TeamINQ takes the preparation, storage, and resupply out of hands-on K-12 science

One of the biggest barriers to doing hands-on science is materials. Equipment is expensive and fragile. Plants and animals need care and permanent homes. Liquids evaporate, vegetables spoil, plates of bacteria die. In many investigations, the number of items needed per student is overwhelming. Science curriculum kits from educational publishers can help, but often they are so large and complex—up to 400 pieces each—that the same problems remain.

This is where TeamINQ steps in. As a statewide science materials, kit delivery, and refurbishment service, TeamINQ has knowledgeable staff members who work with teachers to ensure that the right items are delivered ready to use. Washington University in St. Louis is the local site; TeamINQ partners also include the Kansas City Area Life Sciences Institute and the Ozark Rural Systemic Initiative. Each of these groups has been supplying teachers with classroom-ready science materials for eight to 22 years.

Combining efforts through TeamINQ means that each of the partners has the capability to work with large districts on a system-wide basis. WUSTL began piloting the science kit service with the Hazelwood School District in 2007.

Elizabeth Brands, fourth-grade teacher at Hazelwood’s McNair Elementary, is a dedicated user of the service. She has experienced how research-based inquiry science gets kids motivated to learn, and says, “Kits are a lot of work, but I’d rather do them than worksheets.”

Hazelwood teachers request materials for their students to be delivered on a specified date. Keith May director of the WUSTL TeamINQ, has established a web-based ordering system to ensure the kits are ready and delivered on time. In the event any supplies are missing, May will personally deliver them to the school in time for class. Then, he coordinates pickup, refurbishment, and storage of the kits until they are needed.

“Keith’s great; he gets me whatever I need,” says Brands. “Some of the kits have stuff for teachers to prepare, and he takes care of it for us. I just have to say I need it.”

Brands’ students are actively engaged in observing anole lizards in a habitat they’ve prepared with earthworms and rye grass. “Ours changed colors!” exclaims one student.

“Write it down in your notebook!” rejoins Brands, as she circulates the room. “Discipline problems don’t exist on a day like today,” she notes. And after the lesson concludes, Brands has homes waiting for the lizards. She shares her knowledge of reptiles with students and parents to ensure that the new pets are cared for properly.

TeamINQ currently supports about 2,100 teachers in 37 Missouri districts, reaching more than 50,000 K-12 students each year. The partners also provide professional development for teachers and administrators, and online pre-post assessments with streamlined data collection and analysis. To learn more about TeamINQ services, contact May at (314) 954-8137, or kmay@wustl.edu.

Educator-designed Boeing Middle School Science Institute meets standards and addresses challenges

Preparing students to succeed in high school math and science begins in late elementary and early middle school. Without this strong foundation, students will not be qualified to major in science or technology, which will limit their future career options. To help teachers create effective science learning experiences for grades 4-8, Science Outreach sought input from local leaders in science education.

Through a graduate seminar, this group of science teachers and supervisors examined educational theory from a practical perspective. With leadership from Phyllis Balcerzak, director of professional development, and Paul Markovits, science and mathematics coordinator for the Pattonville School District, the group designed a graduate program that combines advanced science content linked to Missouri and national standards with research-proven teaching methods. Their brainchild, the Boeing Middle School Science Institute, leads to a 15-credit graduate certificate in science education. In many districts, the certificate qualifies teachers for pay advancement and for science specialist roles.

Markovits notes, “Grades 4-8 are the years when we see a drop in students’ science performance. Teachers need many tools to meet the challenge of these years so that their students thrive in science.”

Balcerzak explains that the development group organized the Boeing institute around three key design principles. “First, we wanted to

See Science Institute page 4
Building deep understanding in mathematics takes a teacher, principal, and instructional support team

Elementary and middle school math today looks very different from what we or our parents remember. No longer do children sit in rows taking timed tests and memorizing facts. “What’s important is that kids understand the facts and the mathematical ideas behind them,” says Karen Brannon, math program principal, and instructional coordinator at Brittany Woods Middle in University City, use blocks to model how second grade students think about fractions. Lawrence and LeNoir participated in the Lenses on Learning seminar, which focused on math learning in grades K-8.

Leola Lawrence, math facilitator at Ritenour School District, and Dominic LeNoir, assistant principal at Brittany Woods Middle in University City, use blocks to model how second grade students think about fractions. Lawrence and LeNoir participated in the Lenses on Learning seminar, which focused on math learning in grades K-8. These programs ask students to manipulate objects and take multiple approaches to problems. They encourage struggling with the concepts, instead of simply memorizing facts. This type of curriculum, often called research based, requires new ways of teaching. Principals and instructional coordinators need new tools to help teachers make these changes, and to understand why effective teaching looks very different today than it did a generation ago.

WUSTL provides two programs to help school administrators and curriculum specialists become more supportive of teachers who use research based math programs. Lenses on Learning, developed by EDC, is designed for K-8 principals. Math Coaching in the Classroom focuses on strategies for instructional support specialists. Mastercard Worldwide, through its Project Math initiative, supported WUSTL’s 2009-10 offering of these programs.

Julie Sperry, principal of Brentwood Middle School, attended Lenses on Learning with a colleague. “I think that every individual is here for different reasons,” she says. “For me, this is the first year we’re implementing CMP [Connected Math Program, Pearson]. So it’s helped me truly understand how truly different this way of teaching math is. When I go into my teachers’ classes, and I’ll see them spend 30 minutes on three problems, instead of doing 30 problems in 30 minutes, I’ll know why that’s good,” she explains.

Math Coaching in the Classroom provides more in-depth strategies on ways to partner with teachers. Brannon says it’s important to help teachers understand that coaches are there as collaborators, not as critical evaluators. “Coaching has many approaches, like co-teaching and modeling, but it comes down to creating a relationship where the teacher and coach are comfortable honestly discussing what happens in the classroom and can analyze ways to improve teaching and learning,” she says.

Brannon leads action-oriented seminars in both Lenses and Math Coaching. She shares problems from elementary and middle school math curriculum, and asks principals and coaches to work through them as a student would. Each time, the participants gain new appreciation for students and teachers. Sperry was surprised to discover the challenges in CMP. “I’m thinking, holy cow, this would be so hard for me to teach!” she laughs.

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ScrapArtsMusic and K-12 students explore the physics of sound

Combining recycled industrial scrap, athletic choreography, and energetic rhythms, the ScrapArtsMusic percussion ensemble had more than 400 elementary and middle school students from University City and St. Louis Public jumping out of their Edison Theatre seats in January. ScrapArtsMusic musicians build their own instruments from used materials, then develop kinetic performances with their sculptural creations. During the show several students were invited onstage to beat rhythms, then played with the troupe in an impromptu piece.

To connect the musical experience to the science of sound, the students then created their own simple instruments. Physics professor Patrick Gibbons worked with graduate students to design activities that demonstrated how varied objects can create sounds with different volumes and pitches. More than 40 undergraduate and graduate students from physics, psychology, German, anthropology, biology, musicology, engineering, earth and planetary sciences, history, education, Each One Teach One, and Alpha Phi Omega service fraternity shared activities with groups of students. Ben Burch, graduate student in physics, demonstrated how magnets and wires can make a simple electric guitar, and played his own electric guitar. Jane Fiegen, graduate student in history, brought her own bassoon reeds to show students how an instrument made from a drinking straw is similar to ones played in symphony orchestras. Faculty and staff from Science Outreach, Community and Governmental Relations, community service, and the Edison Theatre coordinated the visits and activities.

Beverley Storer, teacher from Dewey Elementary, commented, “Our students were never ready to go to the next activity because they were so engrossed in the one they were attending! Some of them were discussing how they could have their own scrap art band. They all came back to school feeling very happy and enriched.”

Participating schools from St. Louis Public Schools included Nottingham Community Access and Job Training High School, Dewey International Studies Elementary, Hamilton eMINTS Academy Community and Jefferson Elementary. Students from Brittany Woods Middle in University City School District attended, as did students from St. Michael School, a private school in Clayton. Cheryl Adelstein, director of community and governmental relations, said, “We want to make in克莱ntons Academy Commu- nity and Jefferson Elementary. Students from Brittany Woods Middle in University City School District attended, as did students from St. Michael School, a private school in Clayton. Cheryl Adelstein, director of community and governmental relations, said, “We want to make University City School District. Students from Brittany Woods Middle in University City School District attended, as did students from St. Michael School, a private school in Clayton. Cheryl Adelstein, director of community and governmental relations, said, “We want to make art an integrated part of their education.”

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Spencer Cole, center, percussionist with ScrapArtsMusic, joins in an improvised piece with students from across St. Louis.
Teacher leaders collaborate and build local expertise through NSF program at WUSTL

Recognition of leadership among teachers is now part of a national initiative. Traditionally, teachers who want to be leaders work toward becoming principals or central office administrators. However, many teachers prefer to stay in the classroom, and at the same time, share their expertise with colleagues and the community.

In today’s schools, this is becoming an option for more teachers. Most often leadership opportunities for teachers involve presenting at workshops or conferences, or leading initiatives in their own and other schools. Phyllis Balcerzak, director of professional development, envisions a program that builds on current professional development, envisions a program that builds on current professional development, including a graduate degree program for biology teacher leaders. She also points to research that indicates teachers can make changes in curriculum and instruction through collaboration, both within and outside of their districts.

“At the foundation of Science Outreach leadership programs are structures that support teachers to reflect on challenges and help each other find solutions,” she explains. “Washington University creates opportunities for science teachers that aren’t available anywhere else.”

Joan Braun, science teacher at Cross Keys Middle School

“Washington University creates opportunities for science teachers that aren’t available anywhere else.”

Balcerzak is a teacher educator who has worked in WUSTL’s preservice teacher preparation program, and previously as an ecologist, an environmental chemist, and a biology teacher. She directs teacher education programs for Science Outreach, including a graduate degree program for biology teacher leaders. She says her interest in the Noyce program came from WUSTL’s unique approach to teacher development.

“When teachers talk deeply about their profession, ideas emerge that can inform policy in positive, productive ways,” says Balcerzak.

Through a $631,000 grant from the National Science Foundation’s Robert Noyce Master Teacher Scholarship Program, Balcerzak guides a group of local educators who study teacher leadership. The Noyce fellows collaborate with Balcerzak and other WUSTL faculty monthly. They develop leadership projects through professional organizations and other local school districts. Teachers accepted to the program have master’s degrees and several years of experience. They also receive a stipend for the three-year program.

Joan Braun, science teacher at Cross Keys Middle School, has participated in several courses and partnership efforts with WUSTL. She says her interest in the Noyce program came from WUSTL’s unique approach to teacher development.

“Washington University creates opportunities for science teachers that aren’t available anywhere else,” she says. “This program provides a way to go beyond the surface, to look more deeply into science-related topics. It allows us to collaborate and develop supportive projects, and share experiences with each other,” explains Braun.

The seven Noyce fellows include two science teachers from the Ferguson-Florissant School District, Braun and Melanie Canaday, Berkeley Middle. They also include Chris Cronin, biology teacher at Roosevelt High, St. Louis Public Schools; Chuck McWilliams, biology teacher at Maplewood-Richmond Heights High; Elizabeth Petersen, science teacher at Ladue Middle; Tony Thomas, physics teacher at University City High; and Kelly Williams, science teacher at Holman Middle, Pattonville School District.

Science outreach will accept additional Noyce fellows in 2010. To learn more about the program, contact Balcerzak, (314) 935-6846 or pbalcerz@wustl.edu.

Noyce fellows meet at WUSTL to study strategies for leadership in science teaching and learning. Back row: Tony Thomas, Chris Cronin, Elizabeth Petersen, and Joan Braun. Front row: Phyllis Balcerzak, Melanie Canaday, Kelly Williams, and Chuck McWilliams.

Prairie burn: Zara Graves, sophomore at St. Louis Public’s Metro High School, spreads fire from a drip torch to start a leading edge of a controlled burn at Tyson Research Center. James Trager, restoration biologist from Shaw Nature Reserve, coaches Graves. Graves and students from across St. Louis are participants in the Tyson Environmental Research Fellowships, an advanced field ecology research internship program. Through a partnership with Shaw Nature Reserve and Washington University in St. Louis, high school students explore career opportunities in environmental biology and work on research teams with faculty and graduate students. The program is supported by the National Science Foundation.
experience together all the various approaches teachers use to teach content through inquiry,” she says. “Then, we wanted to develop a process to guide teachers in the selection of the most effective inquiry approach for reaching their content goals. And last, we wanted to help teachers align curriculum, instruction, and assessment in a way that would provide constant feedback about where their students were in the learning process.”

To support these goals, the development team decided that the institute should begin with a course on classroom inquiry. Then, teachers move on to three content-based courses, one each in life science, physical science, and earth science. The final course in the series is a capstone that helps teachers link the institute material to their teaching practice, and provides opportunities for them to adapt their lessons to push student thinking to higher levels.

Markovits explains the challenges of teaching science to middle school students. “There are various constraints that seem to interfere with inquiry,” he says. “The institute will provide a number of techniques to help teachers use inquiry as a basic part of their classroom environment. Hopefully, by the end of the institute, teachers will be saying, ‘I had to use four different approaches in the short time I had, but I know the kids really get it.’”

The seminar participants include science specialists Sue Gieseke, Sacred Heart School, and Jim Gender, Clayton. They also include science teachers Carol Wray, Clayton; Melanie Canaday and Joan Braun, Ferguson-Florissant; Teresa Corley, Kirkwood; Elizabeth Petersen and Kathleen Murphy, Ladue; Julie Roy, Lindbergh; Diane Coffey, Parkway; Kelly Williams, Pattonville; Nathan Peck, Mary Institute-St. Louis Country Day; and Don Knobbe and Lisa Picker, Webster Groves. District science coordinators include Eric Hadley, Ferguson-Florissant; Carrie Launius, Hazelwood; Carol Ross-Baumann, Kirkwood; Becky Litherland, Parkway; Mike Szydowski, Rockwood; and Gwen Randolph, St. Louis Public Schools.

The Boeing institute will open with its first course, Edu 6005 Scientific Inquiry for the Classroom Teacher, in fall 2010. Teachers are encouraged to register in building or district teams. Individual registrations will also be accepted. For more information, call (314) 935-8974, or visit the Science Outreach web site.