Empowering Educators to Effectively Implement I-STEM Education for ALL Students!

STEMATHON
A CELEBRATION OF STEM IN PENNSYLVANIA
From compelling sessions to interactive experiences, STEMATHON offers a collection of opportunities for STEM education professionals at every level to collaborate, learn, and find inspiration.

STEM CONFERENCE • STEM TRADE SHOW • TEACHER EXPO
RESEARCH POSTER SESSION • STEM LEADERSHIP ACADEMY

October 30-31, 2019

Steven Barbato
ITEEA Executive Director/CEO
Email: sbarbato@iteea.org
Empowering Educators to Effectively Implement Integrative STEM Education for ALL students!
Integrative STEM Education through the Content and Practices of Technology and Engineering Education

Students Who Study Technology and Engineering

“Bring STEM to Life!”

www.iteea.org
<table>
<thead>
<tr>
<th>CORE PROGRAM</th>
<th>K–2</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10–12</th>
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<td>EbD-TEEMS <strong>NXTGen</strong>™</td>
<td>EbD-TEEMS <strong>NXTGen</strong>™ (6th Grade Capstone), I³</td>
<td>Exploring Technology</td>
<td>Invention and Innovation</td>
<td>Technological Systems</td>
<td>Foundations of Technology</td>
<td>Technology and Society</td>
<td>Advanced Design Applications *</td>
<td>Advanced Technological Applications *</td>
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What “STEM” Looks Like

- Ted Talk Video of Jane Chen’s Project!
- “A Warm Embrace That Saves Lives!”

https://www.iteea.org/Activities/2142/Reach.aspx?source=generalSearch

IDEO and Shark Tank
STEM⁴: The power of collaboration for change

A joint document authored by Advance CTE, Association of State Supervisors of Mathematics, Council of State Science Supervisors, and International Technology and Engineering Educators Association

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STEM Education Policy Collaborative
The Major Issues

» Lack of STEM preparedness
» Many STEM careers have not yet been envisioned
» Lack of Equity
Three Main Principles

Principle 1.

STEM education should advance the learning of each individual STEM discipline.
Three Main Principles

Principle 2.

STEM education should provide logical and authentic connections between and across the individual STEM disciplines.
Three Main Principles

Principle 3.

STEM education should serve as a bridge to STEM careers.
Why does this matter?

» Student engagement

» Relevance

» Funding opportunities
Recommended Actions

» Ensure high-quality STEM learning

» Increase access and equity for students

» Provide professional learning opportunities for teachers.
WHO/WHAT IS ITEEA?

The professional organization for technology, innovation, design, and engineering educators.

Resource:

Who is ITEEA? Click Here!

ITEEA: Who We Are

Technological and Engineering Literacy for ALL students
STEM Center for Teaching and Learning
Standards-based EbD™ Curriculum for Grades PreK-12

Global professional development and membership services
STEMinars
STEM Journals for Prek_12 (TET – ESJ)
Leadership and Professional Growth
Annual Conference – Baltimore, March 11-14

Awards and Credentials
STEM School of Excellence, Program Excellence,
Program Excellence, Teacher Excellence, Emerging Leaders,
DTE, + + +

International ITEEA STEM Centers

www.iteea.org
Integrative STEM Education

"the application of technological/engineering design based pedagogical approaches to intentionally teach content and practices of science and mathematics education through the content and practices of technology/engineering education. Integrative STEM Education is equally applicable at the natural intersections of learning within the continuum of content areas, educational environments, and academic levels"

(Wells & Ernst, 2012/2015)
(as adapted from Wells/Sanders VA Tech program documents 2006-10).
ITEEA’s STEM Center for Teaching and Learning
6E Learning byDesign

ENGAGE
The purpose of the ENGAGE phase is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.

EXPLORE
The purpose of the EXPLORE phase is to provide students with the opportunity to construct their own understanding of the topic.

EXPLAIN
The purpose of the EXPLAIN phase is to provide students with an opportunity to explain and refine what they have learned so far and determine what it means.

eNGINEER Extend/Elaborate
The purpose of the eNGINEER phase is to provide students with an opportunity to develop greater depth of understanding about the problem topic by applying concepts, practices and attitudes.

ENRICH
The purpose of the ENRICH phase is to provide students with an opportunity to explore in more depth what they have learned and to transfer concepts to more complex problems.

EVALUATE
The purpose of the EVALUATION phase is for both students and teachers to determine how much learning and understanding has taken place.
Humans have always had an innate desire to explore past the boundaries of earth to the moon and beyond. What do humans need to know and be able to do in order to colonize Mars and live there for an extended period of time?

Before we can solve a problem, we must understand it as thoroughly as possible. What exactly are we being asked to do? What resources are available? What are the specifications and constraints for solving the problem? How will we know if we have succeeded?

Apply Engineering Design Process:
- Problem identification
- Brainstorming
- Specifications and constraints
- Multiple iterations
- Predictive analysis
- Modeling
- Testing and evaluation
- Product refinement

How can the lessons we’re learning here apply to other kinds of problems we might encounter in colonizing Mars? How else might the Mars Coleman assist with other problem scenarios? What about other environments, like deep sea research?

Self evaluation
Peer evaluation
Teacher evaluation
Identify STEM practices needed to solve this problem
What about other workforce knowledge and skills?
Integrative STEM Content and Infrastructure for delivery:

• Engineering byDesign™ and EbD-BUZZ (LMS) 6E Learning byDesign™

• EbD™ Pre-Service Teacher Education Initiative

• Professional Development Programming
Professional Development:

- Professional Learning Communities
- STEMinar Series
- National Teacher Effectiveness Coaches
- Authorized Teacher Effectiveness Coaches
  (State/District train-the-trainer model)
- Higher Ed STEM Endorsement Course Sequence
- Just-in-time Micro-badging

What Integrative STEM looks like:

ITEEA Dream Ride . . . Go Baby Go Style

www.iteea.org
What Integrative STEM looks like:

ITEEA Dream Ride . . . Go Baby Go Style

Seated Mode  Standing Mode  Powered Walker Mode
An Innovative Assistive Technology Challenge for Middle School, High School, and College STEM Students
Teachers receive excellent classroom teaching tools:

Teachers and students will use their STEM skills to REACH a member of their community who has a challenge to overcome, and design a viable adaptive or assistive technological solution. Projects can be submitted to ITEEA for an opportunity to earn awards and funding for their STEM program!
Prototyping Tips + Tricks
What is a Prototype?

A prototype is a working product that helps engineers obtain Proof-of-Concept (PoC)—evidence that their idea can actually work—and test the product with a User-Expert to gain feedback and determine the need for any iterations.

Essentially, prototypes are the engineering bridge that takes an idea and turns it into a reality!
Taking an idea and making it a reality is an exciting challenge that combines all aspects of STEM. With 3D printers, laser cutters, microprocessors, and app inventors, never in history has it been easier to create (and iterate) a wide variety of prototypes.

Good Luck!
Empathy + Safety Considerations with UCD
Empathy allows User-Center Designers to put themselves in the shoes of the person for whom they are creating a solution, helping to build a deeper connection and understanding of their User Expert.

Safety is also more likely to be considered when a designer engages in empathy, because it allows the designer to better anticipate any safety concerns and feel a drive to create a safe situation for all involved.

CRITICAL: Empathy and safety should be considered throughout every aspect of User-Center Design.
Let’s examine empathy and safety considerations for each step of the User-Centered Design process...
Let's examine empathy and safety considerations for each step of the User-Centered Design process…

Team #: 12345

Meet Our Product:
The Kitchen Reacher Kit
Brainstorming STEM PROJECTS for next school year?

✓ MUST: Bring STEM skills to life in a real-world, meaningful way.
✓ MUST: Inspire students to innovate ways to help their community.
✓ MUST: Include pre-made lesson plans, activities, worksheets + slides.
✓ BONUS: Earns your school grant opportunities and awards.

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Explore results for the 2018 NAEP Technology and Engineering Literacy Assessment

In 2018, the National Assessment of Educational Progress (NAEP) administered a nationally representative assessment of technology and engineering literacy (TEL) at eighth grade. TEL was a fully digitally based assessment that asked students to solve real-world technology and engineering problems. Students used laptops to answer questions that assessed their knowledge and skills in understanding technological principles, solving technology and engineering-related problems, and using technology to communicate and collaborate. Students also answered survey questions asking about their opportunities to learn about and engage in technology and engineering in and outside of school.

https://youtu.be/eziz0f_d2ZM
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IDEO and Shark Tank
Revision of the Standards for Technological Literacy

- A Joint Project by ITEEA and CTETE
- Funded by the National Science Foundation ATE Conference Grant
How Do You Define and Operationalize Technology and Engineering Literacy?

**Technology** is the modification of the natural environment, through human designed objects, systems, and processes, to satisfy needs and wants.

**Engineering** is the use of scientific principles and mathematical reasoning to optimize technologies in order to meet needs that have been defined by criteria under given constraints.

**Technological and engineering literacy** is the ability to understand, use, create, and assess the human designed environment in increasingly and sophisticated ways over time. — Current Draft Version of STEL, 2020

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We hope to see you and ALL your colleagues at ITEEA’s 82nd Annual Conference in Baltimore, MD
Be a part of ITEEA’s STEM Showcase

ITEEA BALTIMORE
MARCH 11-14, 2020
INTERNATIONAL TECHNOLOGY AND ENGINEERING EDUCATORS ASSOCIATION

www.iteea.org
ITEEA has created the STEM School of Excellence Program to annually recognize outstanding schools for their commitment to providing robust Integrative STEM Education programs. By providing information regarding qualifying activities, your school can receive the recognition it has earned as a leader in STEM Education.

STEM Schools of Excellence will be honored at the 2020 ITEEA Annual Conference in Baltimore and receive a banner and certificate to display in the school. All School Recipients will be proudly posted on our Website Wall of Excellence!
Today’s Presentation

Request Preview Access to EbD courses
Or Google “EbD BUZZ Resources” and scroll down to Request for EbD™ Course Review Access

STEM⁴: The Power of Collaboration for Change

ITEEA REACH Challenge for your students!
An Innovative Assistive Technology Challenge + Educator’s Toolkit for Middle School, High School, and College STEM

ITEEA STEM School of Excellence Program!

www.iteea.org
Thank you!

Technology and Engineering bring STEM To Life

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