

# Family Engineering

## *For Parents & Elementary-Aged Children*

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National Science Foundation

The demand for scientists and engineers will grow by 44% in ten years.

U.S. Bureau of Labor Statistics

# The Challenge

85% of kids aged 8-17 are not interested in a future engineering career.

Only 20% of parents have or will encourage their children to consider an engineering career.

American Society for Quality Survey (Harris Interactive, 2008)

Universities in the United States had 11% fewer engineering graduates in 2005 than in 1985.

(Carroll, *Power Engineering*, 2007)

High-tech companies have been issuing the “crisis warning” about engineering shortages for at least the past two decades.

(Brown and Linden, 2008)




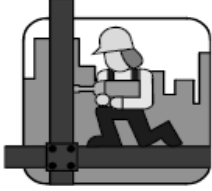












# Public Perceptions Relevant to Engineering

- There is no public face to engineering.
- Engineering work is a sedentary desk job.
- Engineering is strongly linked to math and science, but not to other vital aspects, such as creativity, teamwork, and communication
- Engineers are not seen as directly helping people.
- Many kids want a well paying job that makes a difference.

*Changing the Conversation*, National Academy of Engineering, 2008

# “What Does An Engineer Do?”

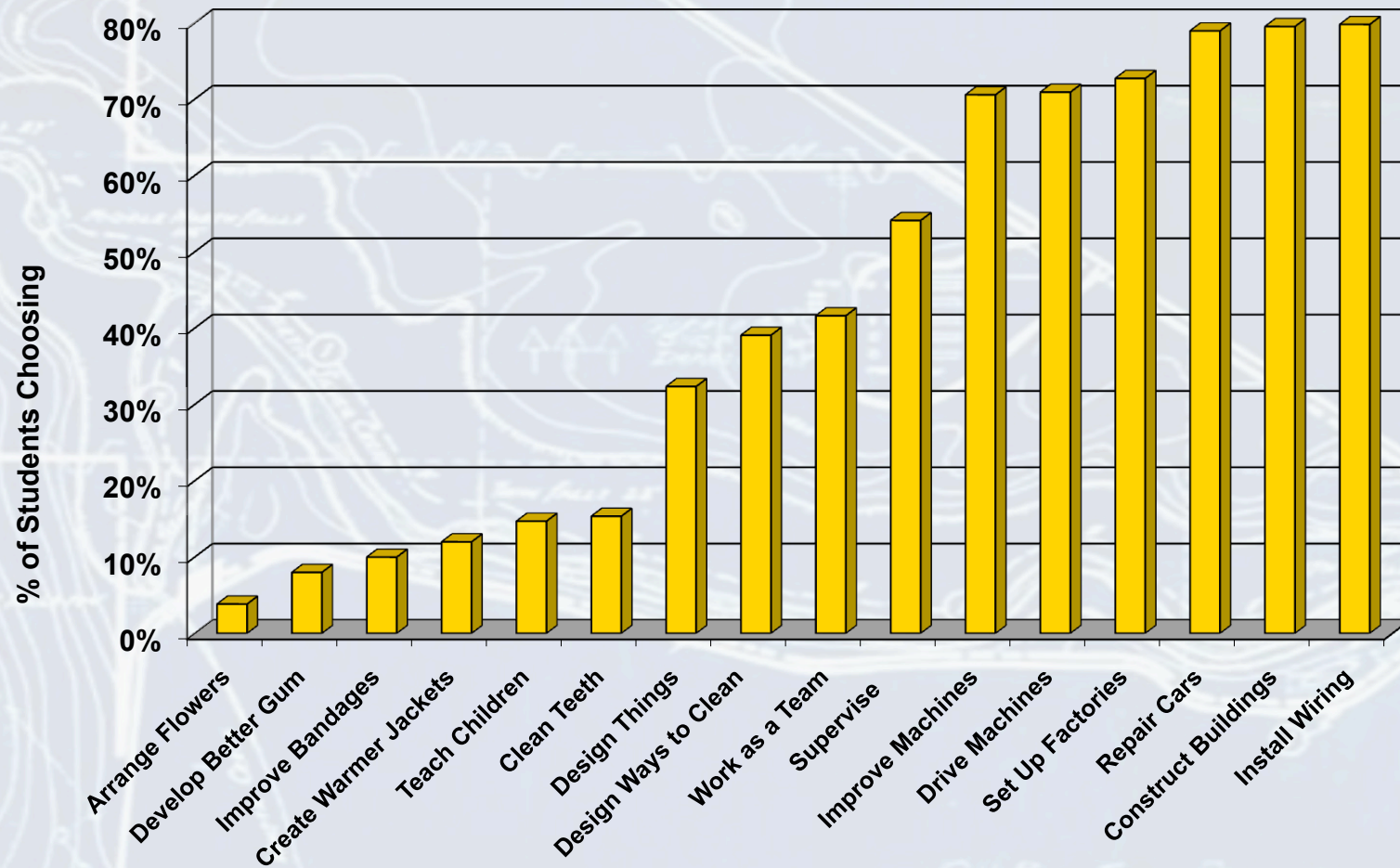
Student page excerpted from *Engineering is Elementary* classroom curriculum seeks to clarify student misconceptions about what engineers really do....

			
Improve Bandages	Develop Better Bubble Gum	Design Ways to Clean Water	Construct Buildings
			
Drive Machines	Arrange Flowers	Read About Inventions	Figure Out How to Track Luggage
			
Work as a Team	Create Warmer Kinds of Jackets	Install Wiring	Sell Food
			
Repair Cars	Design Tunnels	Clean Teeth	Write Computer Programs

Engineering is Elementary @ Museum of Science, Boston.

# What Do Kids Think?

## What is Engineering?



The evidence is consistent, positive, and convincing: families have a major influence on their children's achievement in school and through life.

*A New Wave of Evidence: The Impact of School Family, and  
Community Connections on Student Achievement*  
Henderson and Mapp, 2002

# Parental Involvement Impacts Students' Academic Success & Career Choices

- Student's attitudes about science, math and careers are often formed before the high school years and are influenced by their parents' values.
- 70% of waking hours are outside of school.
- Family participation in education was twice as predictive of student academic success as family socioeconomic status.
- Most consistent predictors of academic achievement and social adjustment are parent expectations.
- Greater parental involvement results in increased confidence as science learners.



# Engineering Learning for Every Child

- Encourage questions
- Foster curiosity
- Build confidence
- Use stuff
- Celebrate discoveries
- Allow time for inquiry & reflection
- Develop problem solving skills
- Enjoy the creative side of engineering
- Create safe environments for exploration
- Listen to children's explanations
- Challenge them to "Try it" themselves
- Engage parents in the learning adventure
- Demonstrate how engineering improves our lives
- Challenge stereotypes about who engineers are
- Make connections between school and career choices



It's okay to say "I don't know."

# Invitational Learning Model

## SCIENCE

Originates in Questions About the Natural World

Methods of Inquiry

Explanations for Phenomena in the Natural World

Personal Actions and Social Applications

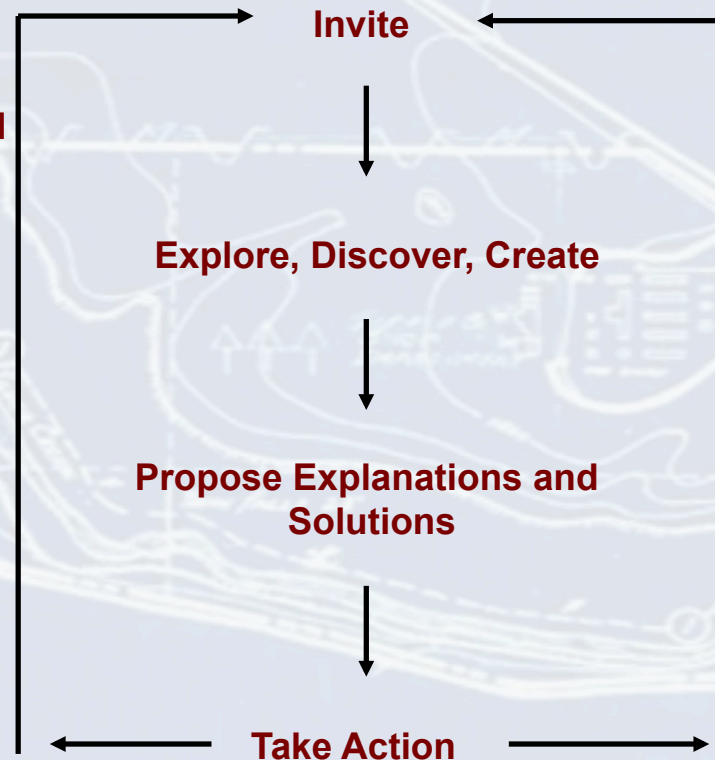
## ENGINEERING

Originates in Problems of Human Adaptation in the Environment

Problem-Solving Strategies

Solutions to Human Problems of Adaptation

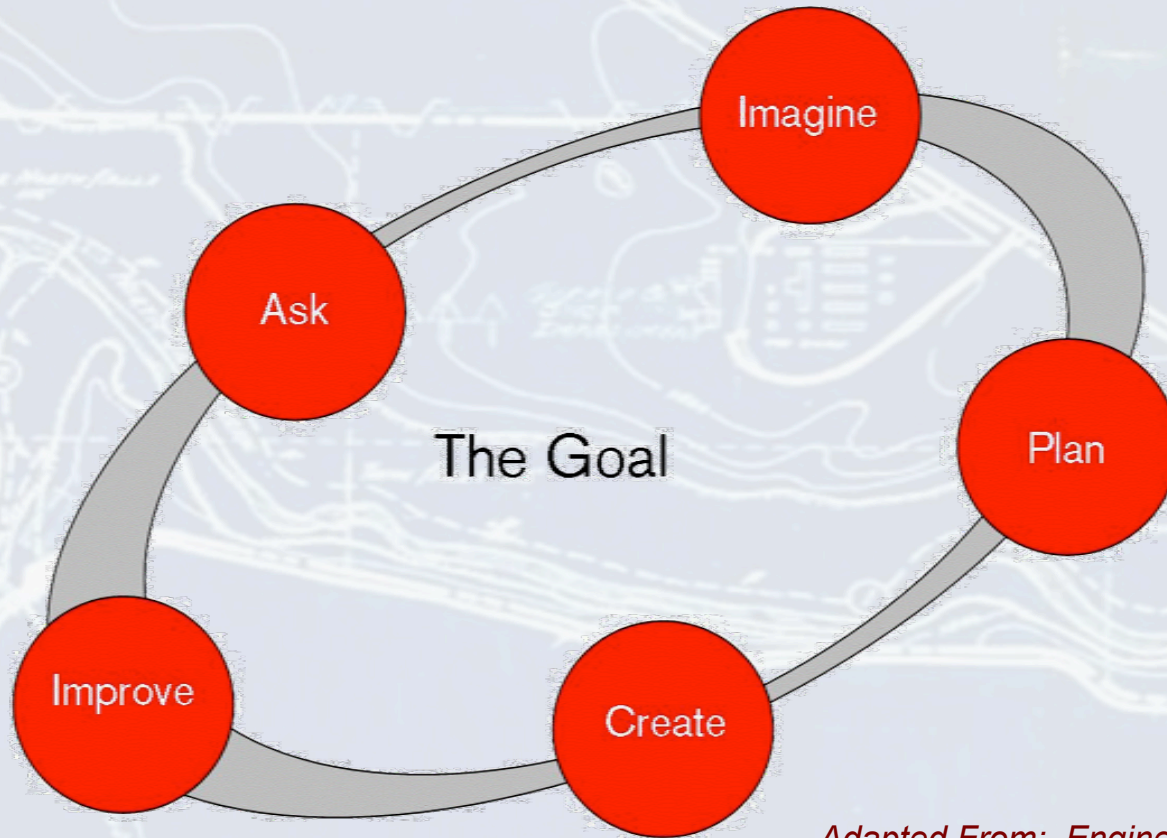
Personal Actions and Social Applications



*Adapted From: Science and Technology for the Elementary Years: Frameworks for Curriculum and Instruction, National Center for Improving Science Education, 1989*

# Engineering Design Process

The Engineering Design Process is a series of steps that engineers use to guide them as they solve problems.



*Adapted From: Engineering Is Elementary*

# Family Engineering Program Goals

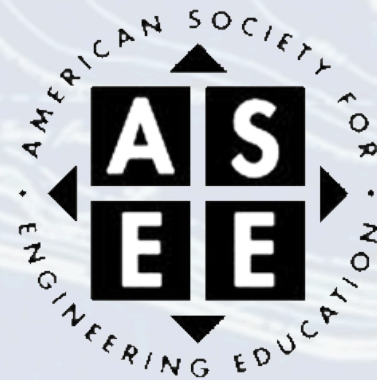
1. Engage families in engineering with fun, hands-on activities.
2. Increase public understanding and appreciation of the role engineering plays in everyday life.
3. Introduce children at an early age to the many career opportunities in engineering.
4. Increase parents' interest in and ability to encourage their children to pursue an engineering career.
5. Provide age-appropriate resources to support volunteers in conducting informal engineering education programs with elementary-aged children and their parents.

# Family Engineering Project Partners

***Michigan Tech***  
Michigan Technological University



Foundation For  
Family Science



# Family Engineering Program Elements

- **Family Engineering Activity Guide** (English and Spanish Language editions)
- **Professional Development Workshops**
- **Dynamic Website ([www.familyengineering.org](http://www.familyengineering.org))**
- **Network of Trained Volunteers**



# Family Engineering Program Development Process

**2009**

Activity Development  
Pilot Testing  
Revisions

Website Development and  
Launch

**2010**

National Field-Testing  
Expert Review

Professional Development and  
Volunteer Training

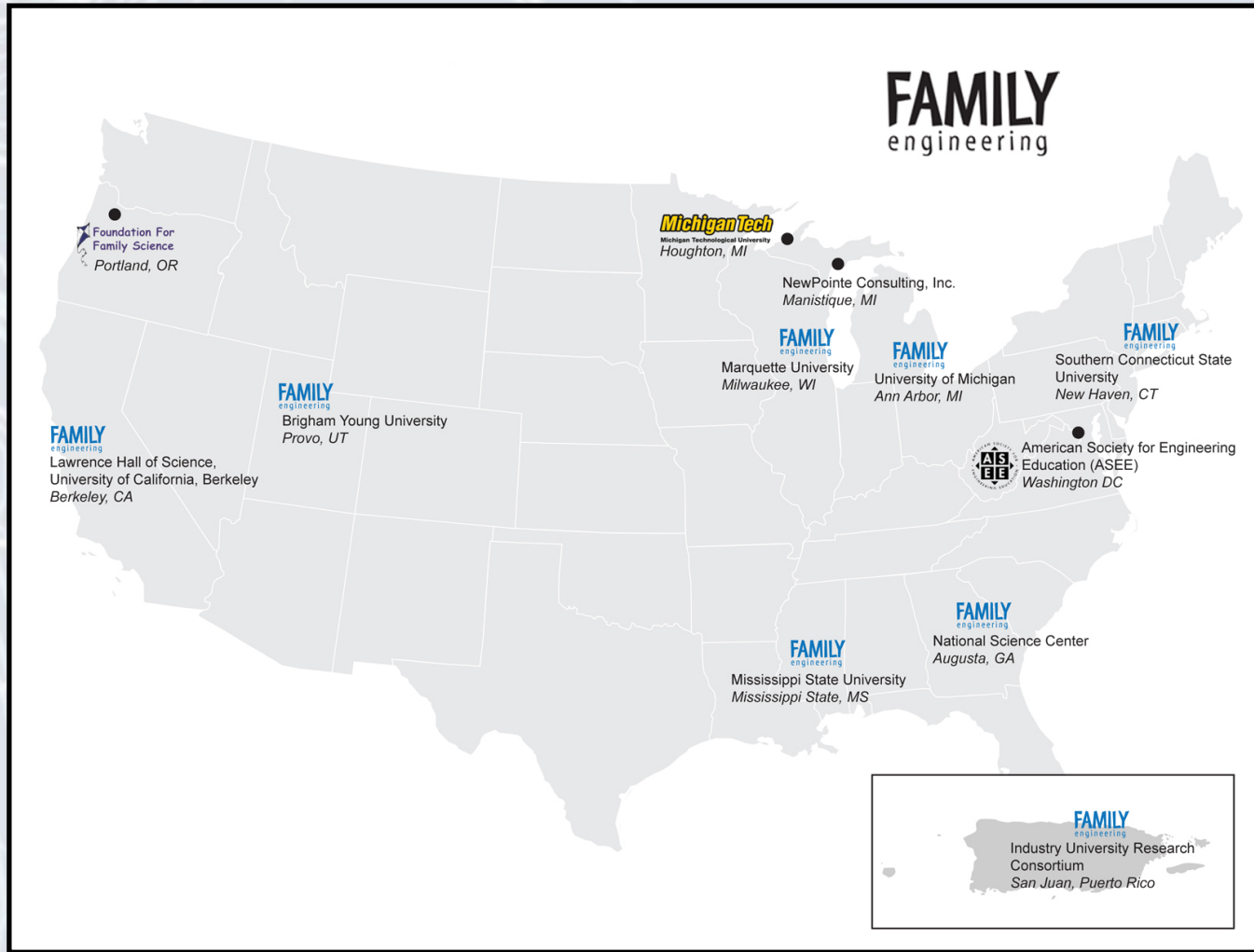
**2011**

Activity Guide Publication

Broad Dissemination and  
Implementation Through a  
Network of Trained Volunteers



# National Field Test Sites



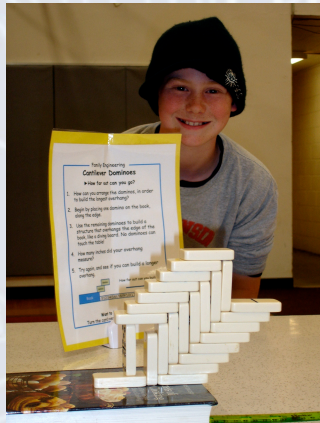
# Family Engineering Activities and Events

- Fun and engaging
- Families learning together
- Simple materials
- Easy to facilitate



- Accessible and approachable
- Suitable for a variety of settings
- Promote problem-solving and teamwork
- Explore engineering disciplines and careers

# What Does a Family Engineering Event Look Like?



# Getting Involved in Family Engineering

## Who

- Parents
- Engineers
- K-5 educators and administrators
- College engineering students
- Members of engineering societies/organizations
- Informal educators from museums, after school programs, scouts, etc.

## How

- Obtain a Family Engineering Activity Guide
- Participate in a Family Engineering Workshop
- Attend or host a Family Engineering Event



# Family Engineering

## Presenter Contacts

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***[www.familyengineering.org](http://www.familyengineering.org)***