Welcome to ITEEA’s interactive STEM kit.

Click on the small STEMbots throughout the document to learn more.
Students who study technology and engineering through an Integrative science, technology, engineering, and mathematics (STEM) Education approach learn about the technological world that inventors, engineers, and other innovators have created. Among other things, they study how energy is generated from coal, natural gas, nuclear power, solar power, as well as when and how it is transmitted and distributed. They examine communication systems: telephone, radio and television, smart devices, satellite communications, fiber optics, and the internet. They delve into manufacturing and materials—processing industries, from steel and petrochemicals to computer chips and household appliances. They investigate transportation, information processing, and medical technology. They are exploring new technologies, such as genetic engineering and emerging technologies, such as artificial intelligence (AI), fusion power and soft robotics.

The goal is to produce students with a more conceptual understanding of technology and engineering, through a STEM lens, and its place in society. These students conceptualize and evaluate new technologies that they may have never seen. By “doing and making,” children are able to become “makers” for the future.

We support the National Academy of Engineers (NAE) in stating that PreK-12 engineering education must promote engineering “habits of mind” (NAE, 2014). Engineering habits of mind are directly addressed in STEL through “Practices” and are aligned with what many believe are essential skills for citizens in the 21st century (Partnership for 21st Century Skills, 2011).

Technology and engineering are pervasive in all aspects of our lives. Every human activity is dependent upon the products, systems, and processes created to help grow food, provide shelter, communicate, work, and recreate. As the world grows more complex, it is increasingly important for everyone to understand more about technology and engineering. People need to understand technology’s impacts on their lives, society, and the environment, as well as how to use and develop technological products, systems, and processes to extend human capabilities. These understandings are all important elements of technological and engineering literacy (ITEEA, 2020, p.1).

Engineers, architects, computer scientists, technicians, and everyone involved with technology use a variety of approaches to problem solving, including design, troubleshooting, research and development, invention, innovation, and experimentation.
**Engineering Design Process** is a problem-solving process that typically begins with defining a human need, want, challenge, or opportunity. After investigation and research, the designer generates ideas for solutions. Then, considering the original criteria, along with various constraints, one or more designs are chosen as the most promising. The selected design is modeled and tested, and then reevaluated. If necessary, the original design is dropped, and another tried. Eventually, through a series of iterations that repeat the variable steps of the process as necessary, a final design is chosen. Once complete, the final design is communicated in a presentation showing the design process used, test results, iterations, problems encountered, solutions, and an evaluation of the final design.

All educational subjects have characteristics that define the discipline: content, an epistemological basis, and a history of practice, inclusive of curricula, teaching, and research. These characteristics drive the educational process, but disciplines are not formed in a vacuum and do not evolve in isolation. Education is, by nature, interdisciplinary. At first glance, Technology and Engineering Education may seem solidly grounded in the sciences and mathematics, but there are also strong connections to the arts and humanities. For example, developers of transportation systems such as trucks and electric cars must consider not just the technical aspects of personal mobility but also aesthetic principles that will appeal to users; human factors principles that will enable the vehicle to be safe and to better fit the needs of users; social factors that will influence acceptance and adoption of the device; and communication of ideas, plans, and marketing through proficient technical writing skills. These interdisciplinary connections are crucial for technological and engineering literacy and are a fundamental element found throughout *Standards for Technological and Engineering Literacy* (STEL). Technology and Engineering Education reinforces and complements the material that students learn in other classes—Technology and Engineering Bring STEM to Life™

Technological and engineering literacy is the ability to understand, use, create, and assess the human-designed environment. A technologically and engineering literate person understands, in increasingly sophisticated ways that evolve over time, what technology is, how it is created, and how it shapes society, and in turn is shaped by society. A technologically literate person will be comfortable with learning about technology and engineering, without being afraid or intimidated.

Learning to understand and thrive within the framework of technology and engineering, technological and engineering literacy benefits students in several ways. For future engineers, aspiring architects, or students who will have jobs in one area of technology or another, it means they will leave high school with a head start on their careers. They will already understand the basics of such things as design, making, and doing, as well as possess a big picture of the field they are entering. This will allow them to put the specialized knowledge they learn later into a broader context.

STEM is an important force in our global economy; anyone and everyone benefits by being familiar with integrative STEM. On the individual level, technological and engineering literacy allows consumers to better assess products and make more intelligent buying decisions, policy decisions, and those that affect our quality of life.

Technology and engineering are complex and constantly evolving, so teachers should spend less time on discrete facts and more on the broad dimensions of knowing, thinking, and doing in the context of technology and engineering. The *knowing* dimension involves taking in information, organizing it, and understanding factual and conceptual relationships. *Thinking* entails making sense of information through questioning, analysis, and decision making. *Doing* involves using technology and engineering in applied ways such as designing, making/building, producing, and evaluating. All three—knowing, thinking, and doing—are symbiotic and equally important in the development of technological and engineering literacy (ITEEA, 2020, p.4). Technology and Engineering Education through Integrative STEM education effectively delivers technological and engineering literacy and paves the way for making a positive difference in the lives of humankind!
ITEEA’s mission is to advance technological and engineering capabilities for all people and to nurture and promote the professionalism of those engaged in these pursuits. ITEEA seeks to meet the professional needs and interests of members as well as to improve public understanding of technology, innovation, design, engineering, and their contributions to human life.

ITEEA is the largest professional educational association, principal voice, and information clearinghouse devoted to enhancing technology, innovation, design, and engineering through experiences in our schools (K–12). Its membership encompasses individuals and institutions throughout the world with the primary membership in North America. ITEEA strengthens the profession through leadership, professional development, membership services, networking, publications, and classroom resources. ITEEA seeks to meet the professional needs and interests of members as well as to improve public understanding of technology and engineering through integrative STEM education and its contributions to the world in which we live.

In order to achieve these goals, ITEEA:

- Represents more than 35,000 K-12 and post-secondary technology and engineering educators throughout the U.S. and internationally. This includes classroom teachers, developers, administrators, and university personnel in the field representing all levels of education. ITEEA corporate members are comprised of leading technology and engineering companies.

- Conducts a wide variety of professional development programs and holds an Annual Conference—the largest technology and engineering education showcase of exhibits and educational sessions in the world. ITEEA collaborates with like-minded organizations to further strengthen the voice of technology and engineering educators.

- Publishes Technology and Engineering Teacher, The Elementary STEM Journal, Journal of Technology Education, STEM Connections, and a variety of other publications that lead the profession by providing teaching directions, instructional ideas, and networking opportunities.

- Takes part in numerous committees, task forces, and boards that coordinate all aspects of technology and engineering education and sponsors dozens of meetings, conferences, and exhibits each year.

- Sponsors an active honors and awards program that recognizes outstanding educators, programs, and schools from states, provinces, and countries affiliated with the Association. ITEEA also presents award certificates and supports other programs that recognize outstanding efforts in the technology and engineering teaching profession.
Conducts a vigorous public policy program frequently providing information to government, agencies, associations, and other special interest groups concerning technology and engineering education. The Association strives to provide all stakeholders with an understanding of the importance of technological and engineering literacy through technology, innovation, design, and engineering education to the future growth and well-being of all nations.

ITEEA Councils
ITEEA's Councils, including the Council on Technology and Engineering Teacher Education (CTETE), the Council for Supervision and Leadership (ITEEA-CSL), the Elementary STEM Council (ESC), and the Technology and Engineering Education Collegiate Association (TEECA) recruit the best and brightest in our field to lead integrative STEM education for all students and to build a better future for all.

ITEEA's Foundation for Technology and Engineering Educators
ITEEA and its foundation, the Foundation for Technology and Engineering Educators (FTEE), provide awards, grants, and scholarships to support the advancement of technology and engineering education. FTEE awards support programs that will: make our children technologically and engineering literate; transfer industrial and corporate research into our schools; produce models of excellence in technology and engineering teaching; create public awareness regarding the nature of technology and engineering education; and help technology and engineering teachers maintain a competitive edge in technology.

ITEEA's Honorary Society for Technology and Engineering Education
Epsilon Pi Tau recognizes academic excellence of students in fields devoted to the study of technology and the preparation of practitioners for the technology professions. Epsilon Pi Tau also extends the honor of membership and advancement activities to outstanding practitioners in the technology professions, scholars with exemplary research interests in technology in society and/or persons who have significantly supported or advanced technology professions. In addition to a recognition program that extends through members' careers and beyond, Epsilon Pi Tau continually seeks to serve, support, and strengthen the technology professions through publications, conferences, thought leadership, and alliances with corporations, professional associations, government agencies, and nongovernmental organizations.
ITEEA offers individual, PreK-12 schoolwide STEM Memberships, university, and corporate memberships. Our members are classroom teachers, state and local supervisors, college students, college and university faculty, science, math, and art educators who are interested in STEM education.

Who Are ITEEA’s Members?

ITEEA Member Profile

Maurice Frazier, Ph.D.
ITEEA Member: 2004
Technology Teacher, Oscar Smith High School, VA
and Adjunct Professor, Old Dominion University

Maurice’s ITEEA Membership Goal: To make valuable contributions to my profession and promote public awareness about the importance of STEM education.

“I have been a high school technology education teacher at Oscar Smith High School in Chesapeake, VA for 15 years. I also teach at Old Dominion University as an adjunct professor in the STEMPS Department (Science Technology Engineering Mathematics for Professional Studies). The majority of my teaching experience has been in the areas of graphic design and communications.

It has been my experience that membership in ITEEA is extremely beneficial in several different ways. I have been able to establish a professional network of colleagues from across the country. I have had the opportunity to make multiple presentations at the annual conference where I was exposed to latest trends, ideas, and innovations in our field. I also have the ability to tap into numerous instructional resources that have assisted me in the delivery of content to my students. Membership in ITEEA has been a tremendous professional asset for me that I plan to maintain for years to come.”

ITEEA Member Profile

Lauren Lapinski
ITEEA Member: 1999
Bala Cynwyd Middle School
Lower Merion School District, PA

Lauren’s ITEEA Membership Goal: I depend on ITEEA to keep me current in trends/developments in the field and to provide me with a way to stay connected to other technology and engineering professionals.

“I believe that students enrolled in technology and engineering education courses emerge from school more prepared for the world, armed with skills and abilities that will prove invaluable both in and beyond the walls of the classroom. This organization works to ensure that these types of courses continue to exist and students can continue to reap the benefits.

In addition to my work in the classroom for the last 11 years, I’ve also been deeply involved in the Technology Student Association since I was a middle school student myself. Outside of the classroom, I enjoy traveling, spending time with my family, reading, and running with my dog.”
Standards-Based Curriculum

STEM CTL™ has developed the Premier Standards-based Integrative STEM Curriculum Model designed to be flexible, affordable, and accountable. The Engineering byDesign™ (EbD™) curriculum was developed to address the need for a standards-based curriculum and uses Standards for Technological Literacy. Through a dynamic process, EbD™ addresses the needs for a standards-based Integrative STEM curricula. Key attributes are:

- Develops broad Technological and Engineering Literacy for every student using the 6E Learning byDESIGN™ Instructional Model
- Based on Standards for Technological and Engineering Literacy, Next Generation Science Standards (NGSS), Common Core State Standards (CCSS-Mathematics/English-Language Arts) and the National Academy of Engineering’s (NAE) Engineering Habits of Mind
Based on Constructivist theory, EbD™ is problem/project-based within the context of the *Grand Challenges for Engineering (NAE)*.

**Professional Learning:**
The STEM Center for Teaching and Learning™ is building a community of STEM Education Leaders through face-to-face professional development, webinars, and an online learning community that prepare educators to be Integrative STEM professionals. Professional Development Opportunities include:

- **Collaborative Learning Community:** for teachers-by-teachers
- **Summer Institutes on Engineering byDesign Curriculum**
- **On-site workshops** (school/district/state) that develop STEM pedagogy and practice through a facilitated learning opportunity
- **A broad range of options** for developing the Integrative STEM professional.

**Assessment**
ITEEA’s STEM CTL™ is concerned with developing high quality assessments to inform curriculum quality and fidelity, teacher effectiveness, and student growth achievement. To this end, services provide online “Dashboards” for class, school, and state assessment reports that reflect the growth of student knowledge, capabilities, and ways of thinking and acting. Highlights include:

- Innovative performance assessments that focus on what students know and do
- Flexible *Teacher Assessment Dashboard* provides real-time data on student learning
- Links STEM subjects through *Integrative STEM Focal Points*
- Summative Assessment reports that focus on student growth and contribute towards identifying teacher effectiveness.

**Research**
The STEM CTL™ is engaged in validating the “T & E” of STEM through research that focuses on storytelling and data-driven discovery. We highlight great technology and engineering teachers doing great things. We aim to provide data-driven evidence of STEM learning for all students. Initiatives consist of:

- **Institutional Research Agreement** and Student Research Agreement to engage the research community
- **Future Leaders Scholarship** to build a community of STEM CTL™ future collaborators
- **Assessment Development Institute** for the analysis, revision, and updating of EbD assessment items
- **Identify and publish** Publications in research-oriented educational journals.

**Consortium**
ITEEA’s STEM CTL™ uses a Consortium model approach to develop the *Integrative STEM* resources described above. Started in 1999, states join annually to leverage valuable, but declining local resources. Consortium benefits include:

- A group of **National Teacher Effectiveness Coaches (TECs)** that provide high quality, consistent professional development opportunities for states on a cost-recovery model
- **Consortium members** are provided unlimited* distribution of EbD/STEM materials within their state or district (*as defined by the Consortium State/District*)
- **Professional Development opportunities** at the ITEEA Annual Conference including travel funds for the Consortium Director and a lead trainer
- **Strategic Initiatives Meeting** twice per year, including the Fall Leadership Forum (September) and Annual ITEEA Conference (March)
- **Limited Network Schools** are included with the annual membership. The Network Schools include pre-post tests and the EbD online professional learning community (Collaborate byDesign™).
Building a Network of Partners to Help
Create a Technologically and Engineering Literate Society

ITEEA Corporate Partners
For a complete listing of ITEEA Corporate Partners, visit www.iteea.org/Corporate.aspx

ITEEA Institutional Members
For a complete listing of ITEEA Institutional Members, visit www.iteea.org/Institutional.aspx