

The Rationale for Adding Engineering is Elementary® To Your Curriculum

Why Teach Engineering To Children?

In America today, most students don't study engineering until they get to college—if ever. But introducing children to engineering at a much younger age—as early as elementary school—makes good sense. First of all, children are naturally fascinated with building things, not to mention taking things apart to see how they work! Second, solving engineering design challenges involves highly effective learning strategies including project-based and



Engineering builds skills that transfer to other disciplines

hands-on learning. By learning the engineering design process, children build their problem-solving skills—skills that transfer to other disciplines, including math and science. And finally, today's society is increasingly dependent on advanced technologies, a reality that makes engineering and technological literacy essential 21st century skills for all Americans.

Despite the critical need to develop STEM (science, technology, engineering and math) literacy in all students, the number of American high school and college students who take courses in STEM subjects (and who go on to careers in STEM fields) is small, and it's also declining.

The Engineering is Elementary (EiE) curriculum has been expressly designed to address this critical need by increasing children's STEM literacy. Inquiry-based and standards-driven, EiE teaches engineering content and skills, links engineering to the science and math students are already learning, and helps children develop positive associations with engineering and science—to see them as being integral to modern life, and also potential career paths.

The Engineering is Elementary project is based at the Museum of Science, Boston—the nation's only science museum with a comprehensive strategy and infrastructure to foster engineering and technological literacy in both science museums and schools. Launched in 2003 with support from the National Science Foundation, EiE is also supported by numerous foundations and corporations.

20 EiE Units – More Than Just Engineering

Teachers can select from 20 different EiE curricular units. Each unit addresses a different field of engineering (for example mechanical or electrical engineering) –and links to the related science topics commonly taught in the elementary grades. This allows students to use the science knowledge they are learning at the elementary grades.

For example, the EiE unit “Catching the Wind: Designing Windmills” engages children in mechanical engineering, using what they’ve learned about wind and weather. Another EiE unit, “The Best of Bugs: Designing Hand Pollinators,” presents children with an agricultural engineering challenge, drawing on what students have learned about the relationships between insects and plants. (See the document **“EiE 20-Unit Overview”** or visit our website (<http://eie.org/eie-curriculum>) for a list of all 20 units showing the engineering and science topics each unit covers.)

Besides promoting STEM literacy, EiE units also connect with literacy and social studies. Units are organized around illustrated storybooks that feature children from a variety of countries and backgrounds—so students learn about different cultures and world geography while they build their vocabulary. The child protagonist in each storybook faces—and solves—real-world engineering challenges . . . with a little help from an adult engineer who serves as a role model and guide.

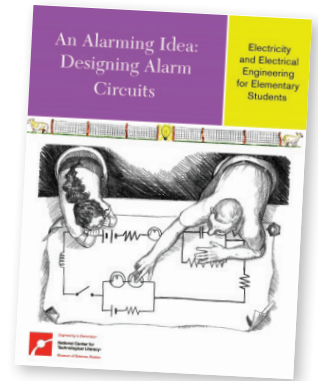
In the storybook “Despina Makes a Splash,” for example, a girl from Santorini, Greece, who loves to swim and dive loses her favorite pair of goggles. She gets tips from her brother’s friend, an ocean engineer, to design a submersible that can rescue the goggles from the ocean floor. In the storybook “Hikaru’s Toy Troubles,” a young boy worried about his parent’s struggling toy shop attracts crowds of customers after he consults with a neighbor, a transportation engineer, and builds an entertaining toy-delivery system.



Lesson Plans That Build Knowledge

All 20 EiE units are structured in the same way. Each unit consists of a short preparatory lesson plus four longer lessons, some of which are designed to take more than one class period.

The **Preparatory Lesson** prompts students to explore the questions, “What is engineering?” and “What is technology?” Many young children hold misconceptions about these terms.

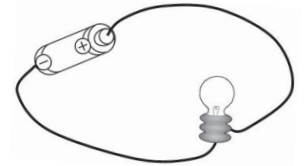


Lesson 1: Engineering Story

This lesson sets the context as students read or listen to the storybook. The lesson includes a series of questions teachers can use to prompt student reflection before, during, and after the story.

Lesson 2: A Broader View

This lesson consists of hands-on activities that help students learn more about the particular field of engineering (mechanical, chemical, electrical, etc.) covered in the unit.



Lesson 3: Scientific Data Inform Engineering Design

In this lesson, children collect and analyze the data they will need to successfully address the Engineering Design Challenge in Lesson 4. For example, they may investigate the properties of different materials or work to systematically vary one parameter of a design.

Lesson 4: Engineering Design Process

Each EiE unit culminates in an engineering design challenge similar to the challenge presented in the storybook. Working in teams and using the engineering design process, students imagine, plan, create, test, and then improve a technology to solve the challenge.

Each curriculum unit includes all the resources a teacher needs to successfully teach these lessons, including:

- The storybook
- A teacher’s guide (with lesson plans, background information, and activity instructions)
- Duplication masters (for both early learners and more advanced learners)
- Student assessment tools (rubrics, multiple choice questions, and open-ended questions)



Engineering is Elementary®

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