



A National Standards-Based Solution for the
 Delivery & Implementation of
 Science, Technology, Engineering & Mathematics



International Technology Education Association
 STEM ⊕ Center for Teaching and Learning™



A Standards-Based Model Program Focusing on Teaching & Learning

The International Technology Education Association's **STEM ⊕ Center for Teaching and Learning™ (STEM±CTL)** has developed the only standards-based national model for Grades K-12 that delivers technological literacy through STEM-based instruction. The model, *Engineering byDesign™*, is built on *Standards for Technological Literacy (ITEA)*; *Principles and Standards for School Mathematics (NCTM)*; and *Project 2061, Benchmarks for Science Literacy (AAAS)*.

Built on the constructivist model, students participating in the program learn concepts and principles in an authentic, problem-based environment. A network of teachers (*EbD™ Network*) has been selected to collaborate and conduct action research in order to better understand the complexities of student learning and to help all students succeed and be prepared for the global society in which they will grow up.

Mission

We live in a technological world. Living in the twenty-first century requires much more from every individual than a basic ability to read, write, and perform simple mathematics. Technology affects every aspect of our lives, from enabling

citizens to perform routine tasks to requiring that they be able to make responsible, informed decisions that affect individuals, our society, and the environment.

Citizens of today must have a basic understanding of how technology affects their world and how they exist both within and around technology. Technological literacy is fundamentally important to all students. Technological processes have become so complex that the community and schools collaborate to provide a quality technology program that prepares students for a changing technological world that is progressively more dependent on an informed, technologically literate citizenry.



Vision

The model STEM program is committed to providing technological study in facilities that are safe and facilitate creativity, enabling all students to meet local, state, and national technological literacy standards. Students are prepared to engage in advanced technological study in the high school years and beyond. Students will be prepared with knowledge and abilities to help them become informed, successful citizens who are able to make sense of the world in which they live. The technology program also enables students to be wise consumers, advocates, and change agents of the technological resources in their own community.

"The Engineering byDesign™ Program is built on the belief that the ingenuity of children is untapped, unrealized potential that, when properly motivated, will lead to the next generation of technologists, innovators, designers, and engineers."

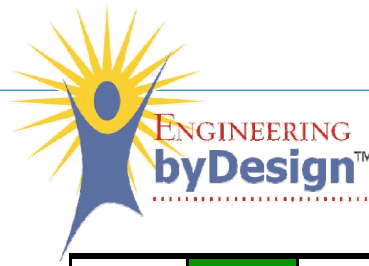
Goals

- Provide a standards-based K-12 program that ensures that all students are technologically literate.
- Provide opportunities for all students without regard to gender or ethnic origin.
- Provide clear standards and expectations for increasing student achievement in math, science, and technology.
- Provide leadership and support that will produce continuous improvement and innovation in the program.
- Restore America's status as the leader in innovation.
- Provide a program that constructs learning from a very early age and culminates in a capstone experience that leads students to become the next generation of technologists, innovators, designers, and engineers.

Organizing Principles

The program is organized around seven principles. These principles are very large concepts that identify major content organizers for the program. In order of importance, the seven organizing principles are:

- Engineering through design improves life.
- Technology has and continues to affect everyday life.
- Technology drives invention and innovation and is a thinking and doing process.
- Technologies are combined to make technological systems.
- Technology creates issues that change the way people live and interact.
- Technology impacts society and must be assessed to determine if it is good or bad.
- Technology is the basis for improving on the past and creating the future.



A K-16 Standards-Based National Model STEM Program

K-2	1	Integrated concepts and lessons	NASA	
3-5	2	Integrated concepts and lessons / I ³ **	NSF NASA	
6	MS-1	Exploring Technology	NASA	18 weeks
7	MS-2	Invention and Innovation	NASA	18 weeks
8	MS-3	Technological Systems	NASA	18 weeks
9	HS-1	Foundations of Technology/Technology, Engineering & Design	NASA	36 weeks
10-12	HS-2	Technological Issues and Impacts	NASA	36 weeks
10-12	HS-4	Technological Design	NASA	36 weeks
11-12	HS-5	Advanced Design Applications/ProBase *	NSF	36 weeks
11-12	HS-6	Advanced Technological Applications/ProBase *	NSF	36 weeks
11-12	HS-7	Engineering Design (Capstone)	NASA	36 weeks
13-16	CL	Engineering Design	NASA	Semester

* ProBase—developed through NSF grant at Illinois State University **I3—developed through NSF grant at California University of Pennsylvania

“Somewhere, something incredible is waiting to be known.”

- Carl Sagan

www.engineeringbydesign.org

Endorsed by the



EbD PathwayExtensions™

The EbD™ Program is a model used by schools developing themes in the STEM and IT Clusters that are seeking to increase all students' achievement in technology, science, mathematics, and Engineering (STEM) through authentic learning. The program is built on constructivist models and creates awareness and competence over time as it builds on learned knowledge and skills—aligning closely with the Cluster Knowledge and Skills in both the STEM and IT Clusters.

Through the EbD™ PathwayExtensions™, the Program is designed to maintain integrity through two delivery scenarios.

1. Pathway program, where schools adopt the articulated sequence of courses in a STEM-and/or an IT-themed academy.
2. Modularizing the components and adapting the design themes to support the STEM, IT, or other academy models. In this scenario, as in many career-themed academy models, some modification is required to ensure themes are aligned with the Cluster Knowledge and Skills.



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