



GlobalMindED

## Responsive STEM Education

*How Project-based Learning Supports Differentiated and Student-Led Learning in the Classroom and Online During and After COVID-19*



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ProjectEngin LLC

# Responsive STEM Education



How can we engage students in STEM disciplines/career fields?



Connecting curricular concepts to the real-world/empowering students to change the world



Supporting students with diverse talents and backgrounds



Benefits of using design challenges and PBL in the classroom and online



Resources/ideas that work

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Engineer/educator – combined the two

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We all engineer – the designed world needs to be part of every student's education

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Challenges of the future will require diverse talent and backgrounds

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Engineering can connect content to real-world issues with a focus on solutions

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Projects based on engineering challenges support skills-based learning

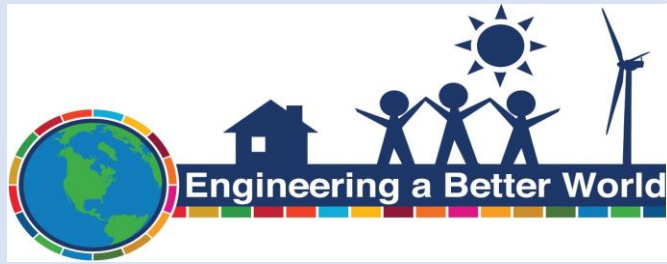
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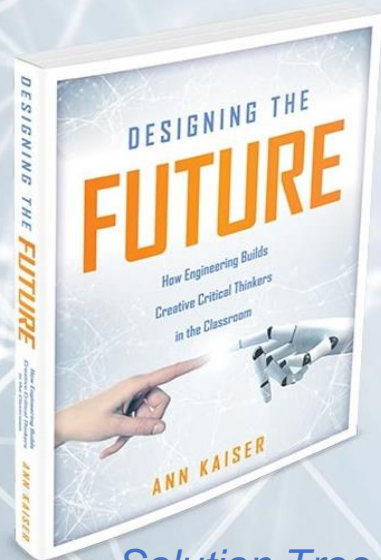
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Re-Engineering  
the Science Fair



*Solution Tree Press*



**EngineerGOOD™**

Engineering Solutions to  
Global Challenges

**participate™**



**ProjectEngin™**

Moving Online:  
Summer - Community of Practice (PLC)  
Fall – PD Course

# ProjectEngin™

## Professional development

- creating online PLC
- developing online courses

## Curriculum

- Middle school NGSS-based
- High school Engineering Design elective

[www.projectengin.com](http://www.projectengin.com)



**TGR** FOUNDATION

A TIGER WOODS CHARITY





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**DR. KATHERINE BIHR**  
**VICE PRESIDENT, PROGRAMS & EDUCATION**  
**TGR FOUNDATION**

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**Katherine Bihr Ed.D.** is the Vice President of Programs and Education for TGR Foundation, A Tiger Woods Charity, providing direction to the personnel, programs and operations of the TGR Learning Lab and the Earl Woods Scholar Program. TGR Foundation provides STEM career exploration and college preparation programs to high potential, low opportunity youth and families. It is through this work, she realized the importance of sharing these programs with educators and to meet that challenge created TGR EDU: Create, a professional learning program and TGR EDU: Explore, a digital resource designed for educators to use with students.







For over 24 years, TGR Foundation  
has been redefining what it  
means to be a champion.

## VISION

A world where opportunity is  
universal and potential is limitless.

## MISSION

Empowering students to pursue  
their passions through education.





# TGR LEARNING LAB

## After-School, In-School and Summer Classes for Grades 5 -12

The TGR Learning Labs allow students to discover personal interests, develop self-confidence and strengthen academic skills.

- **Flagship 35,000 square-foot innovation lab in Anaheim, housing eight smart classrooms, state-of-the-art makerspace and a theater-style auditorium**
- Satellites in Philadelphia, Washington, D.C., S. Florida and the Marine Corps Base in Quantico, VA
- Connects learning to career preparation
- **Served more than 175,000 students since its inception**



# 50+

areas of study in STEM and  
college-access, building  
workforce skills







# TGR EDU: CREATE

TGR EDU: Create is a teacher training program incorporating **interdisciplinary approaches with inquiry-based, student-centered content** focused on STEM, college access and career connections.

- **STEM Studio** workshops are week-long educator trainings where teachers take on the role of students
- Innovative lesson design and **hands-on, project-based** learning activities
- Strategies to enhance teacher curricula and **prepare students for future STEM careers** and navigate through the college process
- Workshops held in **So. Cal, D.C., S. Florida, Santa Fe and Philadelphia**, with regions growing annually



**Professional  
Learning for  
Educators**

# ▲▲▲ | TGR EDU: EXPLORE

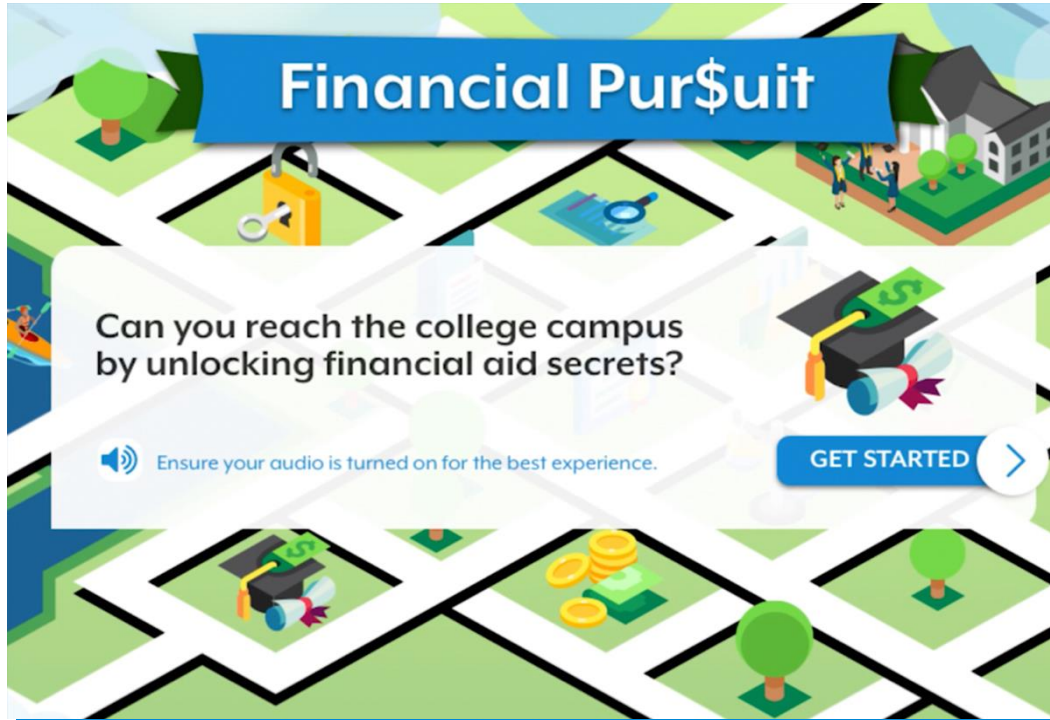
## Free Online Education for Students, Educators and Families

Launched in partnership with **Discovery Education** in 2017, TGR EDU: Explore is a digital version of our TGR Learning Lab, offering access to STEM curricula and college-access programming.

**Available at no cost, the platform offers interactive lessons and video trainings in:**

- **STEM subjects**, from robotics and biotechnology to city planning, biomimicry and more
- **College application** process
- **Financial aid** application

## To Our Solar System and Back



# COVID-19 RESOURCES

In response to school closures brought on by COVID-19, TGR Foundation is finding new ways to provide educators, students and families with no-cost lessons and resources to support distance learning. Along with the 40+ STEM and college-access resources always available on [TGREDUExplore.org](https://www.tgreduexplore.org), TGR Foundation's in-house team has created new learning content over the last several weeks:

## Student and Family Resources

[Design Challenges](#) – No-cost English and Spanish family-friendly activities to unlock your creativity to explore, design and test solutions for real-world problems, with 20+ lessons to choose from

[STEM Unplugged](#) – Bi-monthly English and Spanish video lessons highlighting STEM activities for students to do at home

College-Access Resources – Designed to support students and families navigating the college admissions process during this challenging time  
Digital Workshops available on our [You Tube College-Access Playlist](#)

Digital Downloads:

[Best Practices for High School Seniors](#)

[Tip and Resources to help High School and College Students manage COVID-19](#)

## Educator Resources

[Create Café](#) - Virtual Office Hours every Friday at 12:30pm PDT/3:30pm EDT and 3:30pm PDT/6:30pm EDT

[Mindful Mondays](#) – Live mindfulness sessions for educators

TGR EDU: Create Video Tutorials - Weekly tutorials offering tips and best practices to support educators with distance learning available on our [You Tube Educator Training Playlist](#)

All these resources and more can also be found on the [TGR Foundation homepage](#)





- Preparing learners for tomorrow by creating innovative classrooms connected to today's world
- 4.5 million educators and 45 million students worldwide
- Global leader in K-12 digital curriculum resources and professional learning

### **Responsive STEM Education: PBL Online**

- STEM Careers & Skill Building - Project Based Learning
- STEM Focused - COVID-19 Response Resources



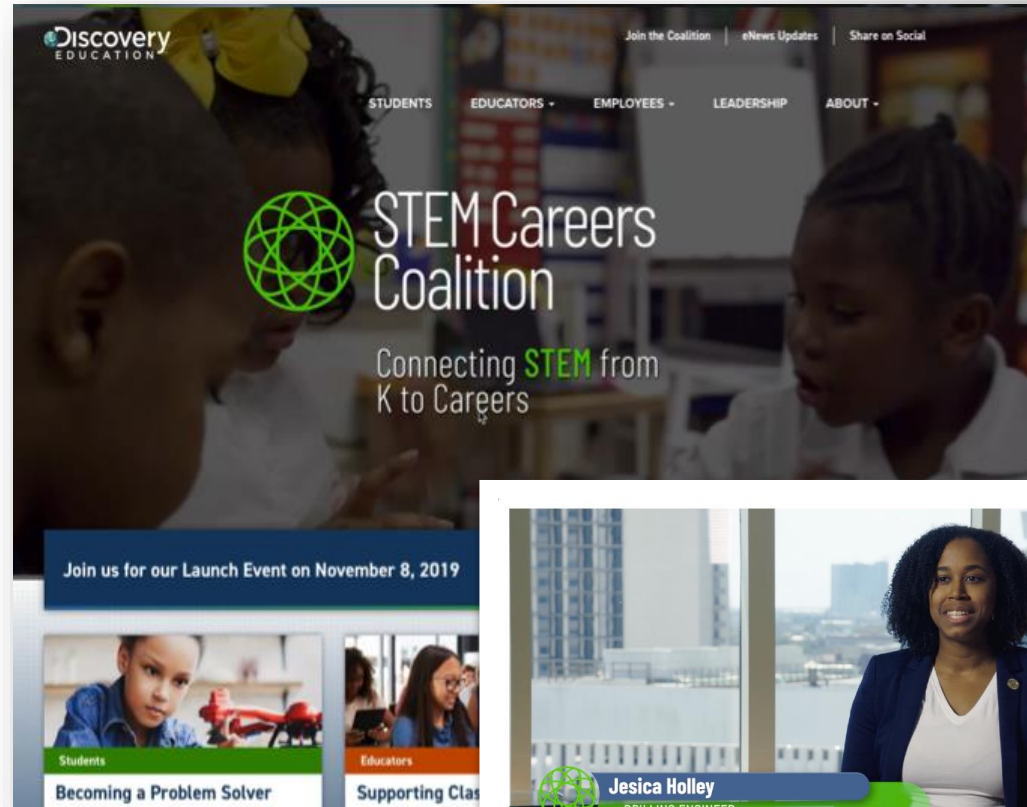
Susanne H. Thompson

Chief Operations Officer  
Corporate/Non-Profit Partnerships

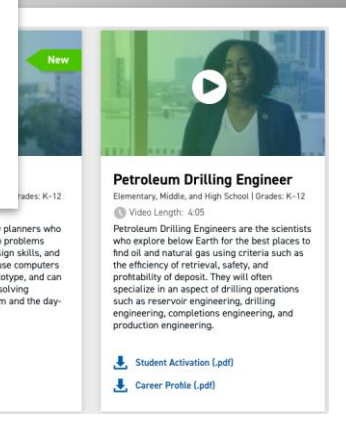


A first-of-its-kind STEM careers initiative that closes the workforce gap by bridging industry and classrooms at unprecedented scale.

[www.stemcareerscoalition.org](http://www.stemcareerscoalition.org)



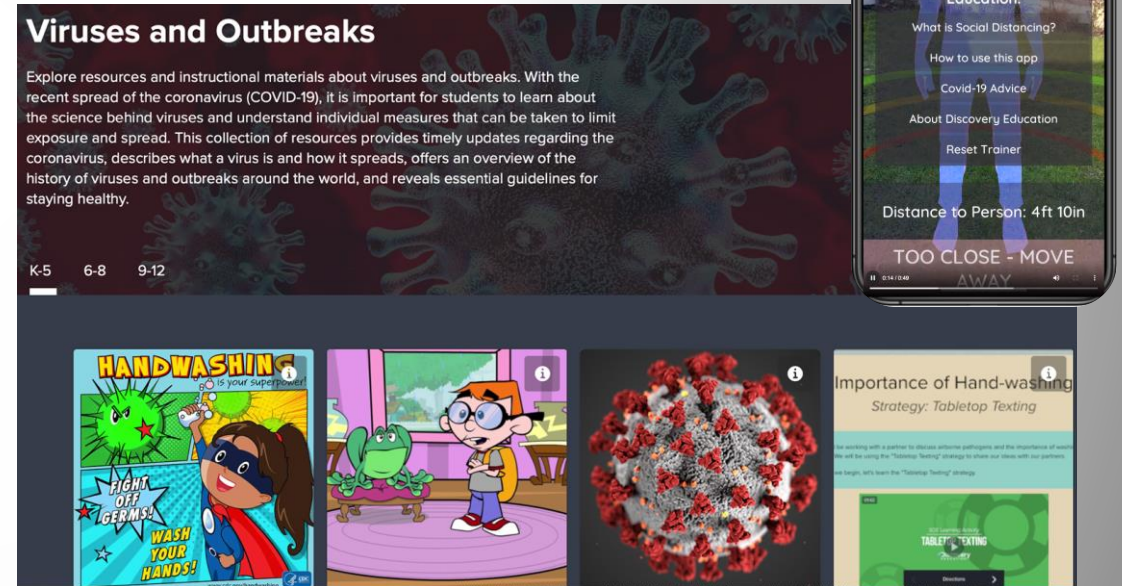
STEM  
Careers



# Coronavirus Response Resources

At Discovery Education we are committed to helping schools and communities maintain normalcy and maintain continuity of learning amidst this crisis and supporting educators throughout this transition to virtual learning.

- Daily DE for Parents
- Virtual Field Trips
- Lesson Planning
- Additional Topical Resources
- Social Distancing App



[www.DiscoveryEducation.com/Virtual-Learning](http://www.DiscoveryEducation.com/Virtual-Learning)



# Daily DE for Parents

<https://den.discoveryeducation.com/participate/dailyde>

## Week 3: Grades 6-8

### MINDS-ON MONDAY

Explore digital  
interactives that get  
you thinking.

### TUNDRA TUESDAY

Learn more about  
polar bears, the arctic,  
and how you can help  
protect our  
environment.

### WHELMERS' WEDNESDAY

Get hands-on as you  
engage in the scientific  
thinking process.

### THURSDAY SKILLZ DAY

Apply your thinking  
skills to real-world  
questions.

### FIELD TRIP FRIDAY

Go on virtual field trips  
to amazing  
destinations.



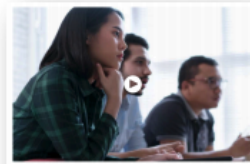
#### Building Bridges for Wildlife

Grades 6-8 | 45-60 Minutes

Students will design and build an innovative  
bridge or wildlife crossing for a specific  
species so they can safely navigate across  
and through human-made structures.

### STUDENT WEEKEND CHALLENGE

Check out [Science Fair Central Maker Corner](#)  
for some fun project ideas that will STEMulate  
your brain!



#### Overview of E-cigarettes for Parents

Parents and Community  
@michigan  
Join the national-style "Overview of E-cigarettes for Parents" presentation at a  
Back to School Night, PTA or PTO night, or other community event to help parents  
and follow community members interested about the youth vaping epidemic and  
what have CANCER! My breath resources can benefit schools.


### PARENT WEEKEND CHALLENGE

Explore tools to help your students make healthy  
decisions about E-cigarettes with parent resources  
and student activities from [Be Vape Free](#).

# Resources for Parents/Caregivers


Virtual fieldtrips take students outside the walls of the classroom to learn about the world around them.

[www.discoveryeducation.com/community/virtual-field-trips/](http://www.discoveryeducation.com/community/virtual-field-trips/)




**Discover Your Happy**  
Discover the Six Sustainable Happiness Skills—mindfulness, human connection, positive outlook, purpose, generosity, and gratitude.


**Discover Your Happy**  
Virtual Field Trip




**Speak Truth to Power**  
Join this inspiring conversation of influential human rights defenders sharing their stories with a new generation of activists.




**TeenDrive365**  
Take three "road trips" to see the cars of the future, the engineering behind safe driving, and the science behind safe driving!




**Generation Beyond: Aviation**  
Join us at Lockheed Martin Skunk Works® where innovative engineers and scientists are building a new generation of aircraft.



**NFL PLAY 60**  
Join us for an all-access pass behind the scenes of Super Bowl LIV in Miami as we celebrate the NFL's 100th season. Huddle to Play It Forward with NFL players, cheerleaders, American Heart Association volunteers, and students. Register...



**Girls Get STEM**  
Explore the Girl Scouts' STEM Center of Excellence where STEM comes to life in new and unexpected ways. Also available in Spanish!



**How Nature Inspires 3M Science**  
How Nature Inspires 3M Science. What do gecko's feet, spider legs, goose feathers, and fireflies have in common? They have all inspired 3M innovations in science! Join special guest host Anne-Lise Emig from Science...

# Resources for Educators

No cost resources to support teachers to develop lesson plans and create engaging, effective virtual learning.

[www.discoveryeducation.com/virtual-learning/](http://www.discoveryeducation.com/virtual-learning/)



**Discovery Education Virtual Learning**

**Getting Started with Virtual Learning**

Virtual learning helps you maintain engagement and continuity of learning outside of the classroom with tools that allow you to still communicate with your students, facilitate group activities, provide feedback, track student progress, and create a lasting educational impact.

**1**

**Discover Resources**

Choose from thousands of vetted, high-quality resources that adapt to and complement your teaching practices, including videos, images, interactives, reading passages, podcasts, and more. All content is ad-free, carefully curated, and segmented by grade level to help find exactly what you need.

**2**

**Grab & Go**

Take advantage of ready-to-use, easily adaptable lessons and step-by-step guides, and find complete collections of research-based strategies through dedicated collections like the [Instructional Integration Library](#). You can also find one-of-a-kind lessons activities and experiences through our [Virtual Field Trips](#).

**3**

**Share with Students**

All resources within Experience can be shared with your students in a variety of ways, including email, web links/URLs, your school's learning management system, social media, and other web-based classroom tools. You can also use Studio, the safe creation and collaboration tool included in Experience, to easily assign content directly and track learning.

**4**

**Ask for Help**

Whether you need a nudge, have a question, or are ready for the next step, know that you are not alone. We've assembled a vast library of support tools, including virtual office hours and interactive courses. And if you're looking for advice from other teachers who are facing the same challenges or reaching for the same goals, the [Discovery Educator Network \(DEN\)](#) is just one click away.



# Additional STEM Resources



## DNA Decoded

The Illumina Foundation and Discovery Education partnered to create DNA Decoded to inspire middle and high school teachers to unlock the power of genomics and impact the future of their students. DNA Decoded provides ready-to-go....



## Navigating Nuclear

This dynamic, standards-aligned program invites students to explore the many applications of nuclear science and its impact on energy, healthcare, food, and the environment through an interactive suite of FREE classroom resources for...



## STEMvest

USAA, Texas ASCD, and Discovery Education have teamed up to create STEMvest, a program to strengthen the San Antonio community by elevating the STEM and financial literacy skills of middle school and high school students while providing...



## Innovation Generation

Powered by Stanley Black & Decker's tools, employees, maker enthusiasts, and Discovery Education's unparalleled classroom reach and curricular expertise, Stanley...



## TGR EDU: Explore

TGR EDU: Explore is a robust program that supports students in college preparation and high-quality STEM career paths. Available at no cost, the standards-aligned resources of TGR EDU: Explore include newly digitized TGR Learning...



## Girls Get STEM: Unleash Your Inner Scientist

Girl Scouts of the USA is unleashing a new partnership with Discovery Education to spark girls' interest in STEM and help them unleash their G.I.R.L. (Go-getter, Innovator, Risk-taker, Leader)™ potential. Girls Get STEM: Unleash Your...



## Team Up with NBA and Discovery Education

We have teamed up with the NBA to develop exciting resources that allow students to use their passion for professional basketball with investigations into key math and STEM concepts.



## Science Fair Central

The Home Depot and Discovery Education have joined forces to help STEAM-power classrooms and homes across the country as students prepare for the careers of tomorrow. With 10 million students from grades K-12 participating in science...

[www.discoveryeducation.com/corporate-and-non-profits/corporate-education-partnerships/](http://www.discoveryeducation.com/corporate-and-non-profits/corporate-education-partnerships/)





## **Kaari Casey**

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Virtual Programs

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516-713-6552

# The New York Academy of Sciences

Founded in **1817**, the Academy is an independent, nonprofit organization with Members 100+ countries...

**7,000+**

Early Career Investigators  
(undergrads, grad students, &  
postdoctoral fellows)

**5,000+**

Young Members (ages 13-19) from  
over 100 countries



**20,000+**

ACTIVE ACADEMY MEMBERS  
ACROSS THE GLOBE



**30 NOBEL  
LAUREATES**

INVOLVED IN DIRECTING  
THE ACADEMY'S PROGRAMMING



**A DISTINGUISHED BOARD OF  
GOVERNORS COMPRISED OF LEADERS**

FROM BUSINESS, ACADEMIA,  
AND PHILANTHROPY

# The Global STEM Alliance (GSA)

A worldwide initiative to **build** and **diversify** the STEM pipeline.

- **Mentorship from real scientists and engineers**
- **Real world challenges and project based learning**
- **Skills training & professional development**

FIND OUT MORE AT  
[www.nyas.org/programs](http://www.nyas.org/programs)





# Virtual Programs

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## The Junior Academy

- Virtual program for exceptional 13–17 year-olds dedicated to STEM and passionate about addressing the world's greatest challenges
- Members collaborate with peers and receive guidance and support from STEM professionals on the Academy's platform, [Launchpad](#).
- Design novel solutions to real-world problems through innovation challenges.
- Win a chance to attend the GSA Summit in New York City!

## 1000 Girls, 1000 Futures

- Virtual STEM program for female students ages 13-17 from around the world
- Connect enthusiastic female mentors with STEM-focused high school girls via an online platform from September- May
- Offers access to real-life role models and innovative programming aimed at helping them to develop essential 21st-century skills

**Bryan Colahan**

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[bcolahan@tivertonschools.org](mailto:bcolahan@tivertonschools.org)



- **B.S. in Finance University of Rhode Island**
- **Masters in Physics Education from Northeastern University**
- **Team and product management experience in the Financial sector**
- **High School Teacher for last 11 years with experience teaching Physics, Engineering, and Math**
- **Passionate about creating experiences in which students can construct their own understanding**
- **Member AMTA, AAPT, NSTA, RISTA, and STEP (MIT Teacher Enrichment Program)**

# Why Engineering in the Classroom?

## Use Engineering for a Real-World context for Teaching Science:

- Moves science out of the textbook and into the real world
- Empowers young people with a vision for improving their world
- Provides a vehicle for active, problem and project-based learning
- Engineering “habits of mind” are 21<sup>st</sup> Century skills!
- Highly transdisciplinary

## Challenges and Adjustments:

- Monitoring the process throughout project
- Communicating effectively
- Use of Google classroom for feedback loop
- FlipGrid/Padlet for collaboration and communication



# Student Work



- Adaptive Design Challenge
  - Students worked with students with disabilities to design an adaptation
  - Empathy driven
  - Voice and Choice
  - Forces and Structural Design
- Chindogu Design Challenge
  - Designing for social distancing
  - They aren't useful but they aren't completely useless either
  - Creativity and communication



What approaches best support engagement and inclusion?



How can we meet the needs of diverse learners and group (classroom and online)?



How can we foster “power” skills by making PBL and active learning part of the classroom and distance learning experience? What are the challenges/successes in transitioning it to online? (Bryan’s “classroom” experience)

# Discussion Points

# Wrapping It All Up

- Additional audience questions
- Panel members
- Where you can find resources





# Thank You!



GlobalMindED

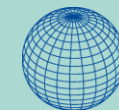
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