

Create a Generation of Problem Solvers

OVERVIEW

EiE is an award-winning program of the Museum of Science, Boston. Our research-based, hands-on engineering curricula (preK-8) introduce learners to the engineering design process and create a generation of problem solvers. They are used in all 50 states and in more than 30 countries across the world. We design our engineering curricular materials, resources, and teacher professional development to best innovate for the reality of today's educational landscape. EiE engages all learners and empowers students and educators to discover their inner engineer.

EiE aims to challenge the misconceptions about STEM, especially engineering, while building a generation of problem solvers who practice 21st century skills and apply engineering, science, and mathematics concepts across disciplines. Our commitment to equity and access is a foundational idea in our curriculum design, professional development, and research.

PRODUCTS AND CURRICULA

WeeEngineer

The first-ever preschool engineering curriculum, Wee Engineer channels preschoolers' natural curiosity and creativity into structured problem solving.

EiE for Kindergarten

EiE for Kindergarten inspires young learners to embrace the field of engineering before stereotypes about "who can engineer" take hold.

Engineering is Elementary

Standards-aligned, teacher-tested engineering units build a foundation for STEM learning in elementary school while students identify and solve challenges in a real-world context.

Engineering Adventures

Fun, creative problem solving units are designed to help kids in grades 3–5 learn to collaborate, communicate, solve problems, and share their solutions with their peers, while being flexible to meet the time and budget constraints of out-of-school settings, including afterschool and summer camp.

Engineering Everywhere

Inspires learners in grades 6–8 to shape the world around them in engaging, learner-centered engineering challenges that can be used in a variety of afterschool, summer camp, and out-of-school settings.

BY THE NUMBERS

EiE was developed **fifteen years ago** by the Museum of Science, Boston—a time when it was unheard of to teach engineering to young children. Since then, we've developed the frameworks, curricula, and professional development—along with advocacy, research, and leadership—to help educators and learners think like engineers:

Served more than
18 million
students

Used in all
50 U.S. states

Adopted in more than
30 countries
internationally

Supported more than
196,000
educators

Appeared at over
12 conferences
featuring our research and our
pioneering approach to engineering
education for young learners

Founding Director
Christine Cunningham
published **Engineering in
Elementary STEM Education**
(MAY 2018, Teachers College Press)

Awarded
9 awards
for the curricula, including the
2017 McGraw Prize in Education

VALUES

1

WE MAKE ENGINEERING ACCESSIBLE FOR ALL

We develop an engineering, problem solving, and critical thinking mindset in all learners.

- We deliberately start in early childhood to build on the natural inclination of young children to explore and shape the world around them, and before societal stereotypes take hold.
- In addition, our curricula is purposefully designed to engage all students—particularly underrepresented, under-performing, and underserved students. We deploy early and frequent testing of our curricula in under-resourced, diverse schools to ensure curricular relevance to all populations.
- We're committed to make engineering accessible for teachers. Curricular materials and resources are carefully created to support and scaffold teachers' knowledge and comfort with engineering.

2

WE KNOW IT WORKS

We work closely with teachers to develop curricula that integrates easily with science, math, ELA, and social studies. We draw from extensive research to determine what high-quality engineering curriculum and instruction looks like and how to best prepare teachers. The curricula is aligned with standards (NGSS, State, WIDA, Common Core).

EiE research on students proves:

- Students who experience EiE **learn science better.***
- After using EiE, **girls do just as well as boys** on engineering and science outcomes. *
- EiE promotes students' **interest in science and engineering careers.****
- EiE addresses students' misconceptions about engineering and technology, **helping them gain a more accurate, standards-based understanding.** ***
- EiE **promotes students' knowledge of engineering content** and awareness of the diverse fields of engineering.**

3

WE INNOVATE, INFLUENCE, AND LEAD EDUCATORS

We carefully consider our curricular choices to support innovation in the classroom. An engineering and problem solving mindset is at our core. We actively blend research with curriculum and professional development. We examine the impact of the curriculum, support teachers to implement new discipline and instructional strategies, and create high-quality curricular resources.

- Teachers who experience EiE's professional development feel more prepared to teach engineering, technology, and problem solving.**
- Teachers rate EiE as “thoughtfully developed,” “easy to use,” and “more effective than traditional science curricula alone” in helping students make real-world connections to classroom learning.**
- Teachers find that EiE develops 21st century skills such as collaboration, creativity, and problem solving.**

PEDAGOGICAL THEORY

Rigorous, research-based design is the cornerstone of each unit in our curricula. Our recommended pedagogical methods are based in a constructivist view of learning. These include the following:



Contextual Learning and Problem Solving. EiE engineering design challenges show students how what they learn in school connects with the world around them.



Collaborative Learning and Teamwork. Most EiE activities involve small-group work that encourages students to consider more than one solution or idea and work collaboratively.



Communication. All EiE curricula develop students' communication skills and encourage them to share ideas in several ways: speaking, writing, drawing, and building.



Project-based Learning. EiE's engineering design challenges engage students in inquiry. As they analyze their own data and make decisions about their design, students engage with content, hone their critical-thinking skills, and take ownership of their learning.

HABITS OF MIND

A well-designed engineering curriculum develops positive strategies for problem solving that we call “Engineering Habits of Mind.” EiE helps teachers introduce engineering habits of mind to their students as early as first grade.

Overlapping with NGSS practices, EiE’s 16 engineering habits of mind anchor lessons, professional development, and research, guiding educators and helping them develop their understanding of what K-12 could look like.

Children who develop habits of mind...	
Investigate properties and uses of materials	Develop and use processes to solve problems
Consider problems in context	Construct models and prototypes
Envision multiple solutions	Make evidence-based decisions
Innovate processes, methods, and designs	Persist and learn from failure
Make tradeoffs between criteria and constraints	Assess implications of solutions
Use systems thinking	Work effectively in teams
Apply math knowledge to problem solving	Communicate effectively
Apply science knowledge to problem solving	See themselves as engineers

STANDARDS:

EiE is developed with careful attention to standards in science and technology/engineering. Curricula are aligned to the NGSS, Common Core, ITEEA Standards for Technological Literacy, K-5 Science Standards for all 50 states, and the EQulP Rubric. [Learn more.](#)

Museum of Science

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SOURCES:

* Exploring the Efficacy of Engineering is Elementary, (E4) NSF #1220305, 2018.

† Elementary Students Interests and Attitudes: A Comparison across Treatments, Museum of Science, Boston, 2017. Retrieved from: <https://www.asee.org/public/conferences/78/papers/20187/view>

‡ The Impact of Engineering is Elementary on Students’ Conceptions of Technology, Museum of Science Boston, 2012. Retrieved from: https://www.eie.org/sites/default/files/downloads/EiE/ResearchPublications/jocz_and_lachapelle_2012_tech_report.pdf



DR. IOANNIS (YANNIS) MIAOULIS PRESIDENT & DIRECTOR, MUSEUM OF SCIENCE, BOSTON

Dr. Ioannis (Yannis) Miaoulis has been President and Director of the Museum of Science, Boston since 2003. Originally from Greece, Dr. Miaoulis came to the Museum after a distinguished association with Tufts University, where he served as Dean of the School of Engineering, Associate Provost, Interim Dean of the University's Graduate School of Arts and Sciences, and Professor of Mechanical Engineering.

Miaoulis was a central figure in leading the charge to introduce engineering into the Massachusetts science and technology public school curriculum in 2001, making the Commonwealth first in the nation to develop a K-12 statewide curriculum framework and assessments for technology/engineering.

In 2004, Miaoulis spearheaded the creation of the National Center for Technological Literacy® (NCTL®) at the Museum. The NCTL aims to enhance knowledge of engineering and technology for people of all ages and to inspire the next generation of engineers, inventors, and scientists.

Miaoulis has testified before U.S. Senate and House committees and served as keynote speaker at education reform conferences worldwide.

A former Wellesley College and WGBH Trustee, Miaoulis has co-chaired the Mass. Technology/Engineering Education Advisory Board. He has also served on the NASA Advisory Council, the NASA Education and Public Outreach Committee, and the National Museum and Library Services Board from 2006 to 2012. A former member of Mass. Governor Deval Patrick's Commonwealth Readiness Project Leadership Council and the Executive Committee of Gov. Patrick's Science, Technology, Engineering and Math Advisory Council, Miaoulis now serves on the Tufts University Board of Directors and the Board of Directors of the Center for the Advancement of Science in Space (CASIS), which manages the International Space Station.

His many honors include an Honorary Doctor of Science degree, SUNY Polytechnic Institute, 2015, the 2014 American Society for Engineering Education (ASEE) President's Award (jointly with the NCTL), the 2012 Science Club for Girls Catalyst Award, the 2011 ASME (American Society of Mechanical Engineers) Ralph Coats Roe Medal, NASA's Exceptional Public Service Medal in 2009, the 2003 Tufts University Alumni Association's Distinguished Service Award, the William P. Desmond Award for Outstanding Contributions to Public Education, the Allan MacLeod Cormack Award for Excellence in Collaborative Research, and the Presidential Young Investigator Award.

Miaoulis has published more than 100 research papers and holds two patents. He has three degrees from Tufts University, a B.S. in mechanical engineering in 1983, an M.A. in economics in 1986, and a Ph.D. in mechanical engineering in 1987. He also received a master's degree in mechanical engineering from the Massachusetts Institute of Technology in 1984.



CHRISTINE M. CUNNINGHAM PHD
FOUNDING DIRECTOR, EiE
VICE PRESIDENT, MUSEUM OF SCIENCE, BOSTON

Dr. Christine Cunningham is an educational researcher who works to make engineering and science more relevant, accessible, and understandable, especially for under-served and underrepresented populations.

As vice president at the Museum of Science, Boston since 2003, she is the Founding Director of Engineering is Elementary™, a groundbreaking project that integrates engineering concepts into preschool, elementary, and middle school curriculum and teacher professional development. As of April 2018, EiE has served 17 million children and 190,000 educators nationwide and

internationally. Her recent book, *Engineering in Elementary STEM Education*, describes what she has learned.

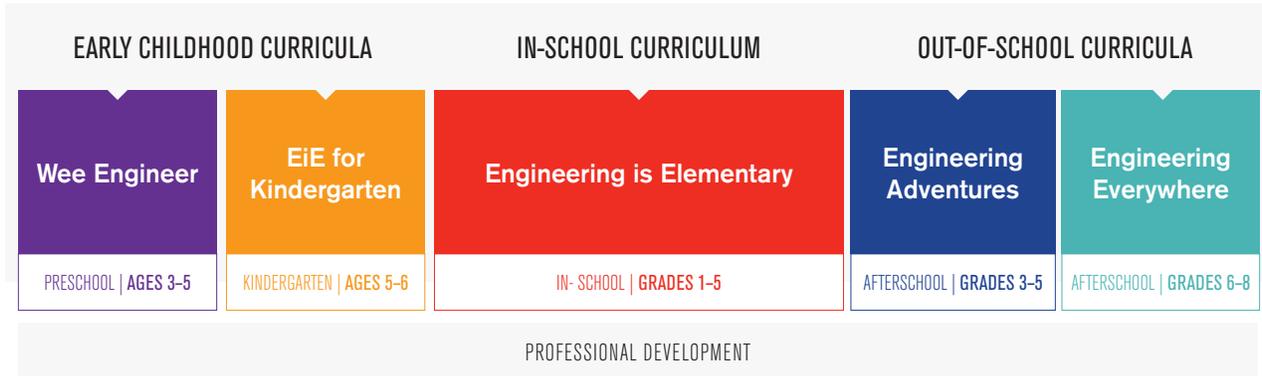
Cunningham has previously served as director of engineering education research at the Tufts University Center for Engineering Educational Outreach, where her work focused on integrating engineering with science, technology, and math in professional development for K–12 teachers. She also directed the Women's Experiences in College Engineering (WECE) project, the first national, longitudinal, large-scale study of the factors that support young women pursuing engineering degrees.

Cunningham is a Fellow of the American Society for Engineering Education (ASEE) and received the ASEE K–12 and Pre-College Division Lifetime Achievement Award in 2015. She was awarded the 2014 International Society for Design and Development in Education Prize, the 2015 IEEE Pre-University Educator Award, and the 1991 Alpheus Henry Snow Prize. In 2017, her work was recognized with the prestigious Harold W. McGraw Jr. Prize in Education.

Cunningham holds joint B.A. and M.A. degrees in biology from Yale University and a Ph.D. in Science Education from Cornell University.

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EiE | THE NATION'S LEADING ENGINEERING CURRICULUM FOR GRADES PREK-8



Wee Engineer® (PRESCHOOL/PRE-K)

Wee Engineer channels preschoolers' natural curiosity and creativity into structured problem solving. Designed as the first preschool engineering curriculum, Wee Engineer sets young learners up for success in school and life. Four hands-on engineering challenges ease learners into the worlds of science and technology as they practice social, fine motor, cognitive, and language skills. They'll learn that there's more than one way to solve a problem, and that it's okay to fail and try again. With Wee Engineer, show children that anyone, even the youngest learners, can engineer.

EiE® for Kindergarten (KINDERGARTEN)

EiE for Kindergarten inspires young learners to embrace the field of engineering before stereotypes about "who can engineer" take hold. This teacher-tested curriculum introduces engineering and the engineering design process in engaging and accessible ways for all young learners and educators. Two hands-on units align to kindergarten engineering performance expectations and connect with other subject areas to prepare children for success in later grades. Young learners are invited to practice the 21st century skills they are already developing in social, emotional, physical, cognitive, and language domains.

Engineering is Elementary® (GRADES 1-5 IN-SCHOOL)

Engineering is Elementary empowers elementary students to become innovative problem solvers who think creatively as they identify and solve challenges in a real-world context. Twenty standards-aligned, teacher-tested engineering units build a foundation for STEM learning. Each hands-on unit is anchored in your science curriculum and designed to engage learners in ways that align with their learning style. With Engineering is Elementary, all students—including English learners, students who receive special education services, and those who have not flourished in traditional academic settings—can work together to find creative solutions and discover their inner engineer.

Engineering Adventures® (GRADES 3-5 AFTERSCHOOL/OUT-OF-SCHOOL)

Engineering Adventures engages learners in grades 3-5 in fun, creative problem solving. Ten hands-on units are low-cost and flexible to meet the time and budget constraints of out-of-school settings, including afterschool and summer camp. Each unit centers on meaningful, open-ended problems with a global context. Learners find out more about the role engineering plays in their lives and the world around them as they're introduced to real engineering challenges and asked to design solutions with an engineering design process. Throughout each unit, kids learn to collaborate, communicate, solve problems, and share their solutions with their peers.

Engineering Everywhere® (GRADES 6-8 AFTERSCHOOL/OUT-OF-SCHOOL)

Engineering Everywhere inspires learners in grades 6-8 to shape the world around them. Our twelve hands-on units were tested in afterschool, summer camp, and out-of-school settings, and they are proven to engage learners in innovative problem solving. Each unit begins with a Special Report video, which sets the context for the engineering design challenge and explores problems like food scarcity, prosthetics, and disease control. As learners work through our design challenges, they'll sharpen 21st century skills like critical thinking, teamwork, and communication, preparing them for success in school and in life.

PROFESSIONAL DEVELOPMENT

Empower innovation in the classroom in our learner-centered workshops. Educators learn the skills they need to foster student-centered, inquiry-based learning, while enhancing their knowledge of engineering content. Select from our existing Train-the-Trainer, Teacher Training, and Online PD workshops, or let us customize a professional development program that is tailored to your specific needs. Learn more at eie.org/pd.

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From **thought leaders** to **young learners**, we work to be leaders in the field of engineering education, professional development, and research.

But, don't just take our word for it:

TEACHERS

“ I imagine my students in 12 years telling their high school guidance counselor that they want to go into engineering, fully confident they can do it because they started all the way back in kindergarten. More than any other curriculum I've ever taught, I believe that engaging in the EiE unit will continue to open doors for my students throughout their educational careers and their lives. ”

Kelly Livingston, CESAR E. CHÁVEZ MULTICULTURAL ACADEMIC CENTER, CHICAGO, IL

“ EiE has opened my students' eyes to the possibility that they can help solve realistic problems. I've had some even tell me they never thought they could be an engineer because they weren't smart enough, or didn't speak English well enough. After working through an EiE unit successfully, they felt more confident in their ability to solve problems like an engineer. ”

Roxanne Camel, VILLAS ELEMENTARY, FT. MYERS, FL

“ As a result of the implementation of the EiE curriculum I have seen an increase of student awareness and desire to do science. It has become a favorite part of their day. They enjoy the collaboration and the hands on activities with their peers. They are becoming problem solvers and do not even realize how much they are learning. ”

Meagan Willard, DESERT WILLOW ELEMENTARY SCHOOL, TUCSON, AZ

“ [EiE] has had a big impact on my students. They become better problem solvers, work better in teams, use the design process to learn from failures and improve on their ideas, and see themselves as engineers. I am often surprised at how well even my lowest performing students do when we work through one of these units. They get the science and feel such a sense of accomplishment when they do an engineering design challenge. ”

Debbie Gordon, VISTA DEL MONTE ELEMENTARY, PALM SPRINGS, FL

“ There are many strong connections between our state standards and EiE. Students always want to do more! Teachers who were skeptical about their students' ability to engineer (and their own) soon realized all could have success and be excited about problem solving. ”

Meg Gebert, TUCSON UNIFIED SCHOOL DISTRICT, TUCSON, FL

“ I like to think I’m an intelligent and capable teacher, but the EiE workshop opened my eyes to what engineering really means. Now, instead of referencing engineering as a career path my students might wish to consider for the distant future, my students ARE engineers, and loving every minute of it. ”

Simone Ryals, TAMARAC ELEMENTARY SCHOOL, FT. MYERS, FL

STUDENTS

The following are interactive testimonials. Please click the links so you can see the students in action!

“ [I like engineering because you get to create stuff and learn and you get to learn more, too. You get to know a lot more when you engineer.](#) [0:13] ”

Julie Mock’s 1st Grade Class, LAKE ELMO, MN

“ [The lesson helped us communicate and get along better, because it was a lot of teamwork.](#) [1:32] ”

Vanessa Ford’s 4th Grade Class, WASHINGTON, DC

“ [When I grow up, I would like to be an engineer because I’ve been wanting to make things that would be helpful, and when I grow up I think I can make things that would be helpful for people.](#) [0:13] ”

Chentel Neat’s 2nd Grade Class, HOLLYWOOD, FL

THOUGHT LEADERS

“ Developing synergy with museums, schools, businesses and the National Science Foundation is absolutely necessary to build math and science educational opportunities. The [EiE] curriculum [developed by the Museum of Science, Boston] is a great tool to involve children in science and engineering at their own level so that they are excited about and enjoy learning. ”

Arden L. Bement, Jr., former director, NATIONAL SCIENCE FOUNDATION

“ EiE curricula provide socially and culturally relevant contexts for students through their well-designed storybooks and their engaging engineering design challenges. Students who experience EiE lessons continue to talk about the characters from the storybooks and the design challenges for a long time after the conclusion of the lessons. ”

Tamara J. Moore and Gillian H. Roehrig, Co-directors, STEM EDUCATION CENTER, UNIVERSITY OF MINNESOTA

“ Engineering is Elementary teaches students the thinking and reasoning skills they need to be successful learners and workers. Because EiE is built around the engineering design process, it teaches students how to solve problems systematically. It also creates the optimism that every problem can be solved, which is relevant to any subject area. These skills and attitudes are important for our kids' future. Life is not multiple choice. ”

Laura J. Bottomley, Director, THE ENGINEERING PLACE, NORTH CAROLINA STATE UNIVERSITY

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