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# The Governor's **STEM** Competition

## May 17 and 18, 2018

Thaddeus Stevens College of Technology  
Lancaster, Pennsylvania



Cover: Logo design by Zachary Sechrist, Commercial Art Student at  
Dauphin County Technical Center  
Dauphin County Technical Center Staff: Lloyd Edwards, Kevin Cagno

## Pennsylvania State Regional Winners

Intermediate Unit	Regional Winners	School District	Team Advisor(s)
Intermediate Unit 1	Bethlehem-Center Senior High School	Bethlehem-Center School District	Dawn Logan
Allegheny IU 3	South Fayette High School	South Fayette School District	James Hausman, III
Northwest Tri-County IU 5	Fairview High School	Fairview School District	Andrew Burt
Riverview IU 6	DuBois Area Senior High School	DuBois Area School District	Jennifer Keith
Westmoreland IU 7	Jeannette Junior-Senior High School	Jeannette City School District	Douglas Lawson
Appalachia IU 8	Chestnut Ridge High School	Chestnut Ridge School District	William Tantorno Keith Fleegle
Central IU 10	State College Area High School	State College Area School District	Robert White
Tuscarora IU 11	Mifflin County High School	Mifflin County School District	Rebecca Conner
Lincoln IU 12	Red Lion Area Senior High School	Red Lion Area School District	Nathan Barrett
Lancaster-Lebanon IU 13	Solanco High School	Solanco School District	Caley P. Roark
Berks County IU 14	Conrad Weiser High School	Conrad Weiser Area School District	Adelle Schade
Capital Area IU 15	Lower Dauphin High School	Lower Dauphin School District	Elizabeth Ann Kirman
Central Susquehanna IU 16	Mid-West High School	Mid-West School District	Matthew Dietz AJ Steininger
BLaST IU 17	Williamsport Area High School	Williamsport Area School District	Andrew Paulhamus
Luzerne IU 18	Wilkes-Barre Area STEM Academy	Wilkes-Barre Area School District	Keith Eberts John Gosciewski
Northeastern Educational IU 19	Valley View High School	Valley View School District	Brandon Dodson

continued . . .

## Pennsylvania State Winners continued . . .

Intermediate Unit	Regional Winners	School District	Team Advisor(s)
Colonial IU 20	Monroe Career and Technical Institute		Ross Ruschman
Carbon Lehigh IU 21	Parkland High School	Parkland School District	Christopher Gahman
Bucks IU 22	Pennridge High School	Pennridge School District	Deborah Cotner- Davis Matthew Peitzman
Montgomery County IU 23	Upper Merion High School	Upper Merion Area School District	Pete Vreeland
Chester County IU 24	Bishop Shanahan High School		John P. Janasik
Delaware County IU 25	Garnet Valley High School	Garnet Valley School District	Elizabeth Bish
Schuylkill IU 29	Nativity BVM High School		Maureen Challenger Dennis Durant

## Project Titles and Descriptions

### IU1 School: Bethlehem Center High School

#### Title: MUSt - Monitors for Unsafe Turns



Our project for the 2018 Governor's STEM competition is called MUSt, otherwise known as Monitors for Unsafe Turning. The main objective of our project is to warn drivers when approaching a blind turn if another driver is traveling in the opposite direction. Pennsylvania, as well as many other states in the Northeast, is known for rural, windy roads that have not only been the cause of many accidents, but have resulted in many fatalities; our team chose this topic to prevent people from being injured or possibly dying due to rural road conditions.

### IU3 School: South Fayette

#### Title: KYHU (Keep Your Head Up)

KYHU is an integrated app and smart-phone cradle system that eliminates distracted driving by incentivizing safe, focused driving behavior.



**IU5 School: Fairview High School**

**Title: Pressure Sensing Rug**



The Pressure Sensing Rug (PSR) is capable of actuating a 110V household outlet simply by stepping on our specially designed rug. This outlet can power any household lamp or appliance, can act as a security or safety feature for a house, and can be built right at home!

**IU6 School: DuBois Area High School**

**Title: Ultrasonic Bird Barrier**



The DuBois Area High School STEM team decided to try and assist the Bellefonte State Fish Hatchery by designing a bird deterrent device that uses ultrasonic and audible sounds. The purpose of the device is to create a sense of discomfort for birds near the hatchery and deter them from approaching the hatchery's runways. The device contains 4 speakers, which cycle through a set of four frequencies every few minutes, and the device can also be operated by solar power.

**IU7 School: Jeannette Junior High School**

**Title: Patcholeum!**



Patcholeum is a temporary pothole patching product used for the immediate repair of potentially damaging potholes. Patcholeum uses an inexpensive organic product to make a non-Newtonian fluid, which becomes highly viscous when pressure is applied. Patcholeum is contained in a flexible plastic container which is easily placed into a pothole until it can be properly patched with asphalt. The Patcholeum is easily removed and can be reused on other potholes.

**IU8 School: Chestnut Ridge High School**

**Title: RADS Remote Access Doorway System**



Hands free secure home entry system making life easier for a wide range of individuals, from disabled individuals, to the elderly, to school children and families in general. RADS operates in both automatic and manual mode making daily life easier and safer using radio frequency activation, digital logic control and a solenoid.

**IU10 School: State College Area High School**

**Title: Piezoom**



Using piezoelectric elements to harvest energy and improve efficiency of everyday devices.

**IU11 School: Mifflin County High School**



**Title: Voice Activated Cabinetry**

The Mifflin County High School STEM team constructed a voice-activated cabinet designed to reduce hazards related to opening cabinets. Using an Amazon Echo or Echo Dot in conjunction with the Raspberry Pi circuit board, the user can issue voice commands to open or close the cabinet without touching the handle. Not only does this reduce the strain on the hands of those with arthritis, but also prevents the transmission of disease from contact with the handle.

**IU12 School: Red Lion Area Senior High School**



**Title: Improving the Efficiency of Solar Panels With Nanoparticles**

In order to improve the efficiency of solar panels, we constructed a small transparent chamber to house a nanoparticle fluid. This nano-fluid absorbs wavelengths of light that would otherwise not be utilized by a photo-voltaic solar panel. As a result, our system collects thermal and electrical energy from the sun.

**IU13 School: Solanco High School**



**Title: Exo-Vertebral Nanotechnology Protective System Utilizing the Effects of non-Newtonian Fluids**

The Exo-Vertebral Nanotechnology Protective System (ENPS) is a suit designed to prevent the serious damages resulting from whiplash. This suit will primarily reduce whiplash injuries in motor vehicle racing, bicycle racing, contact sports, and other activities utilizing non-Newtonian fluids to maintain comfortability and effectiveness.

**IU14 School: Conrad Weiser High School**



**Title: App Design Capable of Assessing 3D Wound Proportions Transferring to a 3D Printer for Personalized Manufacturing of a Bioactive Glass Embedded Bandage**

Development of a wound measurement app capable of recording and documenting patients' wounds. The Image captured on the app is transferred to a 3D printer for generating a personalized bioactive glass embedded bandage. This personalized bandage will utilize its bioactive glass composition due to its ability to prevent infection and promote healthy cell proliferation.

**IU15 School: Lower Dauphin High School**  
**Title: Plastioca: The Tapioca Bioplastic of the Future**



Plastioca is a biodegradable, renewable, and green alternative to traditional polymer-based plastics. Developed to address the growing plastic waste problem in Pennsylvania, Plastioca dissolves when immersed in water, but can tolerate being wet. Plastioca has far-reaching possibilities beyond our original soda ring prototype for improving the lives of citizens of Pennsylvania by reducing the amount of plastic in our waste stream.

**IU16 School: Midd-West High School**  
**Title: Fracking to Freshwater (aka F2F)**



The purpose of F2F is to meet the most basic of human needs: clean drinking water. Using the process of distillation powered by Fresnel lens and available natural gas, as well as the extraction process of phytoremediation, contaminated water from the natural gas industry is transformed into safe, potable drinking water. Although focused on a current need in Pennsylvania, this proposed system can address similar situations across the globe.

**IU17 School: Williamsport Area High School**  
**Title: SafeCar**



SafeCar is a multi-sensor system designed to save the lives of children, pets, and other vehicle occupants. This system is designed to monitor a vehicle's internal environment and alert individuals via text message when unsafe conditions occur in an occupied, unattended vehicle.

**IU18 School: Wilkes-Barre Area STEM Academy**  
**Title: ShredIt**



Our project has multiple functions:

- It breaks down paper and plastic to use for other projects.
- It gives vouchers for each plastic bottle or 1 lb of paper you put in it. Students can use voucher to buy a snack or payoff a lunch debt.
- It cleans up the environment!

**IU19 School: Valley View High School**



**Title: Grill Fire Extinguisher**

In the event of a grill fire, the grill fire extinguisher will allow a user to suppress or extinguish the fire from a safe distance. The extinguisher will dispense a smothering chemical while the delivery portion applies that chemical directly to the flame. The flame will be extinguished completely or suppressed to a level that can safely be extinguished by other means.

**IU20 School: Monroe Career and Technical Institute**



**Title: The Helping Box**

The helping box is a newspaper honor box modified to provide resources to homeless populations. The box is intended to serve as a distribution point when traditional services and outreach centers are closed and in conjunction with The Helping Box website to help people survive and get back on their feet.

**IU21 School: Parkland High School**



**Title: The Plasto-bot**

Our group set out to develop a solution to plastic waste. In order to recycle plastic, plastic must be broken down into a simpler form. Most people own paper shredders at home, but unlike paper, there is no residential plastic shredder currently available. Our project addresses this problem as it provides a way for individuals to break down household plastic objects used on a daily basis.

**IU22 School: Pennridge High School**



**Title: Rams' Original Project**

The Rams' Originals Project consists of designing, creating, and building an acoustic guitar and an electric guitar from Pennsylvania woods to donate to local (within the Pennridge School District) veterans with PTSD who would benefit from music therapy. The team is working closely with a local lumberyard for suggestions and guidance on the best woods to use.

**IU 23 School: Upper Merion High School**



**Title: The Tree Hugger**

The Upper Merion STEM team is creating The Tree Hugger, which is a product designed to be mounted and attached to a tree and measure physical quantities such as water acidity, soil humidity, and



sap viscosity to gain insight into a tree's overall health. Data mining strategies will be implemented to compare certain tree health measures within the subset of trees being monitored. Thus, large-scale implementation of The Tree Hugger would allow for the observation of general trends in tree health within a vast geographic area which could indicate potential damage in regions from environmental anomalies such as hydraulic fracturing.

#### **IU24 School: Bishop Shanahan High School**

##### **Title: Seconds Could Save A Life: "Doora" Door Opener - Operation Rescue Assistance**



When firefighters need to enter a burning building, they have two primary methods at their disposal - "mule kicking" or axe swinging. Kicking is generally slower and more dangerous. Both methods run the risk of losing the ability to re-close the door. As firefighters attempt control a blaze, it may be essential to close the door to prevent drafting. Our system (DOORA) combats both issues by allowing doors to be opened quickly, safely and without damage.

#### **IU25 School: Garnet Valley High School**

##### **Title: Just Can't Weight**



We created our prototype entitled "Just Can't Weight" in order to provide a solution to a worldwide weightlifting problem, that is especially prevalent in our sports-centered community. When bench pressing, one suffers the risk of suffocation upon dropping weight when faced with exhaustion. Through the use of a winch, a carefully designed frame, and systematic wiring, we were able to design a solution to this problem. Our invention works through the pressing of buttons on a weightlifting bar that activates a winch which, subsequently, lifts the bar and any weight that poses a threat to the athlete.

#### **IU29 School: Nativity BVM High School**

##### **Title: "High-tech" Peregrine Falcon Nesting Box**



The Peregrine Falcon population was greatly depleted by the use of DDT in the 1970's – this box provides a safe nesting spot, as well as an opportunity for Pennsylvanians to get a "bird's eye view" of this beautiful creature. The nesting box features a solar-powered actuator which can extend the nesting box to simulate a "cliff" environment (preferred by falcons). The nesting box also features a web cam which enables viewers to see what's happening in the box in real time!

Thank you to the following individuals for their time and commitment to The Governor's STEM Competition 2018:

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**Thaddeus Stevens College of Technology Planning Team:**

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# The Governor's STEM Competition 2018

Tom Wolf, Governor

Pedro A. Rivera, Secretary, Department of Education

David Volkman, Executive Deputy Secretary

Matthew S. Stem, Deputy Secretary, Office of Elementary and Secondary Education



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