

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.

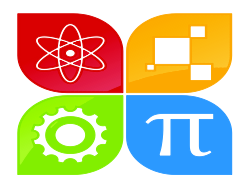
**STEM CONFERENCE • STEM TRADE SHOW • TEACHER EXPO
RESEARCH POSTER SESSION • STEM LEADERSHIP ACADEMY**



October 30-31, 2019

**Steven Barbato
ITEEA Executive Director/CEO
Email: sbarbato@iteea.org**

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





Technology and Engineering bring STEM to Life!

International Technology and Engineering Educators Association
www.iteea.org

**Empowering Educators to Effectively Implement
Integrative STEM Education for ALL students!**

www.iteea.org

















ENGINEERING byDesign™

Integrative STEM Education through the Content and
Practices of Technology and Engineering Education

Students Who Study Technology and Engineering
“Bring STEM to Life!”

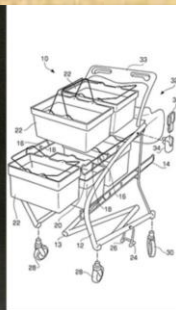
CORE PROGRAM	K-2		EbD-TEEMS NXTGEN[™]		1-6 weeks
	3-6		EbD-TEEMS NXTGEN[™] (6th Grade Capstone), I ³	 	1-6 weeks
	6		<i>Exploring Technology</i>		18 weeks
	7		<i>Invention and Innovation</i>		18 weeks
	8		<i>Technological Systems</i>		18 weeks
	9		<i>Foundations of Technology</i>		36 weeks
	10-12	HS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

What “STEM” Looks Like

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

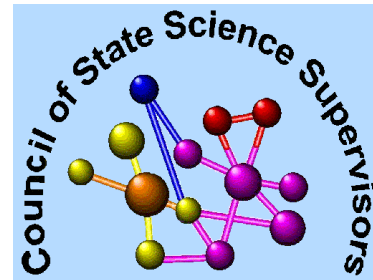


<https://www.iteea.org/Activities/2142/Reach.aspx?source=generalSearch>



IDEO and Shark Tank

STEM Education Policy Collaborative



www.iteea.org



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!](https://www.iteea.org/File.aspx?id=90060&v=4416f187)

<https://www.iteea.org/File.aspx?id=90060&v=4416f187>

www.iteea.org

ITEEA: Who We Are

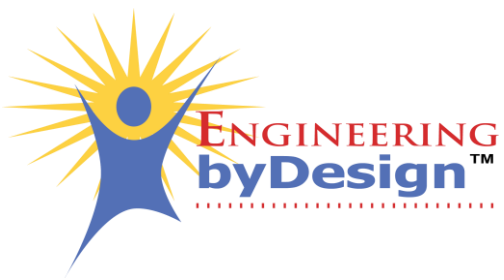
Technological and Engineering Literacy for ALL students
STEM Center for Teaching and Learning
Standards-based EbD™ Curriculum for Grades PreK-12

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



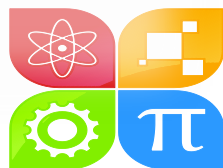
Integrative STEM Education



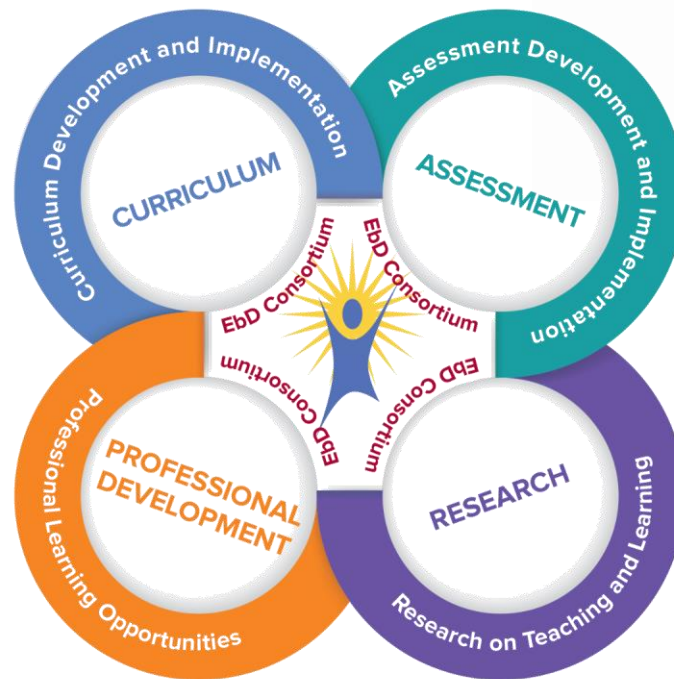
*"the application of technological/engineering **design based** pedagogical approaches to **intentionally teach content and practices of science and mathematics education through the content and practices of technology/engineering education.** Integrative STEM Education is **equally applicable** at the 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 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.



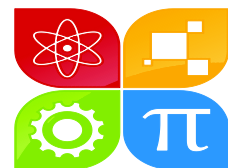
ENRICH

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.



Exploring and Colonizing Mars

The 6E Learning Cycle in Practice



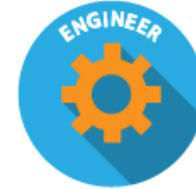
Humans have always had an innate desire to explore past the boundaries of earth to the moon and beyond. What do humans need to know and be able to do in order to colonize Mars and live there for an extended period of time?



How to design a rover/robot to navigate and traverse the Mars surface to assist astronauts in the exploration and colonization of Mars?



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?



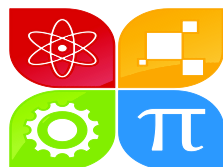
Self evaluation

Peer evaluation

Teacher evaluation

Identify STEM practices needed to solve this problem

What about other workforce knowledge and skills?



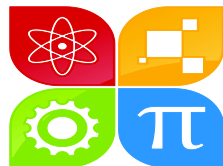
Integrative STEM Content and Infrastructure for delivery:

- Engineering byDesign™ and EbD-BUZZ (LMS)
6E Learning byDesign™
- EbD™ Pre-Service Teacher Education Initiative
- Professional Development Programming

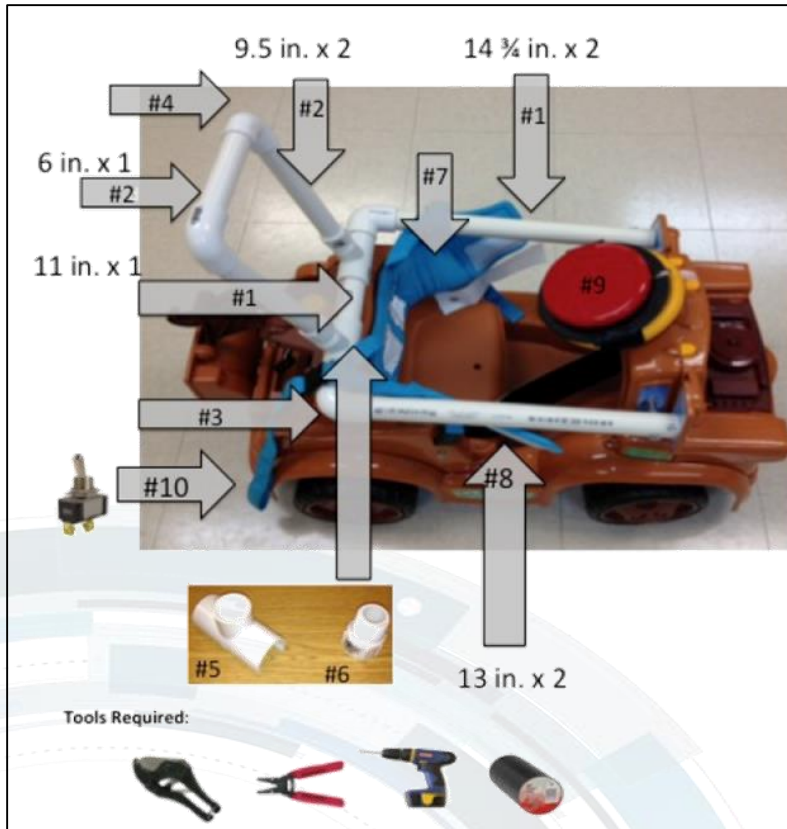
Professional Development:

- 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

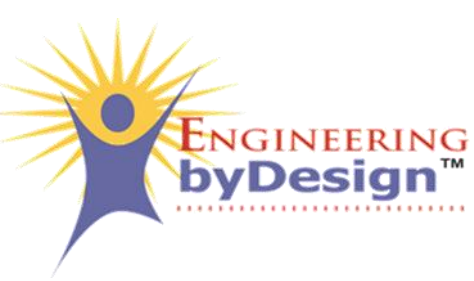
*Safety series 2019-2020 <http://iteea.org/microbadge.aspx>



What Integrative STEM looks like:



ITEEA Dream Ride . . . Go Baby Go Style



What Integrative STEM looks like:

ITEEA Dream Ride . . . Go Baby Go Style



Seated Mode



Standing Mode



Powered Walker Mode



**Use STEM Skills
to Change Lives**



**Inspire
Student
Innovation**



**Impactful
Design-
Thinking
Project**



**Ready-Made
Lesson Plans
+ Slides**

**Let's
REACH
Together!**



**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!



www.iteea.org



Submission Guidelines

Students will learn the details of the REACH Challenge, including a sample submission. This section provides teams with tips on finding a User-Expert, product discounts, templates, and tips on technical writing, photography and videography.

[DOWNLOAD](#)



Assistive Technology

Students will explore the world of adaptive and assistive technology, as well as why these technologies are critically important for those with ability challenges. The exploration will include case studies, resources, and an inspiring lesson on the power of inclusiveness.

[DOWNLOAD](#)



User-Centered Design

Students will create a piece of adaptive technology as they develop a high-level of understanding of User-Centered Design, where the engineer includes its end user throughout the design process, which is filled with iteration. This section includes a fun lesson on the importance of failure.

[DOWNLOAD](#)



Empathy + Safety

Students will learn how empathy and safety methods are applied to each step in the User-Centered Design process. This section includes an activity on listening, and how to conduct a good user interview to obtain qualitative and quantitative data.

[DOWNLOAD](#)



Engineering Prototypes

Students will build a working prototype of their idea, applying what they've learned about User-Centered Design. Tips, tricks and resources for prototyping will be taught through hands-on activities as well as explorations and slides on common mechanisms and control systems.

[DOWNLOAD](#)



Intellectual Property

Students will take on the role of an entrepreneur as they learn how to present their innovation to the world. This section includes information about open source options and the patent process, as well as tips on protecting intellectual property.

[DOWNLOAD](#)


Prototyping Tips + Tricks



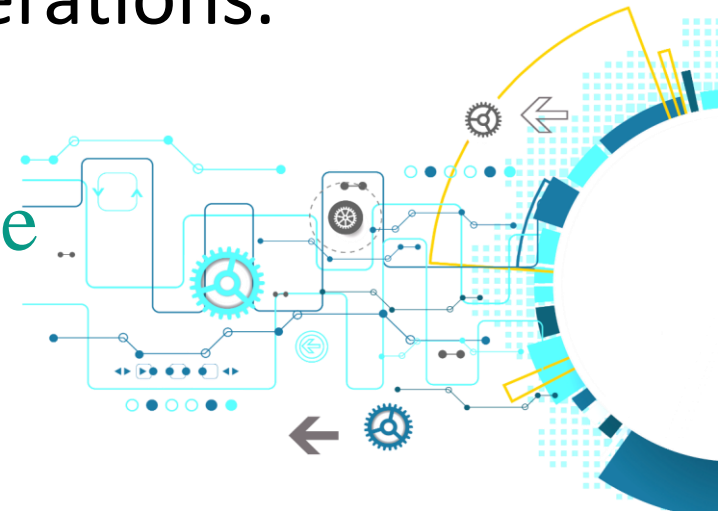


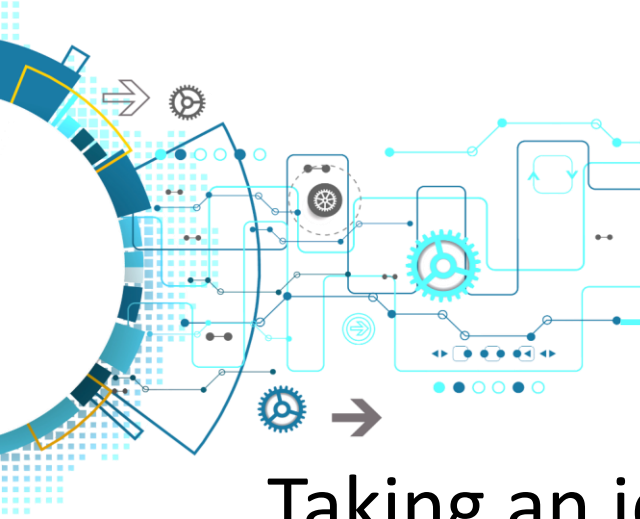
What is a Prototype?

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!





Engineering a Prototype

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's Connection to 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.



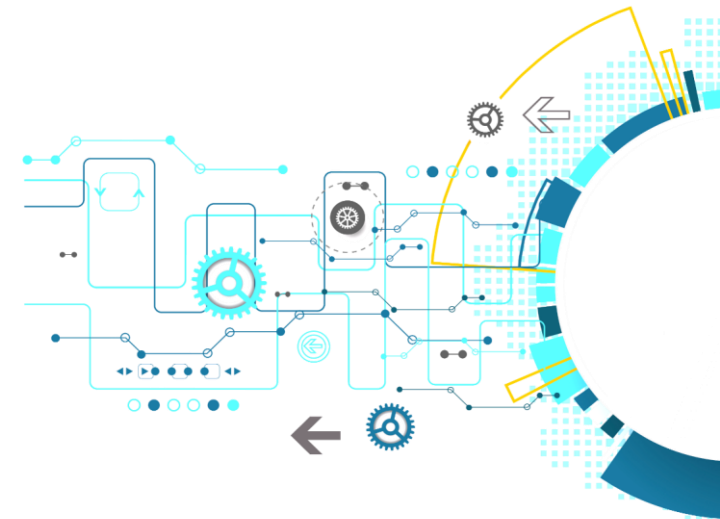
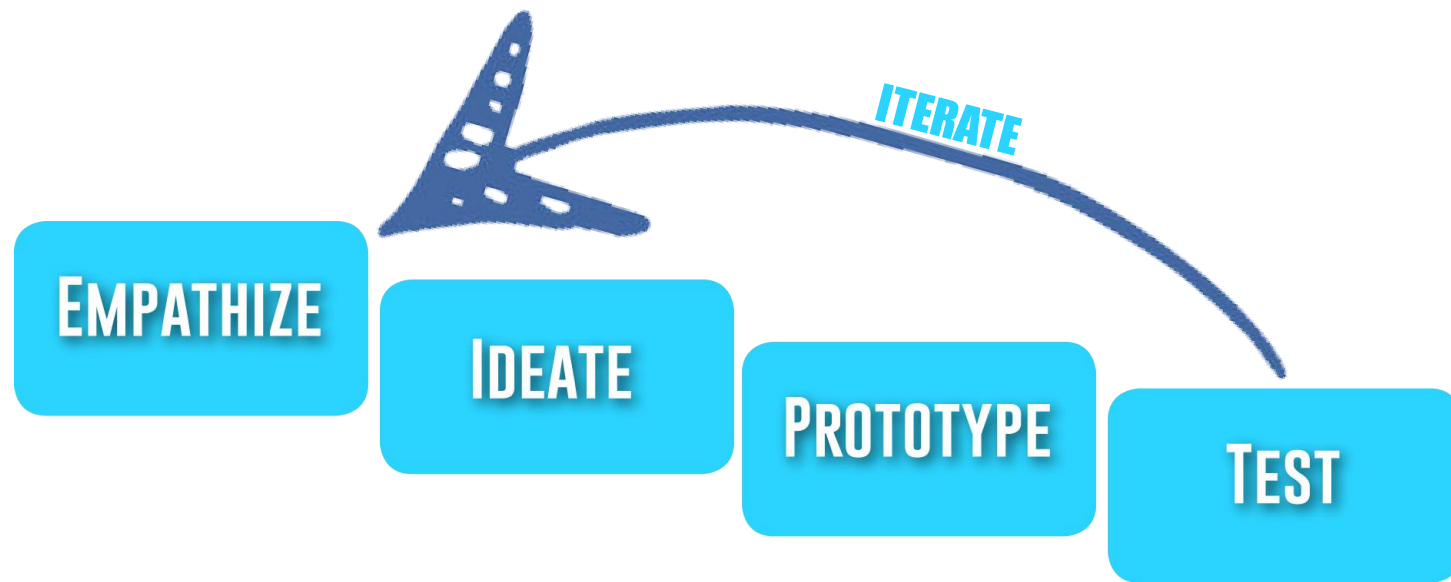
CRITICAL: Empathy and safety should be considered throughout every aspect of User-Center Design.





Steps of User-Centered Design

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.



Found it!





NAEP Technology & Engineering Literacy (TEL) Report Card



Home Results Tasks Student Questionnaires Student Group Comparisons Tool About



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

ITEEA



BALTIMORE



MARCH 11-14, 2020

INTERNATIONAL TECHNOLOGY AND ENGINEERING EDUCATORS ASSOCIATION

We hope to see you and ALL your colleagues at
ITEEA's 82nd Annual Conference in Baltimore, MD

www.iteea.org



Be a part of ITEEA's STEM Showcase

ITEEA 
BALTIMORE 
MARCH 11-14, 2020 

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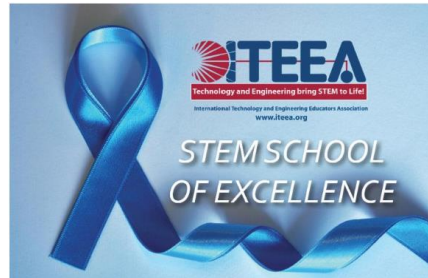


STEM School of Excellence

RECOGNITION PROGRAM



Apply to be an
ITEEA STEM School
of Excellence
today!

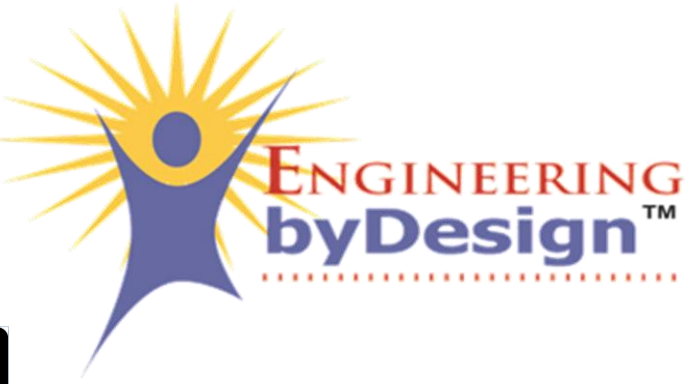


- ITEEA has created the STEM School of Excellence Program to annually recognize outstanding schools for their commitment to providing robust Integrative STEM Education programs. By providing information regarding qualifying activities, your school can receive the recognition it has earned as a leader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



VIEW NOW

Today's Presentation



Request Preview Access to EbD courses

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



VIEW NOW

STEM⁴: The Power of Collaboration for Change



Scan me



ITEEA REACH Challenge for your students!

An Innovative Assistive Technology Challenge + Educator's Toolkit for Middle School, High School, and College STEM

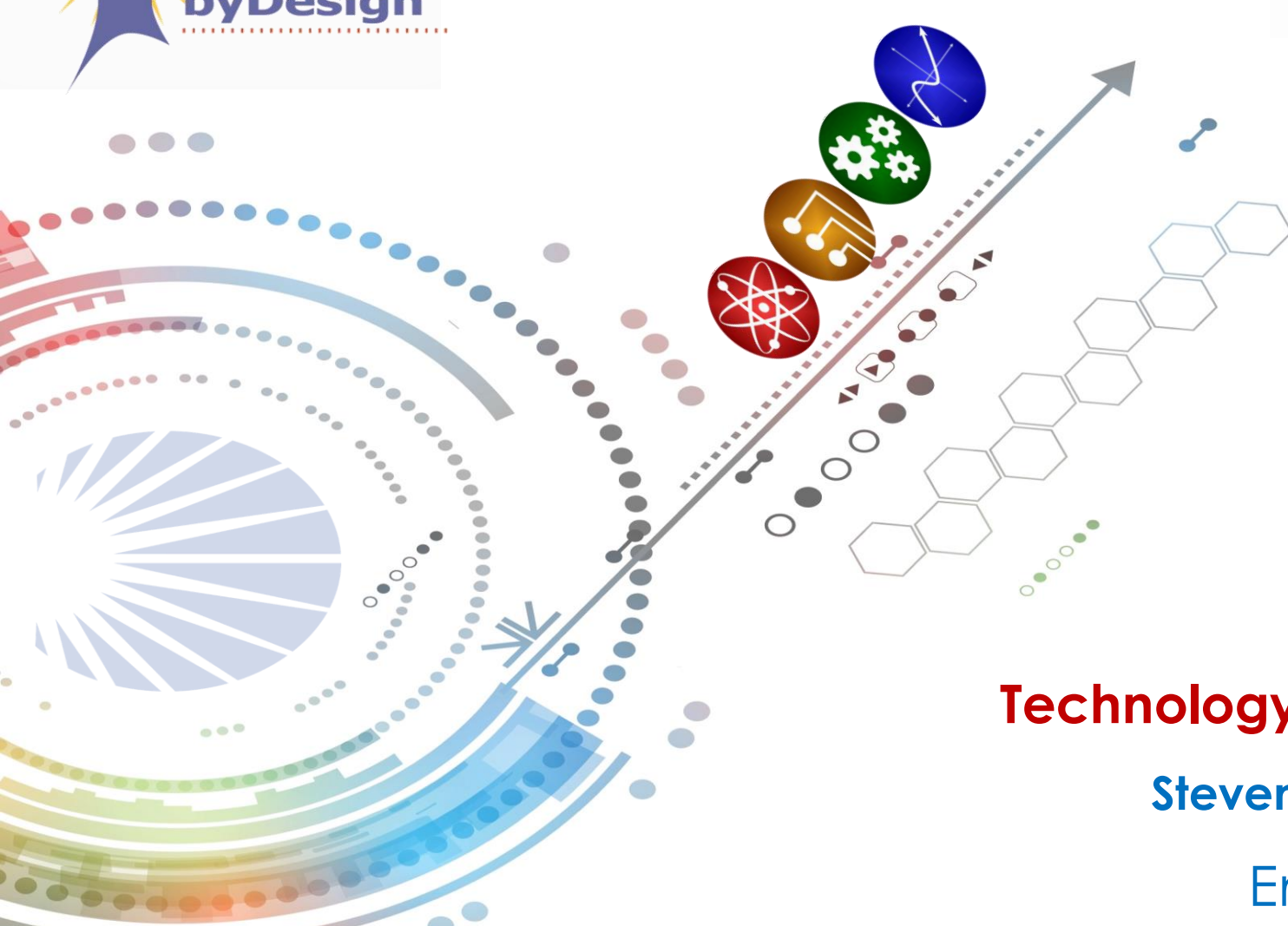
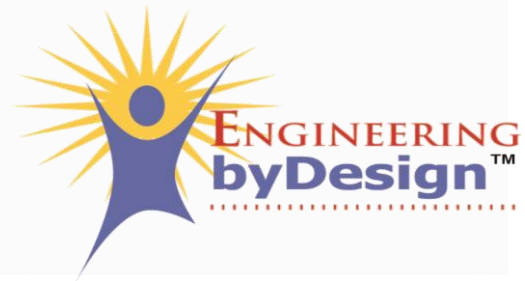


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ITEEA STEM School of Excellence Program!

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RESOURCE LINKS!



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RESEARCH POSTER SESSION • STEM LEADERSHIP ACADEMY



Thank you!

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