Bell Ringer:
List a few of your school or community’s core values.

Can you think of a local issue pertaining to the greater social good that was controversial because values were in conflict?
Engineering for Social Good: EbD™ PreK–12

Jennifer Buelin, Ed.D., NBCT
Director, ITEEA STEM CTL
Social Good:

an action that provides some sort of benefit to the general public.

https://www.socialchangecentral.com/what-is-social-good/
What Integrative STEM looks like:
Jane Chen’s incubator design
In addition to the workforce and economic imperatives, engineering can and should be appreciated as a contributor to sustainable development and transformative improvement in quality of life.

The UN Millennium Development Goals (2000) and the NAE Grand Challenges for Engineering (2008) inspire development of curricula that prompt learners to seek solutions to human needs: potable water, sanitation and waste disposal, energy, sustainable transport, and production of sufficient food to meet the needs of a growing world population.
Is Jane Chen doing engineering?

How do you know?

Would your students recognize Chen’s work as engineering?

How would you define engineering?
“In the K–12 context, “science” is generally taken to mean the traditional natural sciences: physics, chemistry, biology, and (more recently) earth, space, and environmental sciences.

We use the term “engineering” in a very broad sense to mean any engagement in a systematic practice of design to achieve solutions to particular human problems.

Likewise, we broadly use the term “technology” to include all types of human-made systems and processes—not in the limited sense often used in schools that equates technology with modern computational and communications devices. Technologies result when engineers apply their understanding of the natural world and of human behavior to design ways to satisfy human needs and wants.” (NRC, 2012, pp. 11–12)

APPENDIX I
ENGINEERING DESIGN IN THE NEXT GENERATION SCIENCE STANDARDS
Engineering for All – Food: Vertical Farming
Engineering for All – Water: The World in Crisis

• Each 6 week unit is based on NGSS

• Project Drivers:

  o Promoting the potential of engineering as a social good.
  o Revisiting overarching themes (design, modeling, systems, resources, and human values).
  o Using authentic social contexts for teaching and learning STEM ideas and practices.
  o Using Informed Design as the core pedagogical methodology.
The Informed Design Process

1. Clarify problem criteria and constraints
2. Research and investigate
3. Generate alternative designs
4. Choose and justify the optimal solution
5. Develop a prototype
6. Test and evaluate
7. Redesign the solution
8. Communicate your achievements

Re-enter the design cycle at any step to revise solution if necessary
What Integrative STEM looks like:
EbD™ Engineering for All
What is the aim of engineering?

School-based engineering meets the needs of millennial students who are civic-minded, team-oriented, and want to make a difference.

There is growing recognition that ETE experiences can be pedagogically valuable for all students—not only in providing an effective way to contextualize and reinforce STEM skills, but also in mobilizing engineering thinking as a way for young people to approach problems of all kinds.
ITEEA’s STEM Center for Teaching and Learning
<table>
<thead>
<tr>
<th>CORE PROGRAM</th>
<th>HS Choices</th>
<th>Program Title</th>
<th>Grade Level</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td>Exploring Technology</td>
<td>6th Grade</td>
<td>18 weeks</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Invention and Innovation</td>
<td>7th Grade</td>
<td>18 weeks</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Technological Systems</td>
<td>8th Grade</td>
<td>18 weeks</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Foundations of Technology</td>
<td>9th Grade</td>
<td>36 weeks</td>
</tr>
<tr>
<td>10–12</td>
<td></td>
<td>Technology and Society</td>
<td>10th-12th Grade</td>
<td>36 weeks</td>
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<tr>
<td>10–12</td>
<td></td>
<td>Technological Design</td>
<td>10th-12th Grade</td>
<td>36 weeks</td>
</tr>
<tr>
<td>11–12</td>
<td></td>
<td>Advanced Design Applications *</td>
<td>11th-12th Grade</td>
<td>36 weeks</td>
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<td>11–12</td>
<td></td>
<td>Advanced Technological Applications *</td>
<td>11th-12th Grade</td>
<td>36 weeks</td>
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<tr>
<td>11–12</td>
<td></td>
<td>Engineering Design (Capstone)</td>
<td>11th-12th Grade</td>
<td>36 weeks</td>
</tr>
</tbody>
</table>

EbD-TEEMS NXTGEN™
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.
What Integrative STEM looks like:
*ITEEA Dream Ride . . . Go Baby Go Style*
What Integrative STEM looks like:
**ITEEA Dream Ride . . . Go Baby Go Style**
What Integrative STEM looks like: 
ITEEA Dream Ride . . . Go Baby Go Style
Systems Thinking

classicalizing an engineered system, product, or process in terms of it being comprised of a set of interrelated components or subsystems that act together to produce a desired result.
All systems have various inputs, which go through processes to produce outputs.

A system is designed to turn desired results into actual results.

Often, actual results include both intended and unintended outputs, as well as desired and undesired results.

High-functioning systems collect feedback to increase efficiency.
Request Preview Access to EbD courses

Or Google “EbD BUZZ Resources” and scroll down to Request for EbD™ Course Review Access
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: 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 membership services
IdeaGarden
ITEEA Headliner
Leadership and Professional Growth

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

International ITEEA STEM Centers
Be a part of ITEEA’s STEM Showcase
Baltimore, MD     March 11-14, 2020
Questions?

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