Contact:
Julie Parente, Museum of Science and Industry (773) 753-6249
Lisa Miner, Museum of Science and Industry, (773) 947-6005

CENTER FOR THE ADVANCEMENT OF SCIENCE EDUCATION

To achieve our vision—to inspire and motivate our children to achieve their full potential in the fields of science, technology, medicine and engineering—the Museum has created the Center for the Advancement of Science Education.

This new, holistic approach to the Museum's education efforts was fueled by some alarming trends shared by Americans in a recent Harris Interactive® survey and other sources:

- Seventy percent of Americans believe we've lost our global leadership position in science and only 35 percent think we'll regain it in the next 20 years. They point to the quality of our science education as the main reason. (Harris Interactive® survey conducted for the Museum of Science and Industry, 2008)
- In Chicago, 65 percent of fourth-graders and 72 percent of eighth-graders lack even the most basic science knowledge. (National Assessment of Education Progress, 2005)
- Time spent teaching science has decreased; students nationwide average about 30 minutes a day on science, and many schools spend far less time. Most Americans surveyed believe students should spend up to two hours a day on science. (Center on Education Policy, 2008 and Harris Interactive® survey, 2008)

The Center's programs empower teachers, engage the community and excite students, and go beyond the Museum walls into schools and community organizations across the Chicago area. Program development is guided by a committee of education, business and civic leaders who help ensure the Museum is a progressive leader in improving science education.

Programs are designed to provide much-needed support to teachers, reach children in a variety of settings, and make it easy to participate. Americans support a variety of ways to improve science education, from more hands-on classroom activities (97 percent) to more professional development and training for teachers (94 percent), according to the survey. The Center's programs are offered through the Institute for Quality Science Teaching, Community Initiatives and Student Experiences.

Institute for Quality Science Teaching
The Institute for Quality Science Teaching helps educators teach science with passion and confidence in content and teaching strategies. Teachers who are new to science and those who are more seasoned gain inspiration and skills from professional development workshops, master's-level coursework, partnerships with scientists and online resources.

Professional development workshops are designed to increase teachers' knowledge of science content, improve their teaching skills and demonstrate how to use Museum programs and exhibits to enhance science curriculum. About 1,000 teachers participate in our yearlong and summer workshops, ultimately impacting science education for about 30,000 students each year.

The yearlong workshop series targets 4th- through 8th-grade educators with limited experience teaching science. Teachers are recruited in pairs to ensure shared resources and continuity within schools, and most are from Chicago Public Schools. The program targets schools most in need of resources—42 of the 50 schools participating in the 2008-09 school year largely serve low-income children.

Workshops are offered at no cost to teachers who are selected to participate. The Museum reimburses schools for the cost of a substitute teacher for sessions held on school days and provides a stipend to teachers for workshops held on weekends.

Teachers attend five daylong sessions a year, where Museum educators present topic-focused inquiry-based and hands-on science activities. Workshops are aligned with Illinois Learning Standards in science, and teachers receive continuing education credit. Teachers receive lesson plans and all the materials they need to replicate the activities in their classrooms, so students learn science by doing science. Teachers also receive a class field trip, including funding for buses and a Learning Lab program.

The workshop series, which debuted during the 2006-07 school year, currently offers two topics that focus on underlying principles found throughout a science curriculum:

- *Get Energized!* explores concepts related to energy, such as energy transformation and conversion, electricity, sound, light, heat and more. Activities include a ball drop from a three-story balcony to demonstrate potential and kinetic energy, dissecting flashlights, creating circuit boards from everyday materials and more.
- *City Science* focuses on topics such as city ecology, the science behind structures, developing cities of the future and more. Activities include exploring the school yard ecosystem, studying types of pollution, constructing buildings and more.

Teachers credit the workshops with showing them how to make science fun and exciting for their students. They say the comprehensive lesson plans, materials and interactive training sessions provide exactly what they need to help their students learn science.

Planning is underway to offer master's-level coursework in partnership with Loyola University, providing more experienced middle- and high-school teachers the opportunity to specialize in teaching a specific area of science, such as chemistry, physics and earth science. A teacher-in-residence program is also being planned that will allow a teacher to spend a year at the Museum developing programming, connecting with other teachers and sharing knowledge.

Community Initiatives

Community initiatives expand the Museum's reach by providing children from diverse backgrounds with early exposure to exciting ideas, opportunities and career paths. New partnerships with schools and community organizations are extending science engagement beyond the classroom and Museum walls into places where children already spend their time. Demand for these programs is strong, and there are waiting lists for acceptance.

Key community partners include Ada S. McKinley Community Services, Chicago Area Project, Chicago Department of Children and Youth Services, Children's Home + Aid and Mayor Daley's Summer Jobs Program.

<u>After-School Science Minors Clubs</u>

After-school Science Minors Clubs were developed in 2005 to help increase science literacy and increase interest in science in underserved Chicago neighborhoods. The Museum partners with schools and community-based organizations to provide science clubs to about 5,000 8- to 13-year-olds. Currently, there are 57 clubs throughout the Chicago region and Northwest Indiana.

Participating organizations receive three curriculum modules a year; training and on-site support; materials for hands-on activities; and a field trip and Family Day at the Museum. The clubs emphasize informal learning that builds curiosity and encourages teamwork.

<u>Science Minors</u>

Older students ages 14 to 17 can become Science Minors. This youth development program targets teens in underserved communities and provides the opportunity to learn about science, meet scientists, develop public speaking skills and earn service-learning hours.

Students attend 10 Saturday training sessions where they learn about exhibits, conduct hands-on activities and develop job skills. Then, wearing their red Science Minors aprons, they interact with Museum guests on the floor as they demonstrate science activities such as the chemical reactions involved in making foam, frog dissection, the structure of DNA and more.

Three sessions each school year (fall, winter and spring) involve 45 students each time. Since its debut in 2003, about 400 teens have participated.

Science Achievers

Given students' enthusiasm for the Science Minors program, the Museum created Science Achievers in 2006 for students who want to continue their science learning and prepare for college and careers. This program allows teens who have completed Science Minors to deepen their work with the Museum. Approximately 100 students are currently participating.

Students who have completed 50 hours of volunteer service and are at least 16 years old can participate in paid internships both at the Museum and off site. Science Achievers also mentor new classes of Science Minors, facilitate science clubs and receive additional college and career readiness through a partnership with Ada S. McKinley Community Services. In 2008, 24 Science Achievers graduated from high school. From that group 20 were accepted to college with a full or partial scholarship.

The community initiatives programs are designed as a pipeline that feed each other. Students in science clubs can join Science Minors as teens and go on to become Science Achievers, where they have the chance to go back and facilitate a science club, creating a cycle that connects to the community. Students credit these programs with showing them the range of science careers that exist, teaching them to be effective public speakers and demonstrating the benefits of teamwork.

Student Experiences

Hands-on learning opportunities at the Museum invite more than 250,000 students on field trips each year to experience the passion and thrill of scientific discovery. Interactive exhibits give students the chance to learn at their own pace, and exhibit guides help teachers make the most out of their Museum visit. Beyond great, interactive exhibits, dedicated Learning Labs allow students to explore science in exciting new ways.

Learning Labs provide facilitated, focused, engaging learning experiences for school groups. About 12,000 students each year in grades 3 through 12 participate in hands-on, hour-long labs offered twice a day Mondays through Thursdays from October through mid-June. Labs are aligned with Illinois Learning Standards in science and have pre- and post-visit activities along with additional resources to enhance what students learn.

In February 2008, the Museum opened new premier educational programming space to allow the expansion of learning opportunities. The Museum currently provides the following lab topics:

- *Advanced Forensics* – Students use forensics techniques such as DNA analysis, forensic anthropology and trace evidence analysis to solve a crime. Grades: 8 to 12
- *City Science* – Students learn the basics of structural design as they design, build and test skyscrapers while exploring potential careers. Grades: 4 to 8
- *Life Begins* – A trained health educator provides an overview of reproduction, fetal development, birth and puberty. Grade: 5
- *Museum Crime Lab* – Students solve a crime at the Museum using fingerprint analysis, chromatography, white powder analysis and microscopy techniques. Grades: 4 to 8
- *Renewable Energy Lab* – Students explore new technology like hydrogen fuel cell cars and discover how some of the latest renewable energy resources work. Grades: 6 to 10
- *Simple Machines* – Students learn about the energy and work behind simple machines as they complete a challenge using levers, pulleys and inclined planes. Grades: 3 to 6
- *Submarine Math* – Students use the U-*505* exhibit to solve problems and investigate mathematical topics such as estimation and unit conversion. Grades: 4 to 7
- *Submarine Science* – Students participate in demonstrations, hands-on activities and guided exploration as they discover the science behind the U-*505*. Grades: 4 to 7
- *Testing the Waters* – Students play environmental scientists and use a Chicago-area water source to explore watersheds and determine the quality of a water sample. Grades: 4 to 8

The Museum has a state-of-the-art videoconferencing lab that connects an onsite classroom of 35 students with three other remote locations anywhere in the world. This technology is a unique way to provide students on field trips with access to real science professionals.

Live … from the Heart, the Museum's premiere videoconferencing program, offers students in grades 8 through 12 a dramatic exploration of the human heart. Students at the Museum and classes connected remotely, watch live open-heart surgery being performed at Advocate Christ Medical Center. Students can talk to the surgical team, ask questions about the procedure, get tips on keeping their heart healthy and find out about exciting careers in medicine. Since the program debuted in 2003, more than 10,000 students have participated. Demand for the program is high; all sessions are booked before the school year begins, and several schools are on the waiting list.

The Museum's videoconferencing lab programming will be expanded to provide students with access to scientists in world-class research laboratories, explorers in extreme environments and more.

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