

WHY K-12 ENGINEERING?

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ASEE EngineeringK12 Center**

1818 N St., NW, Suite 600

Washington DC, 20036

www.engineeringk12.org

Produced by:

Eric Iversen, Chitra Kalyandurg, and Sydney de
Lapeyrouse

outreach@asee.org



WHY INCLUDE IT IN MY CLASSROOM?

Because....

- Engineering is **Academic Glue** – it binds complex math and science concepts to real-world experiences and leads to learning that sticks with students.
- Engineering is **Creativity** – the need for problem-solving and innovation brings out the best ideas from every student.
- Engineering is **Group Work** – students learn to communicate and work together while they learn math and science by applying engineering principles.
- Engineering is **Everywhere** – students learn that engineers have designed, created, or modified nearly everything they touch, wear, eat, see, and hear in their daily lives.
- Engineering is **FUN!**

WHAT ARE THE BENEFITS FOR MY STUDENTS?

The impact on students is real

1. Engineering education **advances learning**
 - Project-based learning has been shown to enhance student understanding of math and science concepts by making them relevant and more enjoyable. ^[1]
2. Engineering education **bridges classroom lessons to real-world experiences**
 - Concrete and applicable engineering concepts connect what is learned in school with what goes on in the outside world.

^[1] Assessments of student learning in engineering outreach programs show “descriptions of what they learnt were overwhelmingly expressed in terms of real-world applications rather than theory or concepts.” Students also “wanted less time devoted to lectures and more time devoted to building and working on projects...” (DeGrazia, et al., *Journal of Engineering Education*, Jan. 2001, pg. 48). For the full article and other stories on this topic, go to http://www.engineeringk12.org/educators/taking_a_closer_look/readings.htm

CAN I REALLY USE ENGINEERING IN MY CLASSROOM?

Hundreds of classroom-ready K-12 engineering education resources, many of which cost little to nothing to implement, are available for teachers at:

1. **Local Colleges & Universities**
Most engineering departments operate K-12 outreach programs designed to help K-12 teachers with curricula, materials, and professional development. Check with your local colleges and universities to see how you and your students can get involved.
2. **Industry**
With a stake in developing tomorrow's engineers, many companies have extensive K-12 outreach programs to help pique students' interest in engineering while in the K-12 classroom.
3. **Museums**
Museums are great places for educators to find science, technology, engineering, and math resources to bring into their classroom.
4. **Other Societies**
From aeronautical to oceanic, civil to biomedical, and environmental to industrial, engineering societies stand ready to help you and your students understand what they do.

WHAT DOES K-12 ENGINEERING ACTUALLY LOOK LIKE?

At ASEE's 2005 K-12 Workshop, attendees learned about these examples of K-12 engineering programs....

Universities/Colleges

- TeachEngineering.com: The Teach Engineering Digital Library is a free, on-line K-12 Math, Science and Engineering Teaching Tool. <http://www.teachengineering.com>
- The Infinity Project: a year-long curriculum leveraging an outstanding textbook, low cost high-impact classroom technology, & best-in-class professional development for teachers. <http://www.infinity-project.org>

Industry

- The Intel Computer Clubhouse Network: The Computer Clubhouse provides a creative and safe after-school learning environment where young people from underserved communities work with adult mentors to explore their own ideas, develop skills, and build confidence in themselves through the use of technology. <http://www.computerclubhouse.org/index.htm>
- PTC Design & Technology in Schools Program: The Design & Technology in Schools Program introduces students to 3D design technology as early as middle school - so they can become better problem solvers, critical thinkers and collaborators. <http://www.ptc.com/for/education/schools/index.htm>
- The Autodesk Design Academy: The Autodesk Design Academy delivers a comprehensive pre-engineering, pre-architecture, and cross-discipline curriculum developed specifically for secondary schools. <http://usa.autodesk.com>

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Industry

- Ford PAS Program: The Ford Partnership for Advanced Studies (Ford PAS) provides high school students with high-quality interdisciplinary learning experiences that challenge them academically and develop their problem-solving, critical thinking, and communication skills. By building strong local partnerships with business and higher education, Ford PAS encourages and prepares students for success in college and professional careers in fields such as business, engineering, and technology. <http://www.fordpas.org>

Museums

- “Engineering is Elementary,” Museum of Science, Boston: The Engineering is Elementary project aims to promote the learning and teaching of engineering and technology by elementary school students and teachers. <http://www.mos.org>

Non-profit Organizations

- The MESA MODEL: Engaging Underrepresented Students in Engineering. <http://www.csuchico.edu/mesa/mesamodel.htm>
- Project Lead the Way: PLTW is a four-year sequence of courses which introduces students to the scope, rigor and discipline of engineering and engineering technology prior to entering college. <http://www.pltw.org>

WHERE ELSE CAN I FIND K-12 ENGINEERING RESOURCES?

Ready-to-use resources are available in all kinds of places:

ASEE Engineering K12 Center: <http://www.engineeringk12.org>

- American Institute of Chemical Engineers: <http://www.aiche.org>
- American Society for Civil Engineers: <http://www.asce.org/kids>
- American Society of Mechanical Engineers: <http://www.asme.org/education/precollege/bestpractice/bp.htm>
- Autodesk Design Academy: <http://usa.autodesk.com>
- Building Big Educators' Guide: http://www.pbs.org/wgbh/buildingbig/educator/act_index.html
- Center for Science Education Design It!: <http://www2.edc.org/cse/work/designit/default.asp>
- DELMIA Education and Training Forum: <http://www.delmia.com>
- Discover Engineering Online: <http://www.discoverengineering.org>
- Design and Discovery: <http://www.intel.com/education/design>
- Ford PAS Program: <http://usa.autodesk.com>
- Future Scientists and Engineers of America (FSEA): <http://www.fsea.org>
- IEEE Virtual Museum: <http://www.ieee-virtual-museum.org>
- The Infinity Project: <http://www.infinity-project.org>
- International Technology Education Association (ITEA): <http://www.iteaconnect.org/index.html>
- Junior Engineering Technical Society (JETS): <http://www.jets.org>
- The MESA MODEL: <http://www.csuchico.edu/mesa/mesamodel.htm>
- Microsoft Education Lesson Plans: <http://www.microsoft.com/education/default.asp?ID=LessonPlans>

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ASEE Engineering K12 Center: <http://www.engineeringk12.org>

- Museum of Science Boston: <http://www.mos.org>
- The National Action Council for Minorities in Engineering (NACME): <http://guidemenacme.org/guideme>
- National Engineers Week: Discover "E": <http://www.eweek.org/site/DiscoverE/activities/index.shtml>
- The National Science Foundation: <http://www.nsf.gov/news/classroom/engineering.jsp>
- National Society of Black Engineers (NSBE): <http://www.nsbe.org/precollege/index.html>
- PCS Edventures: <http://www.edventures.com>
- Pre K-12 Engineering: <http://www.prek-12engineering.org>
- Project Lead The Way: <http://www.pltw.org>
- PTC Design & Technology in Schools Program: <http://www.ptc.com/for/education/schools/index.htm>
- Society of Automotive Engineers (SAE): <http://students.sae.org>
- Society of Hispanic Professional Engineers (SHPE): <http://www.shpe.org>
- Society of Women Engineers (SWE): <http://www.swe.org>
- TeachEngineering Digital Library: <http://www.teachengineering.com>
- Technology Student Association (TSA): <http://www.tsaweb.org>
- US FIRST: <http://www.usfirst.org>
- WEPAN: http://www.wepan.org/events_connection.html