

About the Museum of Science

Anticipating the need to improve science, technology, engineering and math (STEM) education to foster innovation and 21st century skills, the Museum of Science, Boston created the [National Center for Technological Literacy® \(NCTL®\)](#) in 2004. Guided by Museum president and director Ioannis Miaoulis, PhD, the NCTL has worked with education, government, and industry to advance STEM knowledge for all. One of the world's largest science centers, drawing 1.4 million visitors a year, the Museum is the first science museum



in the United States with a strategy and infrastructure to introduce engineering into schools and museums nationwide.

NCTL strategy involves: advocacy; reform of standards and assessments; creation of K-12 curricula and museum programming; teacher professional development (PD); and enhancing public perceptions of engineering. Its engineering curricula have reached an estimated 122,400 teachers and 10.5 million students nationwide.

Led by Miaoulis, the former dean of Tufts engineering school, Massachusetts was first in the nation in 2001 to adopt a statewide K-12 curriculum framework and assessments for technology/engineering. The NCTL is based on his innovative idea that introducing young children to engineering design skills will engage them in using math and science to solve problems, "the process that leads to the innovations facilitating 95% of life," he says. "Since school science curricula focus more on the natural world than on the engineered one, we must make technology and engineering as important as science and math so that students will pursue these fields." For him, engineering is the missing link that brings science and math alive for children who are natural engineers.

That's why the NCTL introduces engineering as early as elementary school and continues it through high school, college, and beyond. Responding to the lack of elementary engineering curricula, Museum vice president Christine Cunningham piloted [Engineering is Elementary® \(EiE®\)](#) in Massachusetts with 8 teachers and 200 students. Her research at Cornell had convinced her that K-12 experience with engineering and technology was essential for all children to understand a world that increasingly depends on those two fields.

Today, the nation's largest elementary engineering curriculum, EiE has reached an estimated 115,600 teachers and 10.2 million students in all 50 states. Its award-winning 20-unit curriculum integrates engineering and technology with science, language arts, social studies, and math via storybooks and hands-on design activities.

EiE is used statewide in Delaware, in Iowa through its STEM Scale-up Program, in Alabama via AMSTI, and districtwide in Baltimore, Washington, DC, and Minneapolis. EiE has been

the model for a European Commission-funded initiative to introduce engineering in primary schools and museums in Europe and Israel and has reached schools on U.S. military bases in Europe and the Pacific. The Museum is also investing \$425,000 to create a PreK-K engineering curriculum for ages 3 to 5, based on EiE.

[Research](#) suggests that students experiencing EiE show greater gains in science learning than those using traditional science curricula; EiE fosters improved attitudes about the value of science and engineering, particularly in girls; EiE promotes students' knowledge of engineering and interest in science and engineering careers; teachers using EiE note students (especially underrepresented racial minorities) are more engaged; teachers experiencing EiE PD feel more prepared to teach engineering, technology, and problem-solving and find EiE develops collaboration, creativity, and problem-solving.



Advocacy

Championing engineering in schools and museums worldwide, Miaoulis has testified before U.S. Senate and House committees and served as keynote speaker at education reform conferences. He built support for the first **Engineering Education for Innovation Act** in 2010 and 2011 and for the **Educating Tomorrow's Engineers Act** in 2013 and 2015. He also championed the STEM provisions of the **Every Student Succeeds Act**, adopted by Congress and signed by President Obama in 2015.

Other Formal NCTL Projects

The Museum's high school [Engineering the Future](#)[®] textbook has reached 1,000 teachers and 30,000 high school students in 38 states.

A [Building Math](#) middle school course, created with Tufts University, has reached over 6,800 teachers and almost 340,000 students in 47 states and won the Association of Educational Publishers' 2008 Distinguished Curriculum Award.

The Museum has worked with the PBS kids TV show and Design Squad website to create Engineering Now!SM for middle school students. Addressing the Next Generation Science Standards, its 10 units involve real-world engineering related to the life, physical, and earth sciences.

The NCTL supports K-12 educators with onsite and online [professional development](#) and is building a network of teacher-educators, using a train-the-trainer model. EiE has reached 18,400 elementary teachers with learner-driven PD workshops. Major corporations including Raytheon and Oracle partner with the Museum to make EiE PD more available at high-needs

schools, supporting nearly 500 teacher PD scholarships. This year, the Museum invested its own funds in a new \$200,000 PD scholarship initiative for rural schools and teachers of English-language learners.

Endorsed by the Massachusetts STEM Advisory Council, the **Gateway Project** originated in 2005 to help school districts develop strategic plans to implement K-12 technology and engineering programs, while introducing educators to resources supporting standards-based curricula and assessments. Replicated in New Hampshire, Texas, and Maine as a model, Gateway, led by Museum vice president Yvonne Spicer, has reached 100 Mass. districts serving 640,000 students and more than 600 K-12 educational leaders.

NCTL Informal Projects

Museum educators have engaged 750,000 young visitors – 53% are female -- in [Design Challenges](#) (designchallenges@mos.org), a program conceived by Miaoulis, involving the engineering design cycle.

The NCTL is creating EiE-based out-of-school-time elementary and middle school curricula, [Engineering Adventures](#)® and [Engineering Everywhere](#)™, respectively.

[The Science Behind Pixar](#) (educationenterprises@mos.org), a 12,000-foot exhibition developed in collaboration with Pixar Animation Studios, is touring nationally after having transformed the complexities of computer science into compelling experiences for 321,800 Museum visitors and producing its best summer attendance in 17 years.

The Museum has promoted engineering to more than 3 million people in museums nationally and in Australia via **Star Wars: Where Science Meets Imagination** exhibition, created with Lucasfilm Ltd.

The Museum led a \$41 million National Science Foundation-funded **Nanoscale Informal Science Education Network** of science museums, reaching an estimated 30 million people, which has become a model for the [National Informal STEM Network](#), a national community of informal educators and scientists dedicated to fostering public awareness, engagement, and understanding of STEM.

Awards

In 2015, the NCTL received the National Science Board's Public Service Award. In 2014 the American Society for Engineering Education presented its President's Award to Miaoulis and the NCTL, honoring Museum vice president Christine Cunningham as an ASEE Fellow. In 2014 EiE and EiE director Cunningham received the International Society for Design and Development in Education Award for excellence in science or math education design. The NCTL also won the 2010 Smaller Business Association of New England Innovation Award.