



National Center for
Technological Literacy®
Museum of Science, Boston

Technological Literacy Takes Shape: Engineering Education Expands

Progress in K-12 technological literacy and engineering education is being made as evidenced by the following developments:

- in 2000, the International Technology Education Association published Standards for Technological Literacy, Massachusetts is the first state in the nation to adopt K-12 Technology/Engineering standards and develops an aligned assessment;
- in 2004, the National Center for Technological Literacy was founded at the Museum of Science, Boston, in response to statewide implementation of technology/engineering standards and the MCAS assessment,
- in 2007, the National Governors Association STEM Agenda urged governors to adopt technology and engineering standards and assessments and several states have sought assistance from the National Center for Technological Literacy including NH, NJ, MN, TX, and PA;
- in 2009, the NAEP Science assessment will measure student technological design skills and the P.L.100-315, the Higher Education Opportunity Act defined “technology literacy” to include the engineering design process;
- in 2012, NAEP will administer a Technological Literacy assessment;
- the National Academy of Engineering will soon release two new reports on K-12 engineering education; and,
- numerous universities (i.e. National Center for Engineering & Technology Education, Stevens Institute of Technology, Purdue University, North Carolina State University, Valley City State University) and science museums (i.e. Museum of Science, Boston, Science Museum of Minnesota, Oregon Museum of Science & Industry) have engineering education programs for pre-service and in-service K-12 teachers.

NAEP Science 2009

Technological Design Skills

The National Center for Technological Literacy and others worked to include technological design skills as part of the Science 2009 framework based on nationally recognized standards (Benchmarks 2061, AAAS). Based on testimony received from science, engineering, and business representatives in favor of testing knowledge of technological design principles, the National Assessment Governing Board voted to

include Technological Design as one of the Science Practices and maintain the 10% allocation for this area on the assessment.

NAEP Technological Literacy Probe Study, 2012

The National Center for Technological Literacy serves on the Steering Committee which first met in December 2008. They have identified three areas that should be assessed: engineering design process, information & communication (ICT) literacy, and possibly technology & society.

Technology Literacy as defined in P.L. 110-315, THE HIGHER EDUCATION OPPORTUNITY ACT Conference Report 110-803, Page 487:

The Conference agreement contains language to ensure that funds under section 232 can be used to, "build the skills of teacher candidates to support technology-rich instruction, assessment and learning management in content areas, technology literacy, an understanding of the principles of universal design, and the development of other skills for entering the workplace."

The Conferees intend the term "technology literacy" to include student knowledge and skills in using contemporary information, communication, and learning technologies in a manner necessary for successful employment, life-long learning and citizenship in the knowledge-based, digital, and global 21st century, which includes, at a minimum, the ability to use technology to:

- (1) Effectively communicate and collaborate with others in a safe and ethical manner;
- (2) Analyze and solve problems, including the application of the engineering design process;
- (3) Access, evaluate, manage, and create information and otherwise gain information literacy; and
- (4) Demonstrate creative thinking, construct knowledge, and develop innovative products and processes.

National Academy of Engineering Report "Understanding and Improving K-12 Engineering in the United States"

This report is due to be released September 8, 2009.

The National Academy of Engineering and the National Research Council define the "**engineering design process**" to mean the iterative process for creation and manipulation of the human-made world. The process combines knowledge and skills from a variety of fields with the application of values and understanding of societal needs to create systems, components, or processes to meet human needs. Initialized by problem definition, followed by clarity of the specifications that the designed product

must meet, the open-ended engineering design process optimizes competing needs and constraints, and uses modeling and analysis to drive the creation of new engineered solutions to serve humankind.

The National Academy of Engineering and the National Research Council define “**technology**” to mean the artifacts of the human-made world (e.g., computers and software, aircraft, pesticides, water-treatment plants, birth-control pills, and microwave ovens). Technology also includes the knowledge and processes used to create and to operate the artifacts—engineering know-how, manufacturing expertise, various technical skills, and so on—are equally important. An especially important area of knowledge is the engineering design process, of starting with a set of criteria and constraints and working toward a solution—a device, say, or a process—that meets those conditions. Technology also includes the infrastructure necessary for the design, manufacture, operation, and repair of technological artifacts, from corporate headquarters and engineering schools to manufacturing plants and maintenance facilities.

RESOURCES:

Standards for Technological Literacy, ITEA, 2000

Technically Speaking, NAE, 2002

Tech Tally, NAE, 2006

NGA STEM Agenda,

National Academy of Engineering Studies Underway

- Review of K-12 Engineering Curricula
- Review of Technology & Engineering Standards