downtown, at I-44 and Beaumont Antire Road. Fees of $5-8 per student or scout are charged based on program length. Contact Marty Galganski, (314) 935-8437 or mgalganski@biology.wustl.edu, for additional information and program scheduling.

The Tyson Field Science Program is supported by the Gaylord Foundation, the Friends of Tyson, and other donors.

Take your class outside!

Students at Curtis-Bishop Middle School in Wellston use batteries to turn on a light bulb in a Teaching Team activity.

Tyson Field Science Program offers new experiences for preK-12

Teachers as researchers continued from page 1

two types of research fellowships are available in summer 2004. The first fellowship, in bioinformatics and genomics, takes place over two summers. The first summer consists of lab research, seminars, and technology resource exploration. The second summer includes development of a curriculum extension project.

The second type of fellowship consists of a single summer experience in various areas. Teachers are matched with faculty mentors in Arts and Sciences and the School of Medicine based on interest and availability. These fellowships include a small budget for classroom extension projects.

Each fellowship lasts six to eight weeks, and pays a stipend of $600 per week.

Teachers may choose instead to pay $75 for three graduate credits in biology. Application deadline is Jan. 5, 2004. Contact Susan Flowers, (314) 935-8271 or flowers@biology2.wustl.edu.

The research fellowships are supported by the Howard Hughes Medical Institute and the National Science Foundation.
Involve high school students in the university experience with DNA Science Days

Michael Smith prepares a DNA sample for sequencing. Smith and his biology class from Jennings High School attended a DNA Science Day program in April.

Attention biology teachers: Bring your students for a DNA Science Day at Washington University. Students do an advanced genetics laboratory, tour campus, and receive admission information. The program, transportation, and lunch are provided free of charge. Teachers may plan visits during the fall or spring semester. Contact Susan Flowers, (314) 935-8271 or flowers@biology2.wustl.edu.

Karen Thompson, biology teacher at Jennings High School, brought two classes for DNA Science Days in April. Her students analyzed their own DNA for a specific sequence, and then learned how the technique can be applied to crime investigations and medical tests.

“The lab was very real and stretched them academically. I liked the level of difficulty—it wasn’t watered down,” says Thompson. “I also liked that kids could actually see themselves doing something like this in college or in a career.”

DNA Science Days are supported by the Howard Hughes Medical Institute, the Dana Brown Charitable Trust, and the Monsanto Fund.

Spring 2004 Teacher Education Programs

Education 6000 Hands-On Science K-8: Heredity & Life Cycles

Teachers of grades K-8 can learn the science behind the standards plus inquiry methods of teaching them through the Education 6000 Hands-On Science K-8 series. For spring 2004, Science Outreach offers Education 6002 Hands-On Science K-8: Heredity and Life Cycles. The course explores how plants and animals pass their traits on to the next generation. Topics include Mendelian genetics, mutations, DNA, genetically modified foods and other new developments.

Education 6002 meets on the main campus of Washington University. The 16-week semester class is held Tuesday evenings, from 4:30-7 p.m, beginning Jan. 20, 2004. Teachers receive three graduate credits in education plus hands-on materials for their classrooms for a registration fee of $200. Contact Amy O’Brien, (314) 935-6846, or e-mail obrien@biology2.wustl.edu, to register.

Education 6000 is supported by the Howard Hughes Medical Institute.

Graduate Certificate in Science Education

Teachers interested in earning a master’s degree often pursue Washington University’s graduate certificate in science education as a first step. The 15-credit certificate may be completed with courses in the Education 6000 series, independent study, and other science courses. The credits may then be applied to a master of arts in education through the department of education.

Acceptance to this competitive program allows teachers to take courses for only a $75 registration fee. An application and letters of recommendation are required. Deadlines for admission are Nov. 15 for spring acceptance, and April 15 for fall acceptance. Contact Amy O’Brien, (314) 935-6846 or obrien@biology2.wustl.edu.

The certificate program is supported by the Howard Hughes Medical Institute.

“I’ve always tried to decide what I want in a graduate program, science or education. What I really like about this program is it’s the best of both. These classes have opened my eyes to what else is going on in education.”

–Carol Stephenson, Wydown Middle School science teacher and former Saint Louis Zoo educator
Combine field trips with inquiry through the Outreach Partnership

Two workshops were held this summer as part of the Outreach Partnership, a Washington University Science Outreach curriculum development project in collaboration with the St. Louis Science Center, the Saint Louis Zoo, and the Missouri Botanical Garden.

Animal Behavior met at the Zoo for three Fridays in June and July. Stan Braude, WU lecturer in biology; Janet Crews and Carol Stephenson, Wydown Middle School (Clayton), shared the curriculum they developed with 14 teachers. The activities for middle school science show students how to make observations and develop a tool called an ethogram to analyze animal behavior.

A second workshop explored the consequences of human alterations to the natural environment. Mark Kalk, Phyllis Balcerzak, and Emily Whitney of WU Science Outreach met with seven teachers for Human Impact Ecology at Tyson Research Center during June. The group worked with curriculum developed by Balcerzak, Mark Kalk, program coordinator, and Michelle Dodds, science teacher at Pattonville Heights Middle School. The high school level investigations explore human impact on aquatic ecosystems through pond life studies and water quality testing.

Outreach Partnership curriculum ties hands-on classroom investigations to field trips to the Science Center, Garden, Zoo, and Tyson Research Center. The units are: Animal Behavior, Human Impact Ecology, Health Science, Populations and Communities, Genetics, and Evolution. For more information, visit the Science Outreach website, www.so.wustl.edu, or contact Mark Kalk, (314) 935-8138, kalk@biology2.wustl.edu.

The Outreach Partnership is supported by the Missouri Coordinating Board for Higher Education and the National Institutes of Health.

Modern Genetics welcomes four new partner schools
Program seeks additional partners for 2004-05

The Modern Genetics for All Students partnership continues to grow, with four new schools joining the program this year: Affton High School, Elsberry High School, Hazelwood Central High School, and Mehlville Senior High School.

Karen Griffon, biology teacher at Elsberry, said she became interested in the program to update her skills. “Things have changed since I took biology,” she says. “Plus, I’ve recently moved from middle school to high school.” She adds, “I’m really excited about using the curriculum with the kids. The material is very user-friendly.”

The addition of the new partner schools brings the number of high schools participating to 25 in the St. Louis area, affecting 4,000 biology students each year.

Teachers in partner schools take the three-credit biology class covers labs from the Modern Genetics program.

The Modern Genetics partnership includes:
- Affton High School
- Elsberry High School
- Hazelwood Central High School
- Mehlville Senior High School

The Modern Genetics program is supported by the Howard Hughes Medical Institute, the Dana Brown Charitable Trust, the Monsanto Fund, and the WU Genome Sequencing Center.

Modern Genetics welcomes four new partner schools
Program seeks additional partners for 2004-05

Biology teachers Bill Koch, Bob Ludwinski, and Jackie Ori prepare to separate DNA by electrophoresis in the Modern Genetics graduate course held in June.
Meeting the challenge:
St. Louis MSP schools fulfill the promise of No Child Left Behind

St. Louis educators are working to meet the challenges set forth by President Bush in the No Child Left Behind Act. Through a five-year, $6.5 million Math and Science Partnership (MSP) grant from the National Science Foundation, five school districts and four organizations are combining their strengths to improve student achievement in math and science. Since receiving the funding in fall 2002, Washington University Science Outreach has supported partner districts’ initiatives to raise MAP scores, to close achievement gaps, and to provide challenging curriculum in math and science.

The five school districts, Ferguson-Florissant, Maplewood-Richmond Heights, Riverview Gardens, University City, and Webster Groves, participated in intensive curriculum planning and adoption sessions over the summer. Their efforts were joined by St. Louis MSP staff members at Washington University and the St. Louis Science Center. Karen Brannon, math specialist, and Darlene Norfleet, science specialist, met with each district’s math and science coordinators and teachers.

Brannon explains why schools and teachers must take the lead in new curriculum adoption and implementation. “Professional development isn’t something where you ask someone to come in and ‘treat’ you,” she says. “That doesn’t work very well. Teachers have to do it themselves.”

In addition to meeting with individual districts, Norfleet also worked with Patrick Gibbons, professor of physics, to teach a graduate course, Education 6012 Hands-On Science K-8: Earth and Planetary Systems. A group of 20 teachers from MSP partner districts included four teachers from Joplin, Mo., who participated through their district’s Rural Systemic Change program. Brannon coordinated a Math Solutions program with Cooperating School Districts, in which more than 150 teachers from across the St. Louis area discovered how Marilyn Burns’ techniques can help middle school students understand math concepts.

MSP efforts also proceeded at the St. Louis Science Center. Its new Taylor Community Science Resource Center opened at Kingshighway and Manchester, where lab supplies and hands-on materials will be stored, prepared, and delivered to teachers. Carolyn Ikpeama, St. Louis MSP director at the Science Center, began planning with the five partner districts on a variety of programs designed to engage parents and families in science and math education. Ikpeama has started several programs for families this fall, and looks forward to working more with the Saint Louis Zoo, another MSP partner.

“What child will believe they’re bad at science if they go to the Zoo or the Science Center every month?” she says. “So much education depends on exposure, and that’s a big part of what parents can do.”

For more information about the St. Louis MSP, contact project director Victoria May, (314) 935-6846, or may@biology2.wustl.edu.

The St. Louis MSP is supported by the National Science Foundation.
Venturing into the Missouri woods during summer reminds us that we can’t take the comforts of urban life for granted. Bugs, sunburn, poisonous plants, plus heat and humidity make our dependence on technology instantly obvious. For some teachers, doing inquiry science poses similar challenges. Many question how they can give students realistic experiences, and avoid the pitfalls of teaching without a textbook.

This summer, a group of teachers and students at Tyson Research Center made the first steps in overcoming their fears of the outdoors and of teaching science. Through the Centers for Inquiry in Science Teaching and Learning (CISTL) project, teachers and students worked with Tyson Field Science staff to lead outdoor education programs, develop new ones, and complete personal projects in science inquiry.

Three high school students, Meritte Tawfik and Chelsea Brothers, from Gateway Institute of Technology (St. Louis Public); and Chris Campbell, from Rockwood Summit High School (Rockwood), became interns through their involvement with the St. Louis Science Center. As a partner in the CISTL project, the Science Center provides a site for studying how informal education programs impact student learning.

Amanda Matthiesen wrote a project for elementary students exploring how Native Americans once used the land at Tyson.

Brothers says that working with young students at Tyson gave her an experience she hadn’t had before. “A lot of kids aren’t comfortable being outdoors,” she says. “I felt the same way. It was just different from what I was used to.”

The student interns expanded what they learned into personal projects. Campbell explored the history of the caves at Tyson. “Last year, an owl ate the bats out of one cave,” he says. He investigated how that population of bats has changed since then. He also developed a lesson for young visitors. “I taught a class about habitats and made it a history lesson,” he explains. “The caves were mined out, then the military used them as storage. There’s a lot of human and natural history here.”

The student interns also were able to help the teacher interns by providing the perspective of younger students. In turn, the students gained a sense of collegiality with the teachers. “We were working with the teachers as our peers,” said Campbell. “It was interesting to talk that way with an adult.”

The teacher interns included three from St. Louis Public Schools: Jed Shields, Pruitt Military Academy; Amanda Matthiesen, Adams Elementary; and Lori Ann Carroll, Gallaudet School for Deaf Elementary; plus Nikki Davenport from Jackson Park Elementary (University City). Nicole Van Gasse, an education major at Washington University, also did an internship.

Matthiesen explained that she sought the internship to help make her science teaching more like the inquiry lessons she did in other subjects.

“I didn’t want to go near science. My approach was very traditional, because I was very scared,” she says. “I was scared because of my own experience—I had to memorize facts. But I knew I wasn’t being fair to the kids.”

Matthiesen says she will return to the classroom with a new approach to science. “The dialogue and collaboration with other teachers here got me thinking about what it is to learn and teach science,” she says. “We got to interact with intellectual ideas, share our action research projects, and have a constant exposure to science. It made me face my fears. I’m going to be a completely different teacher next year. I’m in a very different place.”

The internship program is part of the CISTL CLT project, supported by the National Science Foundation. For more information about CISTL, visit http://cistl.wustl.edu, or e-mail cistl@artsci.wustl.edu.

Overcoming the fear of snakes, bugs and science

Teachers and students join ecology educators at Tyson to research, learn and share

Chris Campbell and Chelsea Brothers relax in Tyson’s outdoor classroom.

Amanda Matthiesen wrote a project for elementary students exploring how Native Americans once used the land at Tyson.
Science Outreach thanks program partners

The success of Science Outreach programs depends on the time and expertise of faculty, students, and education staff from Washington University, area school districts, and partner organizations. Thank you to the individuals listed for their involvement in Outreach programs over the past year.

Science Outreach is especially grateful to Steve Bequette, sales representative for ISC BioExpress, for his generous gift and for his assistance in coordinating donations of used laboratory equipment. We also thank Mike Pritch at Eppendorf for authorizing donation of all traded equipment. And our thanks to the following Washington University faculty and researchers who donated equipment: Oscar Chilson, Josephine Clark-Curtiss, Roy Curtiss, Danny Kohl, Barbara Pickard, Deborah Rubin, Maulik Shah, Elzbieta Swietlicki, Soo Young Wanda, and Xiaoming Xia.

Outreach Partnership
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Saint Louis Zoo
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Jeff Polish
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Amy Hwang

Summer Scholars Program in Biology and Biomedical Research
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Tim Schedel
Kathy Ponder
Zhou-Feng Chen
Jason Weber
Susan Dutcher
Petraka Levin
Steve Johnson
Alison Goate
Daniel Link
Eduardo Groisman

St. Louis Science Center welcomes teachers and families for special fall events

Open House, Sept. 18, 3:30-7 p.m. See the new Omnimax movies free and more. Contact Alice Walker, (314) 286-4617, or awalker@slsc.org.

DNA Celebration, Sept. 28. Visit Science Outreach at interactive exhibits on DNA and genetics.

Kindergarten Teachers Conference, Oct. 3, 5-9 p.m. at the Magic House; Oct. 4, 8 a.m.-4:30 p.m. at the Science Center. $65 fee includes three meals. Call Suzanne Walton, (314) 289-4431.

Shining Star Awards: Nominate your favorite educator for a St. Louis Science Center Shining Star Award. Deadline for nominations is Oct. 24. Winners will be recognized at the annual Shining Star Awards Banquet on Nov. 14. Contact Alice Walker, (314) 286-4617, or awalker@slsc.org.
Keeping Busy

Congratulations and welcome to our newest fellows in the Washington University Graduate Certificate in Science Education program: Barbara Addelson and Lydia Toth, Missouri Botanical Garden; Karen Benton, Our Redeemer Lutheran; Kevin Kohler, Koch Elementary (Riverview Gardens); Kevin Manwaring, North Kirkwood Middle; Beverly Miller, Mason Ridge Elementary (Parkway); Carol Stephenson, Wydown Middle (Clayton).

Whiteside Middle School in Belleville, Ill., received a National Service Learning Leader Award, thanks in part to efforts by teacher Maura Brueggeman.

The Academy of Science of St. Louis announced two educator awards:

Liz Petersen, seventh grade science teacher at Ladue Middle School, received the Outstanding Science Teacher Award. Fifth grade teachers Ann Hansen and Pam Bogosian of Barretts Elementary School (Parkway) shared the Monsanto Science Fair Teachers Award.

Kathie Reuter, teacher at Kratz Elementary in Ritenour, received a grant from Washington University’s Olin School of Business and the Taylor Foundation to hold St. Louis’s first Lego League in March 2003.

Glendolene Rucker, teacher at Curtis Bishop Middle School in Wellston, was named to Who’s Who in American Teachers in 2002. Rucker also received the St. Louis Science Center’s Shining Star Award in 2002.