

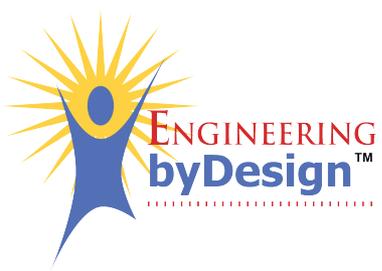


Engineering for Social Good: EbD™ PreK–12

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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



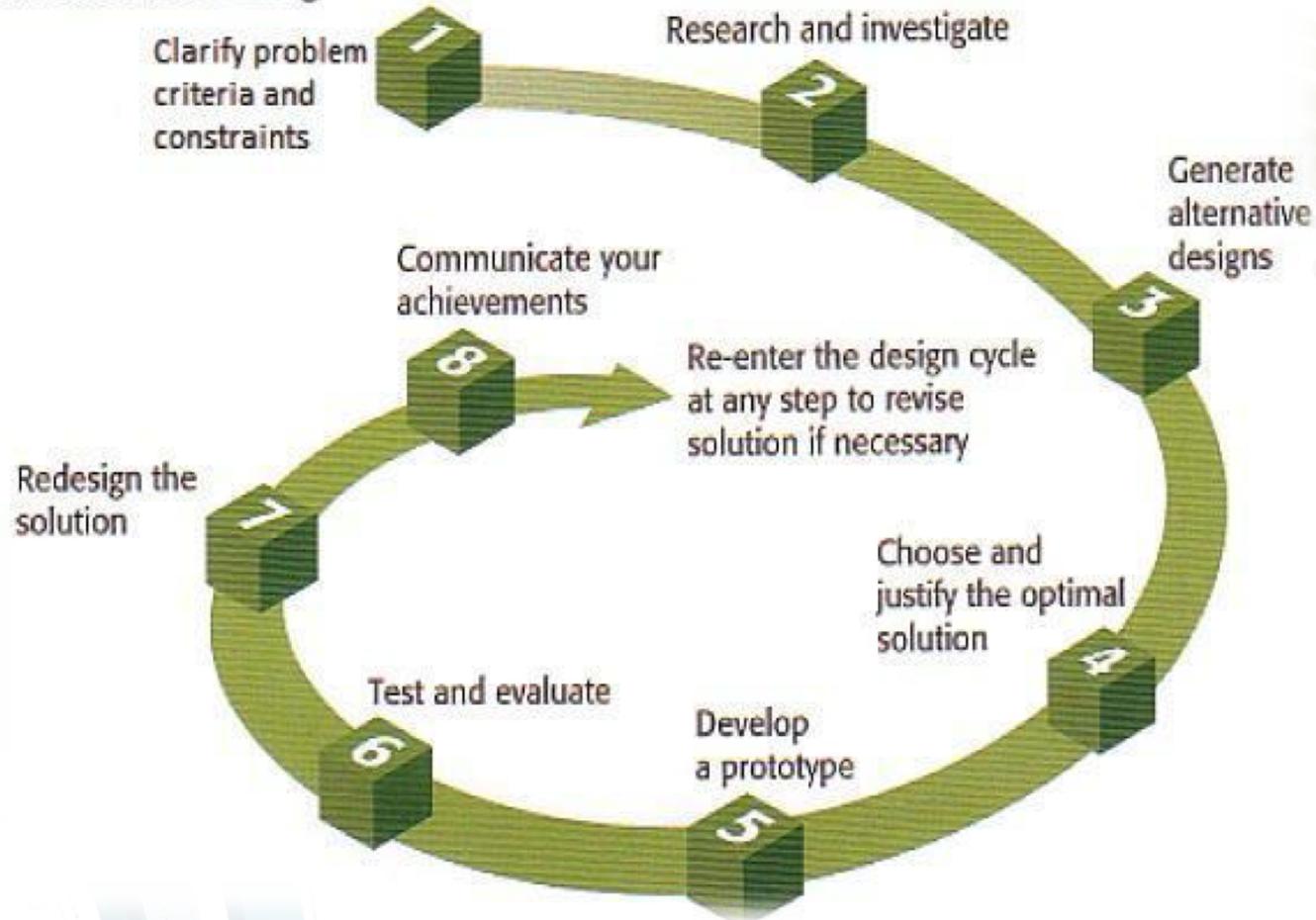
Engineering for All – Food: Vertical Farming

Engineering for All – Water: The World in Crisis

- Each 6 week unit is based on NGSS
- Project Drivers:
 - Promoting the potential of engineering as a social good.
 - Revisiting overarching themes (design, modeling, systems, resources, and human values).
 - Using authentic social contexts for teaching and learning STEM ideas and practices.
 - Using *Informed Design* as the core pedagogical methodology.

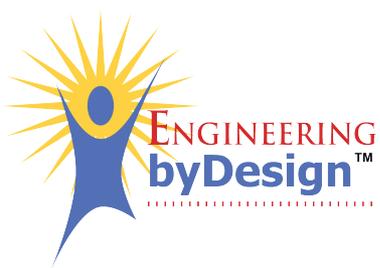


The Informed Design Process



What Integrative STEM looks like: EbD™ Engineering for All

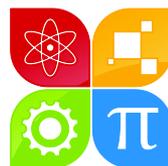




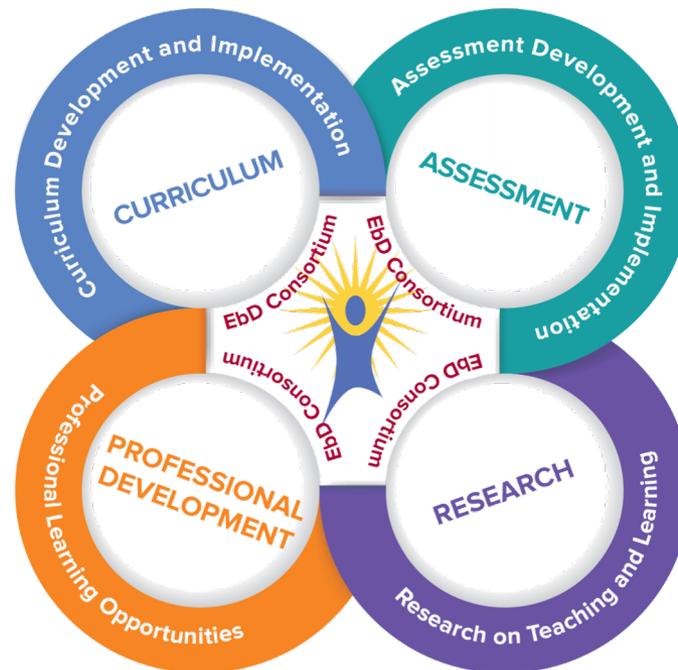
What is the aim of engineering?

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



CORE PROGRAM	K-2		EbD-TEEMS NXTGEN[™]		1-6 weeks
	3-6		EbD-TEEMS NXTGEN[™] (6th Grade Capstone), I ³	 	1-6 weeks
	6		<i>Exploring Technology</i>		18 weeks
	7		<i>Invention and Innovation</i>		18 weeks
	8		<i>Technological Systems</i>		18 weeks
	9		<i>Foundations of Technology</i>		36 weeks
	10-12	HS Choices	<i>Technology and Society</i>		36 weeks
	10-12		<i>Technological Design</i>		36 weeks
	11-12		<i>Advanced Design Applications</i> *		36 weeks
	11-12		<i>Advanced Technological Applications</i> *		36 weeks
	11-12		<i>Engineering Design (Capstone)</i>		36 weeks

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.



eENGINEER Extend/Elaborate

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



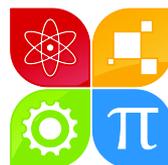
ENRICH

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

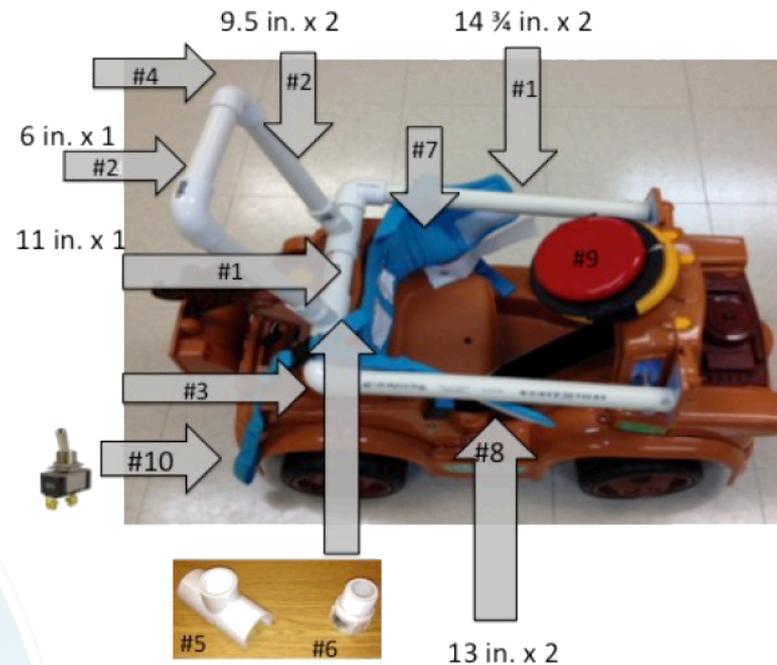
The purpose of the EVALUATION phase is for both students and teachers to determine how much learning and understanding has taken place.



What Integrative STEM looks like: *ITEEA Dream Ride . . . Go Baby Go Style*



What Integrative STEM looks like: *ITEEA Dream Ride . . . Go Baby Go Style*



Tools Required:



What Integrative STEM looks like: *ITEEA Dream Ride . . . Go Baby Go Style*



Seated Mode

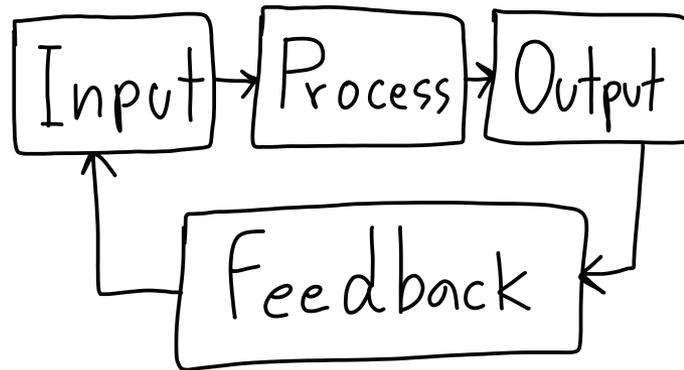


Standing Mode



Powered Walker Mode

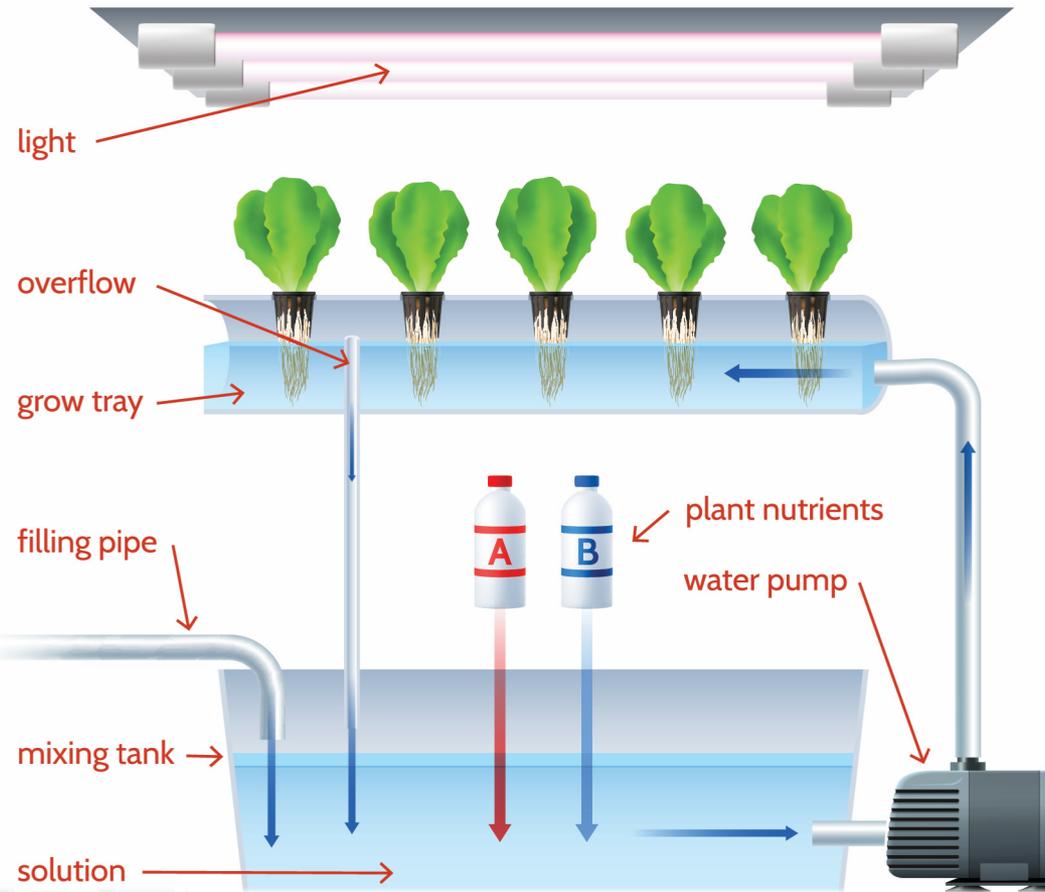




- All systems have various inputs, which go through processes to produce outputs.
- A system is designed to turn desired results into actual results.
- Often, actual results include both intended and unintended outputs, as well as desired and undesired results.
- High-functioning systems collect feedback to increase efficiency.



HYDROPONIC SYSTEM

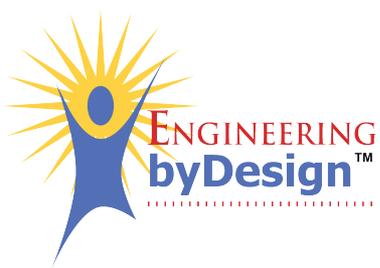


Request Preview Access to EbD courses



Or Google “EbD BUZZ Resources” and scroll down to [Request for EbD™ Course Review Access](#)





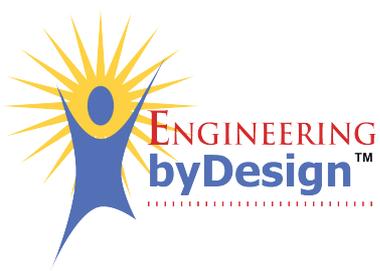
Integrative STEM Education:

"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

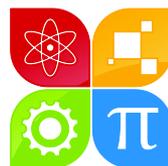
ITEEA Headliner

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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