

Resources

Many organizations are actively involved in making math, science, and engineering more engaging to students. You are not alone. Here are some resources that feature effective methods for engaging students.

National Action Council for Minorities in Engineering

www.nacme.org
www.nacmebacksmc.org

Engineering Your Life

www.engineeringyourlife.org

Project Lead The Way

www.pltw.org

Engineer Girl

www.engineergirl.org

Manufacturing Is Cool

www.manufacturingiscool.com

FIRST (For Inspiration and Recognition of Science and Technology)

www.usfirst.org

Try Engineering

www.tryengineering.org

Engineers Without Borders

www.ewb-usa.org

NACME
National Action Council for
Minorities in Engineering, Inc.

440 Hamilton Avenue, Suite 302
White Plains, NY 10601-1813

Phone: 914-539-4010
Fax: 914-539-4032

www.nacme.org

NACME
National Action Council for
Minorities in Engineering, Inc.

LIFE TAKES ENGINEERING

HELP SHAPE TOMORROW'S ENGINEERS



A New Generation of Engineers

Engineers are needed in just about every aspect of our lives. They design buildings, roads, automobiles, and parks. They map the oceans, find clean sources of energy, design better computers, develop new medical technology, improve artificial limbs, find ways to purify water, and make agriculture more efficient—and these are just a few examples of all that engineers do. Yet, people know very little about engineering.

You're already teaching students the basics of engineering in school. Every time you teach students hands-on ways to identify a problem and solve it, you're teaching them engineering.

Problem Solvers

Engineers are problem solvers. They use science and math to find solutions to problems that people face every day.

Engineers are currently working on some monumental challenges facing the world. The solutions they find could not only save lives, but reshape the world we live in—even transform the planet.

- Engineers are working on a way to make solar energy economical and make toxic batteries obsolete. Together, these achievements could stop global warming while providing the world with safe, reliable, and pollution-free energy.
- One way to potentially stop the catastrophe of global warming, which could destroy life as we know it, is to capture carbon dioxide and contain it.
- Today's nuclear power plants carry the threat of environmental disasters like those that occurred at Three Mile Island and Chernobyl—and the waste products of nuclear power remain toxic for more than 200,000 years. If engineers find a way to make energy from nuclear fusion—where atoms are joined instead of split, as they are in nuclear fission—the power source would be much safer and more stable.
- For the first time ever in 2008, more people on the planet lived in cities than in rural areas. With 3.3

billion people crammed into cities around the world, finding ways to manage these populations—getting people to work and school and back; delivering goods and services; and making their lives safer and pleasanter with parks, police and fire protection, and recreation—has become a major challenge for engineers.

- Computers have completely changed our world—and they have the potential to put us in completely different worlds. Using virtual reality, firefighters could practice fighting a fire without the danger of getting hurt. Mountain climbers could learn to recognize the signs of an avalanche without being on a mountain. We could travel to India or the Antarctic without ever leaving home. Engineers are developing virtual reality systems to do all this and more.
- As the human population swells, access to clean drinking water is one of the biggest crises facing the world. Finding affordable, easy ways to make water safe to drink is vital, especially for people living in the developing world.

See www.engineeringchallenges.org for more challenges engineers are tackling.

Engineers focus on specific problem areas that affect the world. Here are some of the major branches of engineering. Almost all require a minimum of a bachelor's of engineering.

Mechanical/Automotive:

These engineers apply the basics of physics, mechanics, and thermodynamics to design machines. These machines include locomotive engines, motorcycles, washing machines, assembly-line manufacturing machines, bicycles, and hybrid cars.



Civil/Structural: Whereas mechanical engineers specialize in objects in motion (machines), civil and structural engineers



focus on objects that are static, or stationary. They build roads, bridges, and buildings to withstand the elements of nature and human use.

Electrical: Electrical engineers apply the properties of atoms and electrons to deliver energy to the world. They design conductors, power stations, and generators. They also design more efficient and safer home wiring systems and are involved in the design of home appliances, cars, airplanes, computers, and microelectronics.



Chemical/Material:

Chemical engineers use physics and chemistry to make new substances out of raw materials. Chemical engineers have been involved in the design of Gore-Tex, fleece, and other high-performance fabrics;

they've turned corn into biofuels; they've developed high-performance plastics for water bottles and mugs; they've invented longer-lasting concrete; and they've mapped the genes in the human genome.



Aerospace: Aerospace engineers design planes, rockets, and spaceships. They apply principles of physics and mechanics to design safer, faster aircraft.



Industrial: Industrial engineers study processes. Using math and physics, they look at operations and make them more efficient. The context could be a car factory, a farm operation, or the way products are delivered around the country. They look for

problems in the process and work to make the operation safer and more efficient, saving money and increasing productivity.



Computer: Computer engineers design the hardware or software of computers—they make the circuits run faster or write better programs.



Nuclear: Nuclear engineers oversee the process of splitting atoms to make energy. Nuclear engineers are also at work on one of the great engineering challenges of the modern age: nuclear fusion.



Talk About Dreams, Not Just Careers

Studies have found that most people don't fully understand what engineers do. Children typically don't consider science, technology, engineering, or math (the so-called "STEM" fields) as careers, because they're unaware of the potential and possibilities they can offer. This is especially true of minorities and girls, who have traditionally not been encouraged to excel in these fields. Teachers can change how students see these careers by the way they describe them. But too often, students are told engineers need to be good in math and science, without being told specifically what engineers do.

Showing students how what they're learning can be applied in the world is a powerful motivator.

"If you're talking to kids about being a doctor, you don't say 'you're going to have to really study hard and be good in science.' You say, 'You could discover a cure for cancer or Alzheimer's disease.' Give them a dream, but also give them some realistic ideas for what they'll have to do."

— Laurie Maxson,
Youth Programs Director
Project Lead The Way

Marvels of Engineering

■ **The Great Wall of China**—This stone structure, thousands of miles long, is the only artificial object visible from space. It protected ancient China from invasion for centuries.



■ **The Panama Canal**—A 51-mile passage dug through Central America that connects the Atlantic and Pacific oceans and provides a cheap shipping route.



■ **The Alaska Pipeline**—An 800-mile-long pipeline built through frozen tundra, it has delivered 15 million gallons of oil since finished in the 1970s.



■ **The microchip**—Tiny in size, it is the brain behind every electronic device today, including the MP3 player, computer, cell phone, and washing machine—even the jet plane. The microchip has made computers both smaller and faster.



■ **The artificial heart**—Engineers applied mechanics, electronics, and chemistry to create artificial hearts that have prolonged many lives.

