THE PITSCO NETWORK

February-March 2018

Expeditions are 'for our generation'

California students – and teachers – pleased with move from Modules – page 12

Career Expeditions: A cluster of knowledge
page 3

National Guard takes lead with USAR
page 8

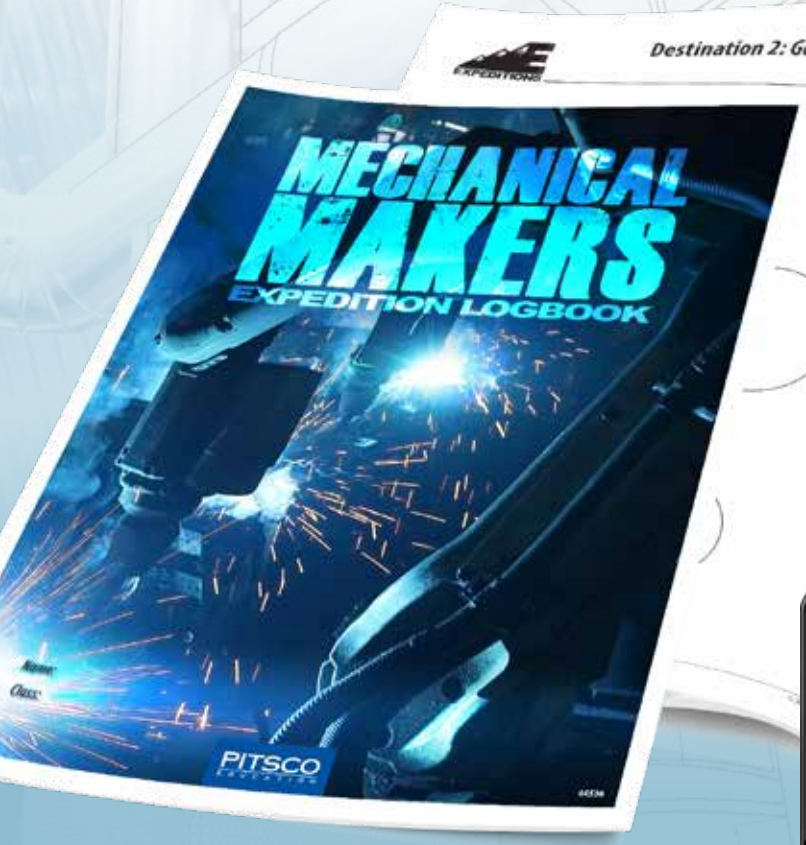
***SySTEM Alert!*: Coils, currents, torque**
pullout

PITSCO EDUCATION

Introducing Career Expeditions

Guided by ACT® WorkKeys® and the career practices outlined in the Common Career Technical Core (CCTC) and the Partnership for 21st Century Learning (P21®), Career Expeditions are designed around national career clusters and provide a greater career focus to your STEM Expeditions® experience.

The flexibility of **Career Expeditions** allows for an **easy-to-implement**, **comprehensive solution** for your school or district. Career Expeditions can **stand alone** as a career-focused course, be **implemented with STEM Expeditions** for a career cluster-focused course, **or be implemented as a supplement** to an existing career cluster course.



Ready to begin developing future-ready learners? Customize your STEM program today.

Visit us online at Pitsco.com or call 800-828-5787.

CONTENTS

Features

Departments/Columns

On the cover – *Photo by Crista Cunningham*

A cluster of knowledge 3

National Guard adopts USAR 8

Robotics for educators 10

12 CA district goes all in

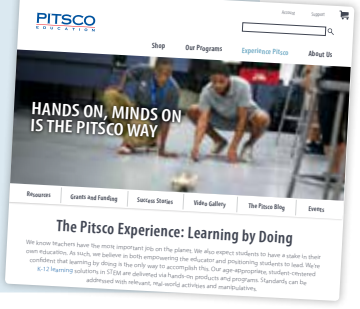
DonorsChoose appeal answered 21

online

Experience Pitsco

Find resources, videos, success stories, blog posts, events listing, and more.

Pitsco.com/Experience-Pitsco



THE PITSCO NETWORK

Volume 19, No. 4 | February-March 2018

Pitsco's vision: *Leading education that positively affects learners*

The Pitsco Network is published by Pitsco, Inc., five times each year (bimonthly, except June-July). Information and articles are geared to Pitsco Education facilitators and administrators.

Article submissions and story ideas: Story ideas, suggestions, and full-text submissions are welcome. Please send them to Editor Tom Farmer at tfarmer@pitsco.com or P.O. Box 1708, Pittsburg, KS 66762.

Change of address: To report a change of address or name of recipient, contact Editor Tom Farmer at tfarmer@pitsco.com or P.O. Box 1708, Pittsburg, KS 66762.

2017 APEX® AWARDS FOR PUBLICATION EXCELLENCE

PITSCO EDUCATION

From the Executive Editor

Enjoy the rewards of the here and now

We want our young people to grow into capable adults. The education we work to provide has value if it prepares them for the future. First we sow and then we reap. But that doesn't mean our efforts are fruitless before harvest.

It is good as well to enjoy the rewards of the here and now. I've never met a teacher who isn't thrilled to witness a student experiencing a "light bulb moment." Or a teacher who doesn't relish the cackle of excitement felt during a great activity.

Another fruit of our toil is the coming together that education engenders. At times the divisions in our society cause frustrations, but it feels good when a noble purpose brings people of different backgrounds to the table. At its best, our task gathers students, parents, community and business leaders, and others. At Pitsco we love to see these relationships blossom, and when we feel we've played a part, we feel proud.

In this issue of *The Pitsco Network*:

- Placentia-Yorba Linda middle schoolers exclaim "Expeditions are for 'our generation.'"
- The Massachusetts Army National Guard is serious about lending support to schools in search of quality robotics experiences.
- Sometimes getting parents involved can be a challenge. Dave the Science Guy has some ideas for turning parents into partners.
- Community donors chipped in through a popular crowdfunding site to help Denton Magnet School of Technology students get the drag racing system of their dream.
- Pitsco is offering webinars for teachers who want to get the most out their purchases.
- Looking to make a curriculum purchase but undecided on titles? Curriculum writers offer their own two cents on their favorite Expeditions and STREAM Missions.
- Teachers involved in the Emporia State Robotics Competition help education majors see how robots connect to STEM and critical thinking in the classroom.

Matt Frankenbery

Matt Frankenbery
Vice President, Education & Executive Editor

By David Meador, Curriculum Specialist • dmeador@pitsco.com

Career Expeditions: A cluster of knowledge

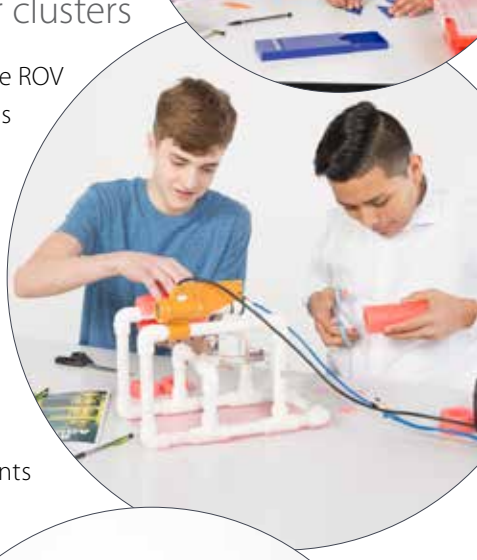
The most engaging way to explore and experience national career clusters

Well, it's happened again. You've worked hard to develop a middle school program to prep students for their CTE experience, but the unavoidable happens and an eager CTE student moves into your school from another district. It can be a struggle sometimes to integrate students like this into a program that is well designed to build students' skills over time.

If only you could offer something to easily provide that foundation and advance those CTE skills, maybe an entire course or maybe just something the students could work on that would focus their attention on skills and information in the cluster area of your course. Well, Pitsco now has exactly that in its new Career Expeditions.

The Career Expeditions focus on the national career clusters. Students develop a plan of study for a career of their interest using information from hands-on activities they complete over the course of an Expedition. Following are brief descriptions that give examples of activities the students complete during Career Expeditions.

- In *Now Hiring*, which is the introductory Expedition, students explore the 16 career clusters and related occupations. They complete skills evaluations and interest inventories to identify careers that might be suited to their interests and abilities.
- In *Artistic Communication*, students explore career pathways in the Arts, A/V Technology, and Communications career cluster by completing activities related to video storytelling such as correct camera work, editing processes, and storyboarding.
- In *Mechanical Makers*, students explore career pathways in the Manufacturing career cluster by completing tasks related to robotics and the ways those robots are used in modern manufacturing.
- In *Remote Aquabotics*, students work with an underwater remotely operated vehicle (ROV). They demonstrate the correct operation of an ROV and inspect and assess the ROV operation. They adjust the ROV to complete presented tasks as well as explore careers in the STEM career cluster.



- In *Special Delivery*, students explore career pathways in the Transportation, Distribution, and Logistics career cluster by completing tasks related to shipping.
- In *Top Dog Architecture*, students explore career pathways in the Architecture and Construction career cluster by completing tasks related to truss construction and testing.

- In *Under Pressure*, students work with a basic hydraulic system. They demonstrate the correct operation of a hydraulic system and also inspect and assess the hydraulic system operation. They design and construct a fluid reservoir for

the hydraulic system as well as explore careers in the Agriculture, Food, and Natural Resources career cluster.

- In *Vital Signs*, students learn to properly take and record vital signs using digital medical equipment, specifically temperature, pulse, oxygen levels, respiration rate, and blood pressure. They learn to fill out various medical forms related to patient care as well as explore careers in the Health Science career cluster.

Because of the way they are structured, these Expeditions naturally can be used to introduce cluster ideas. This can be done in three different course options:

1. **Full lab focused on career exploration –** This uses all eight titles in the lab as an extensive introduction to the national career clusters.
2. **Full lab focused on a specific career cluster –** This solution includes an individual Career Expedition title; *Now Hiring*, the introduction to career clusters; and several Pitsco STEM Expeditions® connected to the specific career cluster.
3. **Supplemental to introduce a career cluster –** This solution includes an individual Career Expedition title; *Now Hiring*, the introduction to career clusters; and district resources.

Any of these three scenarios would likely solve some of the problems encountered when introducing high school students who have little or no experience in CTE and need extra support. In the end, we want them to succeed in Pitsco programs and flourish.

Our curriculum writers' favorite **Expeditions**

The term *insider information* has negative connotations, especially in the context of the stock market. But for the purposes of this article, consider insider information to be free sage advice for anyone considering which Pitsco STEM Expeditions® to purchase when switching over from Modules or adding to a lab. The free advice comes courtesy of four Pitsco Education curriculum specialists who wrote many of the STEM Expeditions.

Terry Carter

The ***Making Waves*** Expedition was one of my favorites to write because I am a fan of almost all genres of music. The way different instrument sounds can be blended to create a pleasurable listening experience has always been fascinating to me. When visiting classrooms and receiving feedback from teachers and students, I love to see how creative the students can be when designing their instruments. Although the noise level can be high at times, the energy level in the classroom has always exceeded my expectations.

Another one of my favorite Expeditions is ***Transportation Stations*** because it can be mind-boggling when I think about the systems that work together to provide the things we purchase. The transportation and logistics sector continues to change as newer technologies are introduced to the market, but the need for coordination among all the moving parts does not change. From building the Load Bot to applying knowledge gained from activities, students are highly engaged and excited during this Expedition.

Ray Grissom

The ***Dragster Design*** Expedition is one of my favorites. I have always been interested in building and making things from wood. I feel it is important that students get the opportunity to do the same thing. Adding to the hands-on experience with wood is the science of what makes the car move and how to make the car go faster. This Expedition is a great blend of old-school building and a modern design process.

Taking Control is an Expedition that I enjoyed being involved with. Looking at how many microcontrollers are used in our everyday activities points to a need for students to be able to think logically. Taking Control enables students to begin coding with simple tasks and then progress into more complex thinking. Coding skills and sensors enable students to use their creative thinking to create an endless variety of controls for systems.

David Meador

Mining Mechanics is one of my favorite Expeditions. The students learn a lot in a hands-on manner. They learn where and why mineral deposits occur in different locations across the Earth. Along with that, they learn how hydraulic systems in an excavator work together to accomplish a goal. The Expedition teaches systems thinking, project planning, decision-making, and even engineering trade-offs. All of this is wrapped around an activity that I find fun and challenging.

Thermal Physics is also a favorite Expedition of mine. The concepts and activities presented in this Expedition have useful applications across many different careers from bakers to civil engineers. Students need to see a connection between the concepts they are learning and their lives, and this Expedition helps them do exactly that.

Aaron Locke

Carousels, Tilt-A-Whirls, roller coasters . . . How can an Expedition centered on a theme park go wrong? I wrote ***Theme Park Physics*** to combine two of my favorite things – physics and phun! Throughout my student career, going all the way back to Mr. Spielman's seventh-grade science class, energy concepts were usually taught with roller coasters. So, why not have kids explore the concepts of potential and kinetic energy as they design and build their own roller coaster? Wrap those activities around a coaster accident mystery with twists, turns, ups, and downs, and this ride keeps kids thrilled about learning.

You know how people say you always remember your first love? In a similar manner, I'll always remember ***Engineering Rockets***. It was the prototype STEM Expedition, and it laid the groundwork for many more Expeditions to follow. As students explore how forces cause a rocket to move and the dynamics of a rocket's flight, they design and build their own water bottle rocket. My favorite part of this Expedition is the Engineering Rocket Challenge, in which students compete to build a rocket that will soar the highest, carry a payload, or have the longest flight time.

By Tom Farmer, Editor • tfarmer@pitsco.com

Pitsco Missions lab earns **2017 Golden Bell Award**

Caring is the key; lab manager in Nuevo, CA, says 'it's for the kids'

NUEVO, CA – Award-winning educators care about their students – and every other aspect of their job – because that's what it takes to make a positive difference in education. Case in point: the Pitsco Education Missions lab at Valley View Elementary School in Nuevo, CA, which has been named a California School Boards Association (CSBA) 2017 Golden Bell recipient as a "Solid Gold STEM Lab."

The caring classroom teachers at Valley View Elementary regularly bring their students into the engaging hands-on Pitsco science lab where career exploration comes to life. And the activities even include life in the form of many creatures found throughout the *Animals*, *Ecology*, *Bug World*, and *Undersea Adventure* Missions.

Keeping the lab – and creatures – thriving requires passion and attention to detail. That's where Lab Manager Elisabeth Fair comes into play. Though she is quick to credit the classroom teachers and her principal for the lab's success, she is the constant, the one who oversees the materials and the creatures, thereby giving students a riveting, real-life experience they won't find anywhere else in their school day.

"My principal is wonderful," Fair said. "She's like, 'Whatever works.' I'm really blessed in that she's a super big supporter of the lab."

For example, in order to better prepare fifth graders for their state science test, Fair suggested rotating them through a specific series of Missions that line up best with the standards tested, and her principal and the classroom teachers were fully supportive.

That high level of trust in a Missions lab manager is essential to achieve success that culminates in a California Golden Bell honor. The CBSA sponsors the Golden Bell Awards program, which "promotes excellence in education and school board governance by recognizing outstanding programs and governance practices of school boards in school districts and county offices of education throughout California."

Even though the Missions lab at Valley View Elementary is geared toward students in Grades 3-6, children in K-2 also are invited to watch and learn about mealworms, fish, tadpoles, lizards, and pillbugs/sowbugs.

"I just love everyone coming in, so I've had kindergarten come in, second grade even, and we talk about the animals," said Fair, who is in her third year facilitating the Pitsco Missions lab. "Last year, I had the second graders come in so the kids could check it out before the end of the school year because they were coming in the following year, so I wanted them to get a little taste of what they could expect from a STEM lab."

Everything that Fair and the classroom teachers do at Valley View is for one reason. "It's for the kids – the excitement they get watching these animals grow," Fair said. "For those who struggle with the reading and the writing, they have something they can come in and connect with, and even if they don't understand Earth and space, they can go home and talk about the tadpoles and how they're developing."

Under the guidance of Lab Manager Elisabeth Fair (right), the Pitsco Missions lab helped Valley View Elementary School earn the California School Boards Association Golden Bell award for "Solid Gold STEM Lab." Fair particularly enjoys sharing information about the lab's critters with students at all grade levels.

Curriculum writers' favorite **STREAM Missions**

Asking STREAM Missions curriculum specialists which title is their favorite is almost unfair. After all, they wrote the Missions, so each one is special in one way or another. With all of that in mind, we asked the question anyway, and here's what the Pitsco curriculum specialists had to say about their favorite STREAM Missions at each grade level, three through five.

Niccole Vogel

Grade 5, *Under the Microscope* – I love this Mission because students get hands-on experience with a real microscope! Students not only get to learn the history, care, and parts of the microscope, but they also get to use it to look at plant and animal cell slides. Students also apply life science concepts to learn what all living things have in common and how cells are essential to survival. Students create a mitosis comic strip and build animal and plant cell models. This Mission lets students to act like a biologist and get under the microscope!

Grade 4, *Earth Rocks* – My favorite activity in the *Earth Rocks* Mission is the oil spill cleanup. Students learn about fossil fuels and then create an oil spill setup and use the engineering design process to create an effective method for cleaning it up! Students also create models of each type of rock found in the rock cycle, a sedimentary rock model made of outdoor materials, and a model of Earth's layers. After students create a model of Earth's layers, then they get to take core samples! Students apply Earth science concepts by conducting tests on actual igneous, metamorphic, and sedimentary rock sets. This Mission enables students to act like a geologist and rock 'n' roll!

Grade 3, *Magnetism* – Who doesn't love playing with magnets?! In the *Magnetism* Mission, students design a magnetic game and build a crane that uses magnets to pick up paper clips. My favorite activity is when students create an abstract-style painting by using magnets and different types of metal! Students apply physical science concepts by learning about magnetic poles, atoms and iron, and magnetic fields, and they experiment with magnets. This Mission lets students to get stuck on magnets

Grade 5, *Crime Lab* – I love the *Crime Lab* Mission because it involves a crime to solve. Students are presented with different suspects – teachers – who could have stolen cookies from the classroom during lunch. Students are presented with different forensic evidence and perform experiments to determine who the culprit is. Students apply physical science and life science concepts to unravel the mystery. Who did it? Spark, Note, South, White, or Chase?

Tammy Pankey

Grade 4, *Space Exploration* – Who doesn't love learning about space travels? Students get to design a Mars rover, make colorful rockets and launch them, and then ensure their rockets can land safely using parachutes they construct. Students determine the speed traveled by each different mode of transportation and see the importance a parachute has on the rocket speed. They also explore different lunar landing sites and plot them on a Moon map. This Mission is out of this world!

Grade 3, *Motion* – My favorite activity in this Mission uses motion-sequence figures. Students create poses with their figure that simulate different movements. They use pointillism to create a series of silhouetted images that show a motion sequence. They also play a game where they give directions in different forms to mark places on a map. They get to swing pendulums to learn about mass and design a tiny surfboard to investigate friction. P

Underserved schools seeking gateways to STEM experiences through robotics have a wonderful ally in the Massachusetts Army National Guard. The Guard is using its resources to bring the Urban Search & Rescue competition to a wider population.

By Cody White, Communications Assistant • cwhite@pitsco.com

Massachusetts Army National Guard takes lead with USAR

TETRIX® materials strengthen statewide effort with Urban Search & Rescue competition

BEDFORD, MA – Providing students with hands-on robotics experience opens doors to their future. Strengthening STEM skills benefits all of our communities by giving today's youth the knowledge they will need to tackle tomorrow's issues. Unfortunately, not all schools have the resources to provide these experiences. Now, schools in Massachusetts have a new ally in delivering these opportunities: the Massachusetts Army National Guard.

The Guard had long noted a hunger for STEM resources. Over the years, the Guard has partnered with several education organizations in its effort to attract talented, technically minded young people. It was through a partnership with SkillsUSA® that the Massachusetts Army National Guard became aware of a perfect opportunity to help schools meet their needs: Robotics: Urban Search & Rescue.

In this robotics competition created and sponsored by Pitsco Education, teams of students design and operate remote-controlled robots through simulated disaster areas, seeking hidden explosives and disposing of them.

One point of interest was the overlap with the Guard's expertise. It maintains multiple explosive ordnance disposal (EOD) teams and works with bomb squads in state law-enforcement agencies.

"Urban Search & Rescue plays right into our mission," said Sergeant First Class Geoffrey Allen of the Guard's recruiting and retention battalion. "You can easily bridge the gap between the robotics the students use and what we would use in a real-world scenario for our own search-and-rescue missions."

As of 2018, the Massachusetts Army National Guard is taking the lead with Urban Search & Rescue in the state. The Guard is providing dedicated trailers fitted with competition courses for district and state leadership meets for SkillsUSA and is running the competitions.

But that isn't all. To increase STEM access, the organization is also bringing its trailers and TETRIX® robotics sets to schools that lack resources to become involved in the competition.

THE FULL EXPERIENCE

The program has had only a short run, but the interest level from schools has been, in a word, fantastic. The traveling trailers have been booked week after week.

Members of the Guard are as enthusiastic about the program as students who benefit. For them, it is a chance to give back to the communities where they live, work, and raise their families.

Electronics Instructor Lisa Roy expressed the enthusiasm that many teachers have felt, "The Pitsco Urban Search and Rescue robot event, in conjunction with the Massachusetts Army National Guard, was an amazing day for the students of Greater Lowell Technical High School. Students learned team-building, critical-thinking, and problem-solving. The Pitsco robots are educational, fun, and challenging for the students. They also provided the students with the opportunity to see the skills they have learned in school used in a real-world environment for search and rescue. Working with the National Guard staff made the event even better for the students and staff."

Rather than a one-size-fits-all approach, the experience the Guard provides is tailored to the wishes of the school. Are teachers looking to introduce complex concepts such as programming and construction, or are they looking to give students a taste for competition? Either way, the Guard is happy to lend a hand.

The team can roll in with prebuilt robots and an obstacle course and host a quick competition. Students have a blast navigating the robots remotely from a command center with the aid of a spotter at the course.

Or, if a teacher wishes, the Guard can provide a more in-depth experience – presenting a whole class on robotics and search and rescue.

The mobile trailers and the expertise the Guard offers are key to this versatility. And, of course, there's the power of the TETRIX robotics platform.

"There are so many different facets to the [TETRIX] robot," said Allen. "Students learn about electronics – putting the motherboard and the servos in the right spot. They learn about mechanics and mechanical engineering – put the wrong piece in the wrong way and the robot isn't going to work. They can even take it a step further, adding modules to the robots so students can program their robots to do simple tasks."

A BENEFIT TO ALL

Through the program, students are exposed to the National Guard and its mission to serve community and country. Students interested in robotics or disaster relief can form a vision of their career path based on what they experience. But for the Guard members leading the Urban Search & Rescue program, the reward is also personal.

Battalion Commander Lieutenant Eric J. Dinoto shared his own story: "I was born and raised here in Massachusetts and have two great kids attending our local high school, so to say that I am invested in enhancing our children's education is an understatement. . . . The Massachusetts Army National Guard is the original community-based organization, and as citizen-soldiers we pride ourselves on giving back to our local communities."

Guard units across the country have noticed the success of the Massachusetts program and the extraordinary STEM opportunity it offers for the state.

"Some of these schools just don't have the ability to purchase things of this scale on their own," said Sergeant Allen. "To give them access to that on our site – it's a win-win for them. We have a great time doing it, and it has brought us into a lot of schools that really want STEM access."

By Aaron Locke, Curriculum Specialist • alocke@pitsco.com | Photos By Tammy Pankey, Curriculum Specialist • tpankey@pitsco.com

Robotics for educators

EMPORIA, KS – **Question:** Why did the robot go back to school?

Answer: Its skills were a bit rusty and it wanted to earn more cache. Ba-dum . . . ching! Or, it was headed to the Emporia State Robotics Invitational.

Over the course of two days in November 2017, 40 robotics teams from across Kansas converged on the campus of Emporia State University to compete in the Emporia State Robotics Invitational. The competition, which started in 2009 with just four teams, is unique in many ways.

It is coordinated by ESU's Teachers College. The goal is to show education majors and future teachers how robotics can be used to teach kids about STEM concepts as well as develop critical-thinking, problem-solving, collaboration, and communication skills.

Teams competed in multiple rounds of R/C-style competition and were ranked by their average score for the rounds they competed in. A round was eight minutes long and was divided into four driving segments. Each team switched drivers every two minutes. During a round, six teams competed against each other to move game pieces into scoring areas, some worth more points than others. The playing field was a large, irregularly shaped area about 30 meters across and consisted of elevated platforms, obstacles, and blind areas that required team spotters to help the robots navigate.

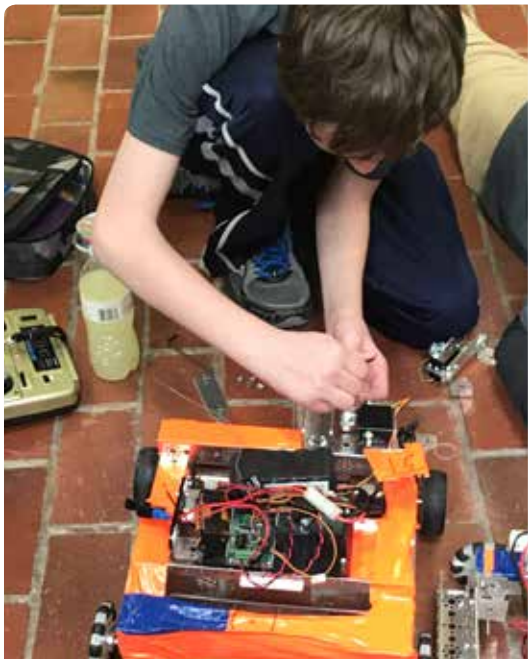
One of the things that made this competition unique is that there were no age categories for the competition. Each round had middle school and high school students going up against education majors in college in their preservice semester. Some of the preservice teachers even brought their elementary classes in for a field trip to watch the competition and cheer for their favorite teams. Now, you might think that the college students would have a great advantage over the high school and middle school teams. But that wasn't the case at all. In fact, it was a team of three ninth graders that had a commanding lead in the competition.

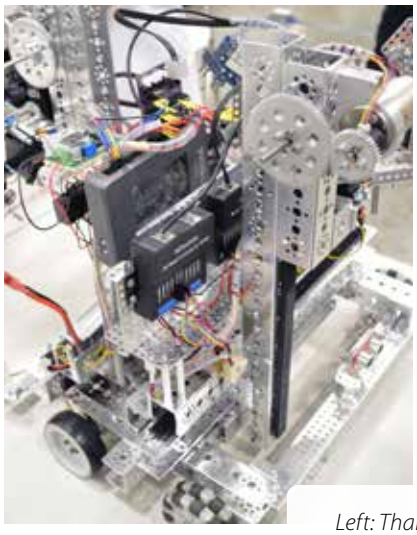
Although not a requirement to use it, every team at the competition used Pitsco's TETRIX robotics system as the base for their robots. Several teams had additional components such as cameras, monitors, and custom 3-D-printed pieces. The ingenuity and creativity of the different teams was astounding. Some teams had fancy robots with complicated grabbers and collection systems. Some teams had powerful gear trains and tank treads for climbing ramps and navigating obstacles. However, it was the teams that simplified and focused on completing one aspect of the competition well that seemed to score the most points.

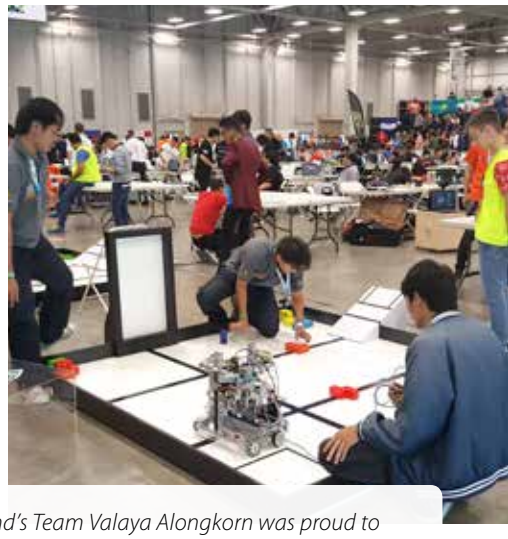
The best part of our time there, though, was interacting with students: letting them explain their robots, hearing about trade-offs and decisions they made, watching them work together to overcome challenges, and seeing their excitement for learning.

During this spring, the competition will conclude at ESU with the top teams from the fall competing again to determine a final winner. Stay tuned to Pitsco's social media and *Network* magazine to find out how the competition concludes.

The goal of the Emporia State University Robotics Invitational is to show future teachers how robotics can be used to teach STEM and instill 21st-century skills.







Left: Thailand's Team Valaya Alongkorn was proud to take first place in the World Robot Olympiad Advanced Robotics Challenge. Middle: The TETRIX® robot built by Team Valaya Alongkorn was a result of experience and hard work. Right: The team's bot was perfect for the new Tetrastack game, dominating more than 20 other robots.

By Patty Cooke, Communications Assistant • pcooke@pitsco.com

Flexible yet durable

Practice, determination, and a flexible-yet-durable TETRIX® building system lead to 2017 WRO™ ARC win for Thailand team

SAN JOSÉ, COSTA RICA – Hard work, persistence, and a willingness to learn and to grow helped propel Thailand's Valaya Alongkorn team to a first-place win in the Advanced Robotics Challenge (ARC) at the 2017 World Robot Olympiad (WRO™).

WRO, an international robotics challenge, gives grade school- to university-level students the opportunity to compete in Olympics-style robotics events. The competition typically draws more than 400 teams from 50 different countries. The Advanced Robotics Challenge is an open competition for students ages 17-25.

Terdsak Intachot, assistant professor of mechatronics and robotics engineering in the Faculty of Industrial Technology at Valaya Alongkorn Rajabhat University under the Royal Patronage in Pathum Thani, Thailand, began having his robotics students compete at WRO in 2012, mainly to gain experience.

"I wanted to allow my students to show their creativity and learn to apply their knowledge with robotics," he explained. "That is the beginning."

YEARS OF HARD WORK WORTH THE EFFORT

In 2014, Intachot became the WRO coach, and in 2015 he formed the current team of programmer Awirut Thaensungnoen and mechanics designers Natthapong Chaetjaew and Apinan Srisopa. Together they learned and grew after each WRO experience. "Combining their experience from the past three years with their aspirations and optimism, we believed we would be successful this year," said Intachot. "This year we focused on robot stability and we practiced more."

That practice – and the willingness to try new things – came in handy in Tetrastack, the new 2017 ARC game.

FROM BOWLING TO *TETRIS*®

In recent years, the ARC game was a bowling challenge where teams had to program a robot to pick up a ball and throw it down a lane to knock down pins. The 2017 game, however, was significantly different. In Tetrastack, autonomous robots had to be programmed to pick up pieces of different shapes and sizes and stack them into a framed-in wall.

To accomplish this feat, the Valaya Alongkorn team wanted a building system that matched their team dynamic: flexible, yet durable. They chose Pitsco's TETRIX® system, and it obviously paid off.

"We appreciated the strength of TETRIX and the material's enduring quality," said Intachot. "Whether we were modifying the robot or practicing repeatedly, the structure and pieces were unchanged. Moreover, the number of pieces allowed us to design and construct a robot that could perform according to the given challenge."

With persistence, flexibility, and a TETRIX system that met all their standards, the Valaya Alongkorn team beat out 21 other teams to win the WRO ARC category for Thailand.

By Tom Farmer, Editor • tfarmer@pitsco.com | **Photos By Crista Cunningham,** Multimedia Graphic Artist • ccunningham@pitsco.com

CA district goes all in with Expeditions

Upgrade from Modules, addition of elementary Missions among the STEM improvements

PLACENTIA, CA – The numbers don't lie. Upgrades and additions to the STEM curriculum from elementary through high school in Placentia-Yorba Linda Unified School District (PYLUSD) have yielded some promising results.

The indisputably positive numbers – made possible in part by a $6 million California Pathways Trust Grant – are the enrollment figures in the district's new middle-level Pitsco STEM Expeditions® labs, which replaced the Pitsco Modules labs PYL students had used for more than a decade.

"There was a huge demand from incoming sixth graders, which is probably why I have two sections of sixth graders," said Mary Chapluk, Expeditions lab facilitator and science teacher at Travis Ranch Middle School. "They all wanted to take STEM, which is why my classes are the biggest they've ever been. They're maxed out."

PYL Director of Innovation and Technology Cary Johnson said one of the grant's primary aims is to increase participation in career technical education, so the southern California district's game plan is working. Even better, enrollment among females in the Pitsco labs is increasing. At Tuffree Middle School, the number of females in STEM has doubled this year.

Mary Chapluk
Lab Facilitator

"We have some very very very talented young ladies, and sometimes we misdirect them by sending them to other classes rather than directing them to engineering," said Tuffree Pitsco Lab Facilitator Robert McLeish. "Some of my best students this year in *Rolling Robots* with all the gears and mechanics are my young ladies, who are getting labeled gearheads because they're doing so well in this program."

The PYL STEM continuum starts at the elementary level where Pitsco Missions labs are stimulating deeper thought and understanding of science and engineering. The Pitsco Expeditions labs serve as an introduction for middle schoolers



Hundreds of hands-on experiences fill every day in the Pitsco Education STEM Expeditions® and Missions labs in 11 schools in the Placentia-Yorba Linda (CA) Unified School District – from Optical Solutions *at Yorba Linda Middle School (left) to* Building Bridges *at Tuffree Middle School (center) to* Rocketry *at Glenview Elementary School (right).*

who get to experience and explore common career fields prior to deciding which pathway they want to pursue as freshmen. CareerLink Academies have been established at all five high schools, creating pathways in engineering, manufacturing, law, digital media arts, and culinary and hospitality, among others.

Johnson says the 21st-century skills students practice daily in the Missions and Expeditions, such as problem-solving, critical thinking, and collaboration, will position them to take on whatever challenges the future holds. (See Administrators' Corner on page 18.)

PILOT LABS SET THE PACE

Although happy with the Pitsco STEM Modules they had been using for years, PYL officials knew it was time to take the next step, so two of the six middle schools – Travis Ranch and Tuffree – were outfitted to pilot test the STEM Expeditions in 2016-17. Chapluk and McLeish put the program through its paces and quickly discovered more room for student creativity and more opportunities to problem-solve – all within timely and engaging career contexts. (See related article on page 16.)

"I said, 'This is great! Definitely, we should roll it out to the other middle schools,'" Chapluk said. "I was very excited about the innovation. I feel like the Modules were more scripted and followed a recipe – do this and do this. And there wasn't as much innovation or creativity. [Expeditions] are exactly what they should be. They are what NGSS is all about. There's not any one answer per se. There's more than one way to reach a solution."

Yorba Linda Middle School Teacher Matt Homstad listened closely to what the pilot teachers were saying and, along with the other middle school Pitsco lab teachers, made the switch prior to the start of this school year. "I just jumped in and started investigating and obviously picked Rob's brain and Mary's brain, asking them questions," Homstad said. "I've talked a lot with [Pitsco Education Program Designer] Aubrey too. She's been a tremendous help."

Robert McLeish
Lab Facilitator

BE PATIENT TRANSITIONING FROM MODULES

McLeish had spent 15 years facilitating Modules before he was asked to pilot test the Expeditions program. This switch to a new framework, new content, and a focus on the engineering design process required a shifting of mental gears.

"When Expeditions came in, I forgot that you have to give it time to make it a part of your program," he said, adding that the way students embraced the new program and the chance to create their own solutions to problems was all the evidence he needed to see. "The kids love the creativity that is involved with it. They make improvements in all the Expeditions, so it's always fun to see how they do that and the creativity that's involved."

Homstad, meanwhile, explained that the transition from Modules to Expeditions was relatively easier than a learning curve he had faced previously. "I felt a little overwhelmed in the beginning of the Modules a couple years ago when I first came in. That was definitely a lot harder than the transition to Expeditions."

CREATIVITY AND DEEPER CONTENT

Every Expedition begins with an Essential Question that serves as the students' focal point throughout the 10 to 15 class periods it takes to complete the work.

"It gives it a real-world component," Homstad said. "Definitely, having that Essential Question makes it open ended with more than one solution. There's no right or wrong answer. A lot of what they're doing is observation. They're just interpreting and they're asking questions of each other."

Chapluk, who like Homstad is a certified science teacher, appreciates the way Expeditions align with the requirements of NGSS. "It's more depth and not as much breadth," she said. "Let's focus on this and let's dive really really deep, and let's do the whole engineering design cycle. . . . Let's go ahead and design it, test it, and then if it's not good enough, let's go back and fix it and make it better. That's really what science is about – not memorizing a bunch of facts."

Matt Homstad
Lab Facilitator

MAJOR DIFFERENCES FROM MODULES

While Modules and Expeditions are both built to develop essential employability skills through hands-on, experiential learning, they are different in other ways, most notably the more flexible grading and implementation options for Expeditions.

Each student completes a detailed logbook while experiencing an Expedition, which is in addition to online assessments tracked through the *Synergy ITC*® learning management system.

"I let them use the logbook on the test. I encourage them to write notes all the time," Homstad said. "It's a great piece of evidence of learning, especially when they're going home a little discouraged after the posttest, but they have these logbooks that are full of observation and hypothesis."

Teachers also have a choice for content delivery – rotational (student pairs work on a diverse set of different topics throughout the lab) or whole class (all student pairs work on a single topic at the same time). Or, there's the option to switch between rotational and whole-class Expeditions.

Chapluk is taking this hybrid approach this spring after a year and a half of strictly rotational delivery. She looks forward to having the flexibility to interject additional content or examples to the entire class when students are all at the same point within the Expedition.

Homstad, however, prefers to stick with a rotational approach for his 18 different Expeditions that have up to 36 students focused on a wide variety of STEM topics, from *Ahead of the Game* to *Urban Wind Farm*. P

Student engagement proves program's effectiveness

Travis Ranch Middle School Principal Susan Metcalf has become an outspoken advocate of Pitsco's STEM Expeditions® for one simple reason that no standardized test could ever measure – student engagement.

"That's very evident in this class because I can walk in here and see the kids are focused on a task. They're using their hands, they're reading directions, they're communicating with a partner, and they're not having to ask the teacher a lot of questions," Metcalf said. "So, it's very apparent that it's an engaging class. And with middle schoolers, I believe it's about just sparking their interest in pursuing science at a higher level and helping expose them to many areas within the sciences."

Seeing students immersed in their work is evidence of full engagement, but listening to conversations between partners at a workstation is another informal measure of program effectiveness.

"I think just observing the kids on a daily basis, hearing their discussions and the questions they're asking is the biggest measure of learning that goes on," Yorba Linda Middle School Teacher Matt Homstad said. "It's collaborative, and it's not just one answer, and it's not just me. It's all of our minds coming together."

If scientific research is your measure of choice to determine a program's effectiveness, Expeditions are faring well on that front as well. A December 2017 report from the Friday Institute for Educational Innovation at North Carolina State University showed that students at a North Carolina middle school who experienced STEM Expeditions scored 20.1 percent higher on the Measures of Academic Progress (MAP) science test than did members of a control group at a nearby middle school. (See article in December 2017-January 2018 issue of *The Pitsco Network*.) P

A training ground for student competitions

YORBA LINDA, CA – It's not quite like going from the minor leagues to Major League Baseball or even moving up from the junior varsity to varsity competition. But students in the Pitsco STEM Expeditions® lab at Travis Ranch Middle School can use the course as a stepping stone to a new Science Olympiad class, in which they prepare for academic competitions.

Susan Metcalf
Principal

"We had a lot of interest in Science Olympiad as an elective, and so we use this class (Expeditions) almost as a prerequisite," said Principal Susan Metcalf. "Students who had taken this class and done well here and also in their science classes, we gave them first choice at being in Science Olympiad because we knew they'd have some of the broad background needed, and we knew they were disciplined enough to work in teams and to be self-directed if they did well in this class."

Jaden

Metcalf's son, Jack, and his classmate Jaden were among a group of students who had Expeditions as sixth graders and then joined the Science Olympiad team/class this school year.

"I built a bridge and got first place in that last year," Jaden said of his Expeditions competition experience. "That helped me choose towers and stuff in Science Olympiad. I built a tower for the recent competition, and it held all the sand weight."

Mainstreaming in an Expeditions lab

YORBA LINDA, CA – Only once did STEM Expeditions® Lab Facilitator Mary Chapluk sound disappointed during a recent conversation with visitors as she was scurrying around the room helping students.

It was when the topic switched to mainstreaming of special-needs students in the Expeditions lab. To be clear, Chapluk was not disappointed to have an autistic student and another with Down syndrome in the lab. On the contrary, her sadness was because the semester was winding down and she wouldn't have them much longer to help her other students as much as they were being helped.

"I think it helps everybody because the students who are mainstreamed, it exposes them to full inclusion, which I'm a huge proponent of. And it helps them develop social skills," Chapluk said. "It encourages the students who are the main part of this class to talk with them and explain what they're doing. Them teaching these students how to do something is deepening their knowledge of the tasks that they're working on."

The two special-needs students are moderate to severe cases, but working with higher-functioning partners – all

Expeditions are team based – gives them valuable one-on-one time for the entire class period.

"The kids have to be accepting," Chapluk said. "I love having them in here."

Expeditions are for 'our generation'

Students with Module and Expedition experience compare the two programs

YORBA LINDA, CA – If you're wondering what all the fuss is about Pitsco's new STEM Expeditions® program, let some uniquely qualified students explain – students who can compare Expeditions with the Pitsco Modules program that has served education well for the past quarter century.

A group of eighth graders at Yorba Linda (CA) Middle School are exploring Expeditions this school year after having worked through Modules as seventh graders. Their near unanimous assessment is that the Expeditions are more challenging, allow room for creativity, and are designed for today's generation.

"We have a lot more technology now since we upgraded to this version, and we have a lot more things that we can learn, like new principles," said Stephanie, one of the eighth graders in Facilitator Matt Homstad's expansive and energy-filled Pitsco lab. "And there's a lot more hands-on activities and much better equipment that we can use."

Classmates echoed Stephanie's comments, noting that Expeditions, with new videos, graphics, and timely topics, seem to be designed with today's students in mind.

"I like how the Expeditions are more like with our generation. Last year it was a bit older," Ethan said. Added Adan, "You learn about the future and what's going to happen, like in *Beyond Earth*. Pretty soon, people are going to go to Mars. In *Urban Wind Farm*, you talk about energy, conserving energy, and what's good energy and what's bad energy, and how to reduce pollution."

The opportunity to experience careers and concepts within an up-to-date context engages students even more than when they worked in pairs to complete the Modules. Students still work with a partner, but they spend a few more days on each topic, going a bit deeper and employing the engineering design process (EDP) every time.

"Each activity is ask, imagine, create a plan. Each one of those is in there," said Zoe. The engineering design process "helps to improve your project after it's done no matter what you're doing. It makes it better so you don't just say, 'OK, I'm done with this,' and then stop. You have to rethink it and then go back and improve it."

Homstad, a certified science teacher, smiles broadly when asked about having the EDP built into every Expedition. He says the process is in line with NGSS, adds motivation, and provides a layer of continuity across all workstations, from *Ahead of the Game* to *Optical Solutions*.

"When the content that they're learning is new and it has this (EDP) foundation to it, that makes it a lot easier every few weeks when they switch over. 'OK, I'm going to start with a question and then I'm going to do this and I know what to expect.' And then at the end, 'I know I have the opportunity to improve.'" Homstad said. "This gives them that motivating factor where they have the chance to improve."

George, another eighth grader, is excited about the EDP. "I think I might use the engineering process in the future. I think

"I like that we get to actually imagine what to do, and I like how we are put into actual careers."

Ethan

"Each activity is ask, imagine, create a plan. . . ."

Zoe

"You learn about the future and what's going to happen, like in *Beyond Earth*. Pretty soon, people are going to go to Mars. . . ."

Adan

"I think I might use the engineering process in the future. I think it's pretty useful because everybody will face failure and they need to improve due to failure. . . ."

George

it's pretty useful because everybody will face failure and they need to improve due to failure. I don't think it's a bad thing. I think it's teaching us how to improve and how to do better."

Perhaps even more exciting for the students are the deep career connections within each Expedition. Ethan: "I like that we get to actually imagine what to do, and I like how we are put into actual careers." Adan: "In the Expeditions, I can kind of dip in my toe to see which [career] I want to do." George: "On the backside of the logbook, it says the jobs we can do in the future. At the start of the Expedition, I always turn to the back page and look because I want to know if I do well on this Expedition, maybe I can look at a job and maybe consider it."

Stephanie might well have been speaking for all her classmates when summing up why she prefers Expeditions over Modules. "It's definitely more modern. The old ones [Modules] are more like from the past, but now all the stuff here is more recent, and it helps us get connected to the modern-day stuff that we're learning." P

Expeditions allow room for customizations

Standardized tests, mandatory in-services, recertification, extra duties – teachers are required to do a lot of things. So when they find wiggle room to personalize their curriculum and classroom because of built-in flexibility, forgive them if they get a little giddy.

Mary Chapluk and Matt Homstad all but shouted out with joy when recently explaining how they have customized a few components of their Pitsco Education STEM Expeditions® labs in Placentia-Yorba Linda Unified School District (PYLUSD) in southern California.

The tweaks began when, facing the reality of facilitating 18 different topics (up to 36 students) at one time, Chapluk simplified the grading process for herself by reviewing the content as a student and writing additional grading rubrics so that she could scan any student's logbook at any point, regardless of where they were in the Expedition.

"The rubrics that came with it are really good," she said. "I used that as a starting point and then I tailored them just to make it a little bit easier for me. I put more detail into it. . . . I do checkpoint days, typically Tuesdays and Thursdays. I say, 'Show me what you've done.' And they just turn page by page, and I score them based on how well they're doing at that point."

Homstad and lab teachers in the other four PYL middle schools have benefitted from Chapluk's efforts as she shared the custom rubrics with them. "Every page of every logbook has a rubric behind it. . . . It's been invaluable for sure," Homstad said.

As for putting a personal stamp on his lab, Homstad started by grouping the Expeditions in as efficient a manner as possible. He grouped workstations focused on electricity so students could share information, he lined up titles that require a lot of foam cutting so they could share equipment, he put the musical *Making Waves* workstation in a small room at the back of the lab, and he put robotics and composites in areas where they had more workspace.

Homstad also has posted the Essential Question for each Expedition at the workstation so students see it several times each day as a constant reminder.

Back in Chapluk's lab, students know when class has officially begun – when their teacher buckles up her loaded tool belt. She got tired of running to her teacher station to retrieve commonly needed tools such as a hammer, pliers, and screwdrivers. "The stuff I need a lot, I just added it to the tool belt so I'd have it. Now I'm not running back and forth or fishing around for stuff."

Student aides in Chapluk's classes also help oversee an equipment checkout system for common or small items such as glue guns and scales. Upon checkout, a magnet with the name of the equipment is moved to a special board near the teacher's desk. The magnet is not taken off the board until the item is checked in, and students are not dismissed from class until the board is empty. P

Facilitator Mary Chapluk enjoys the program flexibility that has enabled her to customize several aspects of the STEM Expeditions® lab, including grading options.

Cary Johnson
K-12 Director of Innovation and Technology
Placentia-Yorba Linda Unified School District, CA

Cary Johnson has been in education for about 20 years, including the past several with Placentia-Yorba Linda Unified School District (PYLUSD) near Anaheim, CA. He spent two years as principal at El Dorado High School, four years as director of secondary education, and the past year in a new and unique capacity. "My boss (deputy superintendent) and superintendent said, 'Hey, we really need to push the envelope.' And so they created this position called K-12 director of innovation and technology." PYLUSD has Pitsco Education's new STEM Expeditions® in all six of its middle schools after using the company's Modules program for more than a decade. Pitsco's science Missions program was added last school year in five of the district's elementary schools.

Administrators' Corner

'We're preparing them to have skills'

CA administrator says Missions, Expeditions are geared toward an uncertain future

Talk about the endgame. You're preparing these students for something STEM related. What exactly is that?

We're preparing them to have skills. We don't know what their jobs are going to be like five, 10, 20 years from now. They need to have the skills to be adaptable for that future. STEM, by its nature, is problem-solving, thinking through issues, being cross disciplined. How many times did you solve a problem just by using language arts? No, you bring in all sorts of different skills. I think that's what's cool about STEM – and particularly Expeditions and the Missions – is that it's problem-based learning and communicating of information.

How did the district fund the move from Modules to STEM Expeditions and the addition of Missions labs at several of the elementary schools?

Part of what helped fund refurbishing and retrofitting the (middle level) STEM labs was the California Career Pathways Trust Grant. The state of California has really kind of doubled down on spending on career technical education. And so, the first round of that was competitive grants, and the California Career Pathways Trust Grant was part of that. We applied and received a $6 million grant for the district.

Talk about the decision to spread STEM down into the elementary level.

One of the grant coauthors was a former elementary teacher. She was like, "You know, Cary, you're looking at this for high school. But we really need to look systemwide." And so her eye was really important for that. We pulled in an elementary principal to be part of that grant-writing team, and that's where we kind of did the whole K through 14 because it was inclusive of community colleges as well.

What year did you get the grant?

Next year is the sunset of it, so it was the 2015-16 school year. It's a four-year grant.

What extra benefits does STEM bring to students?

The biggest side benefit we saw was at the elementary level – how much communication was taking place. That was as big as, if not bigger than, the science part of it was, being able to communicate, the reasoning and kids communicating their thoughts about why this was the answer or why they should do this to find the solutions.

The principal at Glenview Elementary School, Ms. Ramos, talked about that. She liked what she was hearing from the kids together working at Missions.

We've seen that at all five elementaries. They've all said the same thing. That's a key part of why they like the Mission labs.

How does development of 21st-century skills at the elementary level affect kids as they move through the system?

Our ultimate goal was the CareerLink Academies at our high schools. The idea was introducing kids to the concept of careers, not that they had to decide they were going to be an attorney or an engineer in third grade, but exposing them to that concept. So, then they come here to middle school and do the different Expeditions. Ultimately, our goal is to have a chart saying if you like this particular Expedition, you might want to go to Aztec Engineering and Manufacturing Academy, or if you like this one, then you might want to go to Digital Media Arts at El Dorado. The endgame is to introduce them to different careers.

How did the district settle on Pitsco as its STEM provider?

We initially looked at a different vendor. And teachers like Mr. McLeish and Mary Chapluk said we needed to look at Pitsco as well, and we did. And overwhelmingly even I was sold after I saw what was going on with Pitsco and when we went to visit some elementary and

middle schools in Hemet. I thought this is much more of what we need than the other vendor was showing.

What set Pitsco's curriculum apart from the competition?
It was deeper. You're also delivering 21st-century skills that truly teach kids how to not just look at the content but really being able to communicate, being able to work collaboratively, and the customer service. One of the things that all the teachers said was even if it's broke or there's an issue, we can always get hold of Pitsco. They solve the issues for us right away. If we're having an issue with any part of the curriculum, they respond. And I've found that to be true as well. Because if you're a teacher in a classroom, you need the feedback and answers quickly. There was no comparison. Pitsco was much better. It was the curriculum, the setup, the customer service.

The Expeditions are a semester course at Tuffree Middle School instead of full year so that more students can rotate through. The teacher says there's now a higher percentage of females in the STEM course than in years past.
That's absolutely important. That's been a discussion as far as a district in our Career Technical Education Advisory Committee. We actually hosted a Women in Industry conference just a month or so ago. So we had key players from different industries that were female come and speak about their experience of being a female in an industry, whether it was computer science or the medical field or as an attorney. . . . The vibe was so positive at the end. It was cool to hear the struggles that they went through and how they overcame the obstacles.

Because of the skills kids develop in Expeditions and the opportunities they have for success, do you think this lab can help build students' confidence and improve their social and emotional learning?
Middle school is a very strange period in a kid's life where they're not quite high school kids yet, but they're not kids anymore. Any good project-based learning curriculum would do that. It's that old concept that failure is actually good if you can help kids learn to persevere and learn from their failure. That's good for their own confidence.

Every Expedition has the engineering design process built in with a focus on plan-build-improve. How is this skill foundational?
A keynote speaker at a recent conference in Orange County, the COO for SpaceX, was showing video of how they sent a rocket up and it comes down and lands on a huge platform in the ocean. She said, "I'm going to show you the footage from our very first attempt." And it shows a rocket coming down and it hits the pad, but it falls over and blows up. "When I first saw that, I cheered and everyone was looking at me like I was

Students in Robert McLeish's STEM Expeditions® lab have fun putting their bridge to the test on the Pitsco Structures Testing Instrument. The aim is to earn a spot in McLeish's top performers list, which is displayed for all students to see.

nuts. But the reason I cheered is because we hit the pad. Yeah, it was a failure, but out of a huge ocean, we actually hit the pad. So we're going to improve on that. We haven't crashed since." I always heard it's important to fail and learn from that, but this is the COO of one of the biggest private space exploration companies around. And she's saying that. So it was really exciting. It's cool to see someone in the industry saying, "Yeah, that's true."

One of the unique tools in an Expeditions lab is zSpace. What's your take on the role it plays in the lab?
At first I thought was just a novelty, but now my understanding is that the kids enjoy it. It's augmented and virtual reality; that's the next phase, introducing kids to that kind of stuff now. I brought my boss in when it was first demonstrated. When you can look at the heart, do the little mini camera through the heart, and actually feel the heart vibrating because of the haptic feel, that was really cool. I think integrating that into an actual classroom, that's pretty cool for kids to see that it's not just about gaming.

How important is having strong STEM support from your superintendent, Dr. Greg Plutko?
He was the one who had the idea. He and my boss created the innovation and technology position because we were a really good district, but good can sometimes be the enemy of great. You get complacent. Part of his desire was, "Let's push the envelope here and see where we go." But even before that, our school board set the vision. They always want us to look for the next best thing for our kids and make sure that our kids have the opportunity to be successful and choose where they want to go. They really care about what's best for the kids. P

ONLY ONLINE:
Visit Pitsco.com/Network to read more of the interview with Cary Johnson.

Gates (Foundation) to achievement

Pat Forbes
Education Liaison | patforbes@pitsco.com

Foundation eager to fund solutions including many Pitsco proprietary products

In this increasingly complicated world we live in, the trend today is to devote more time and money to STEM education. Pitsco has moved to the forefront in this challenge to meet the advancing needs of the educational community.

Part of that onward march has been the advent and use of the latest technology and the cost it entails. Fortunately, entities have risen to assist in the acquisition and utilization of this technology.

The Bill & Melinda Gates Foundation, for example, has not stood outside the fire when it comes to the improvement of the condition of education, whether in the US or overseas. "Whether the challenge is low-yield crops in Africa or low graduation rates in Los Angeles," the Gates Foundation is ready to assist. Their latest foray is to focus on backing locally inspired solutions.

Their interest in stressing "middle and high school teachers hav[ing] access to high-quality, standards-aligned curriculum choices in English, math, and science, which will be accompanied by professional learning opportunities," will be a stimulus to educators desiring this knowledge.

Pitsco has worked to support these objectives by offering **STEM Professional Development**. Our custom sessions help teachers better understand STEM and make the STEM connections that help students better understand STEM too. And, true to form, teachers learn through engaging hands-on activities and take home a product they can use with their students.

Besides STEM Professional Development, the Gates Foundation could also be a supporter of **TETRIX® robotics** and the TETRIX PULSE™ Robotics Controller. In addition, the foundation would find **K-9 STEM solutions** in line with a program that leads to the development of skills that will emerge later as students progress, and the Pitsco STEM Expeditions® curriculum has been profiled to workplace-readiness standards.

The Gates Foundation is a trendsetter, but should their assistance not be available, you can utilize our private and federal grants sections at Pitsco.com/Grants. There is always help available.

Much more online:
Pitsco.com/Grants

GRANT APPLICATION DEADLINES

March

5 Geraldine R. Dodge Foundation
The foundation strongly supports arts education and integration with STEM.
www.grdodge.org/what-we-fund/education

15 Voya Foundation
The foundation "support[s] organizations that fund high quality, experiential STEM learning opportunities for children in grades K-8."
corporate.voya.com/corporate-responsibility/investing-communities/voya-foundation-grants

31 Ezra Jack Keats Foundation
The foundation supports art and literacy programs in school for younger classes.
www.ezra-jack-keats.org

April

15 McCarthey Dressman Education Foundation
The foundation's Teacher Development Grants encourage creative teaching strategies.
mccartheydressman.org/teacher-development-grants/

May

1 American Honda Foundation
Their focus is on the STEM subjects.
www.honda.com/community/applying-for-a-grant

31 SPIE
This organization promotes STEM instruction in optics and photonics.
spie.org/education/education-outreach-resources/education-outreach-grants?SSO=1

By Patty Cooke, Communications Assistant • pcooke@pitsco.com

DonorsChoose appeal is answered

Campaign funds Pitsco racing system and other items for Mobile, AL, school

"My students need a way to test the amazing dragsters they are building! My students need a Pitsco Impulse G3 Dragster Racing System."

This was the beginning of the DonorsChoose description for Melissa Barnett's dragster racing project in her engineering lab at the Denton Magnet School of Technology in Mobile, Alabama. The school is now in its second year.

The Impulse G3 Race System is a CO_2 dragster racetrack from Pitsco Education with state-of-the-art electronics, durable construction, and Christmas tree lights to signal the launch. "This system will help our students see what they did correctly as well as what was done wrong and help them better achieve their goals every time they build," the description explained.

Barnett's sixth through eighth graders had previously designed and built dragsters as part of an engineering project, and now she was looking for a real-world application they could connect to their knowledge and hard work.

"My students need a way to test the amazing dragsters they are building! My students need a Pitsco Impulse G3 Dragster Racing System."

In just under four months, the project was completely funded, with a total of $1,674.76 raised for the Pitsco Impulse G3 Race System, a Hearlihy Collegiate Drawing Set, a Pitsco Wheel Deal, and a Miniature Ball-Point Hex Driver, and the items were on their way to Barnett and her students.

But before racing their dragsters, students researched the design process and the history of automobiles and figured out the impact their designs would have on the environment. "These projects help my students prepare for the jobs that fall under the STEM category for education and teach them the skills they will need to be successful in the professional world!" Barnett explained on DonorsChoose.

Before Christmas break, the school had an in-house dragster competition. "We raced our dragsters that were made by our older students," said Barnett. "This got our sixth graders very excited about building dragsters for third quarter! Our goal for our in-house competitions is to raise awareness of the projects our students complete throughout the year in our classrooms. . . . We will have another towards the end of the year, with many more dragsters!"

Her thank-you message on the DonorsChoose page expressed her gratitude and alluded to the continued STEM learning the racetrack will bring, saying students "will be learning all kinds of skills" including technical writing and drawing as well as problem-solving. "We can't wait to see what kind of dragsters we will have in the future years!" concluded Barnett. P

Projects and competitions **engage her students**

Melissa Barnett enjoys helping her students learn and grow through various hands-on projects. "My favorite part of teaching is helping students accomplish things they could not do anywhere else," she said. "I love giving them opportunities to help make themselves a better person."

To do that, she turns to Pitsco dragsters, gliders, and structure- and bridge-building projects. "My participation in Technology Student Association when I taught at Bay Minette Middle School taught me about dragsters, bridges, and gliders. Pitsco has the best products for these projects for classroom and competition purposes."

To find out more about Pitsco's hands-on projects and activities, visit Pitsco.com. P

By Corinne Pachl, Technical Editor • cpachl@pitsco.com

Support your own space colony

Mars Mission Specialist: Payload Design challenge for students in Grades 3-12

Maybe you just finished a lesson on outer space. Maybe your class is interested in 3-D printing. Maybe the timing is right to teach your students about rockets and the physics behind them. Or maybe you want a fun activity that implements collaborative learning skills and explores design thinking, STEM concepts, and constraint logic. Whatever topic your class is ready to approach next, Pitsco's new Mars Mission Specialist: Payload Design challenge by Bill Burton can fit right into your curriculum.

The activity asks students to become mission specialists in charge of sending a payload of supplies to a human colony on Mars. The goal is to fit as many food and material goods as possible into the payload in order for the colony to survive and thrive. The catch is there's a logic to the supplies – for example, if students choose to send chickens to space, they need to send water, food, and shelter for the chickens as well.

After deciding exactly what supplies to send to space, your classroom of Mars mission specialists gets to physically design, build, and print a 3-D payload. If you're interested in extending the challenge, you have the option to purchase the payload design challenge with rockets and engines so students can literally send their supplies flying!

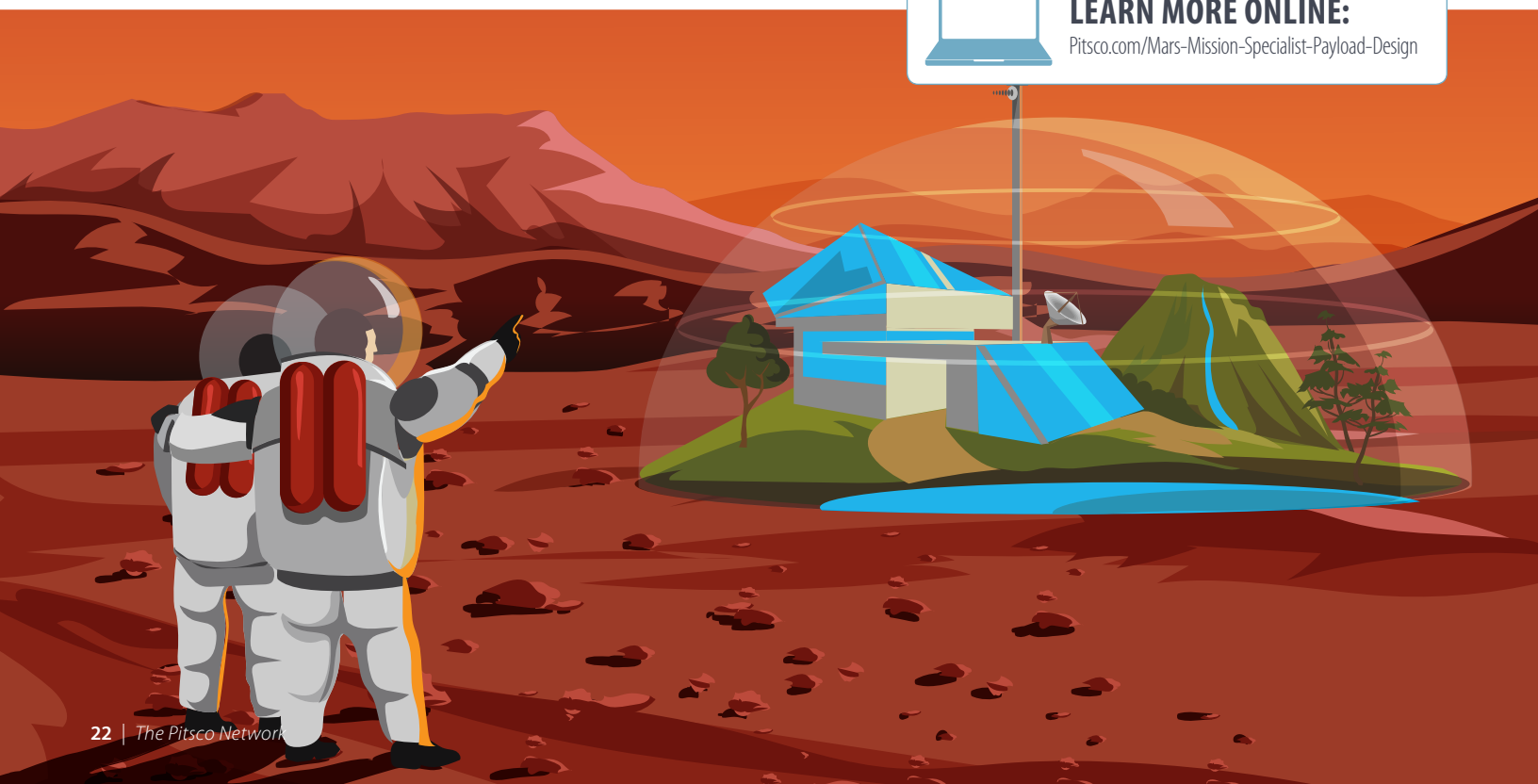
The challenge is intended for students in Grades 3-12, and you can customize it to suit your class's needs. For older or more experienced students, you can easily add extra components to the challenge – students can be very involved with printing their 3-D payload; they can design their own nose cones for their payloads instead of using the ones included with the Pitsco Rocket Kit; and, if there's time, they can complete multiple iterations of their payload design to see how their colony could be best supplied or how best to load their rocket so it can successfully make it to Mars. Or you can omit certain aspects of the challenge with younger students; for example, you can 3-D print the payloads for students or give students hints about how best to supply the Mars colony.

And, just as you can tailor the challenge to any level of experience, the curriculum guide is aligned to Next Generation Science Standards and other national standards for all grade levels.

The complete pack comes with enough supplies to serve 30 students, including a teacher's guide with nine activities, student worksheets, setup instructions, and other background information; weighted pellets representing the colony supplies; and parachutes. Plus, you can find free sizing blocks and other digital downloads at www.pitsco.com/Mars-Mission-Specialist-Payload-Design (3-D printers are sold separately).

Happy exploring!

LEARN MORE ONLINE:
Pitsco.com/Mars-Mission-Specialist-Payload-Design



By Cody White, Communications Assistant • cwhite@pitsco.com

Maximum STEM: Range of offerings perfect for Las Vegas junior high

It was an ambitious request. Educator John Walz was asked in 2016 to build a STEAM program for Silvestri Junior High School in Las Vegas, Nevada. The vision was multifaceted: expose students to a wide range of subjects to hook their interest while also exploring key areas in greater depth – and at the same time keep the program flexible to accommodate changes that might be needed. Walz had experience to draw from, having both led a middle school educational technology program and worked in a position helping elementary and middle school teachers integrate technology in their classrooms.

> "It gives the students a firsthand experience completing online and hands-on activities in many different fields. For some of our students this is their first experience of taking charge of their own learning. . . ."

"I did some research looking at where the programs I used many moons before have evolved and the costs it would take to implement a program," explains Walz. In the end, he proposed a program largely based on Pitsco resources. The convenience and array of offerings, both curriculum and one-off projects and kits, drew Walz to Pitsco.

Currently the program, taught by Walz and another teacher, Dr. Pregosin, includes 18 Pitsco middle-level curriculum titles and a new whole-class STEM Expedition®. These introduce students to numerous career paths they might pursue in high school and beyond.

Several three- and five-week units delve a bit deeper. These include units in digital photography, animation, engineering that utilizes Pitsco bridge-building kits; a robotics program based in TETRIX® that emphasizes 21st-century skills and higher-order thinking; and 3-D design and printing from Pitsco.

(continued page 28)

By Jessica Born, Digital Marketing Manager • jborn@pitsco.com

New Pitsco.com – A wealth of information is just a click away!

We hope you've seen the new and improved Pitsco.com by now. If you haven't, please grab your nearest device (it's mobile responsive after all!) and navigate there now! It was built with you in mind. We considered what the educators leading classrooms and schools would want front and center when shopping for supplies or what you might need when crafting a grant application or purchase request. We want to best support your work with 21st-century learners.

One of our favorite aspects of the new site is the Our Programs section. It is loaded with details about all of our customizable curricula and solutions. You might remember we started as a catalog company but we've always worked to provide more than just single kits or individual products because we know STEM isn't a singular experience. It's holistic and evergreen. Yes, with STEM-based products, activities, and curricula, students learn more than just science, technology, engineering, and math.

We've seen it proven time and time again that students learn best in a collaborative, hands-on environment where they can practice and develop communication, leadership, and problem-solving skills. We believe in providing opportunities for creativity, empathy, and critical thinking through meaningful and relevant lessons and projects.

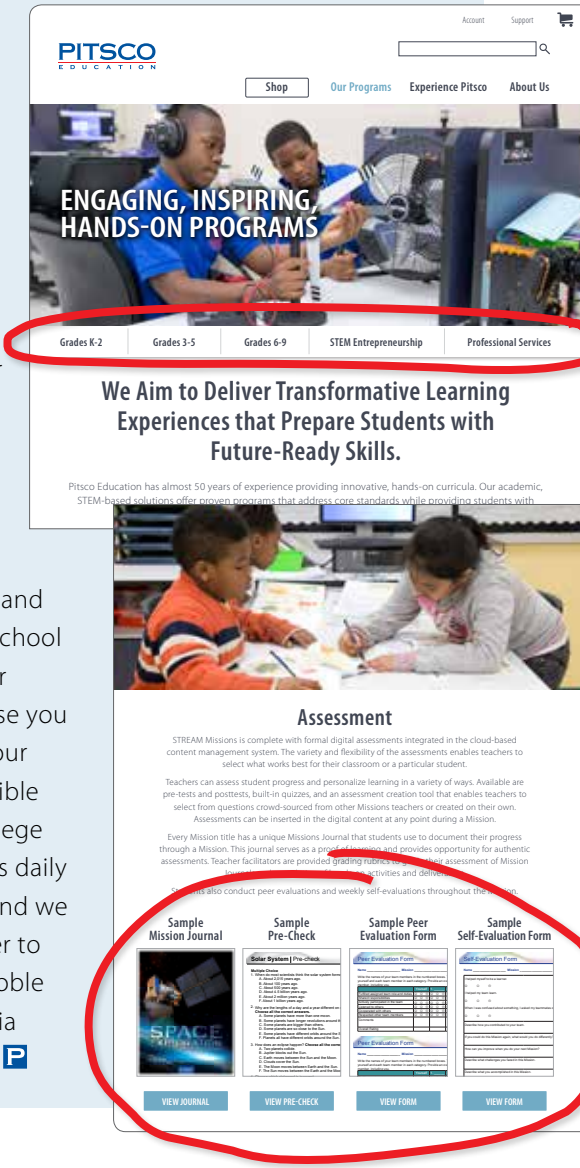
The Our Programs section highlights our key offerings – Elementary STEM Units, STREAM Missions, and STEM Expeditions®. These offerings are valuable assets to a program that desires to deliver a top-quality STEM-STEAM-STREAM education.

You can drill into each program to gain a better understanding of the specific application and execution. Within each, you'll find a curriculum overview, a list of titles, environment information, and how to get started. As you explore you'll find program-specific samples and examples. For instance, if you are within the Grades 3-5 STREAM Missions Curriculum Overview section, you can check out a sample Mission Journal or a sample evaluation form. But it doesn't end there. You can also gain access to standards correlations for the curriculum. We can even create custom assessments and alignments for you! You can check resources and reach an education consultant in three easy steps too.

You can also locate Success Stories and other resources peppered throughout the site's sections and pages. Success Stories highlight institutions and individuals, just like you, who have experienced real results within their school, lab, or initiative.

When you're shopping, please take note of the item-specific sample teacher guides, student activities, and user guides within the lower third of a product's page. Even sample code and programming libraries are at your fingertips for some of our TETRIX® robotics items. Videos have been included, as applicable, and you can find many of them in our streamlined video gallery. Not sure if the product will meet your needs? Hear from customers and colleagues via their testimonials at the bottom of many pages.

We hope you find that exploring potential products and solutions for your school or district has never been easier, because you have enough on your plate already. Tangible preparation for college and career happens daily with your efforts. And we couldn't be prouder to assist you in that noble work – in person, via phone, and online.



Four quarters, four robots, and a lot of fun!

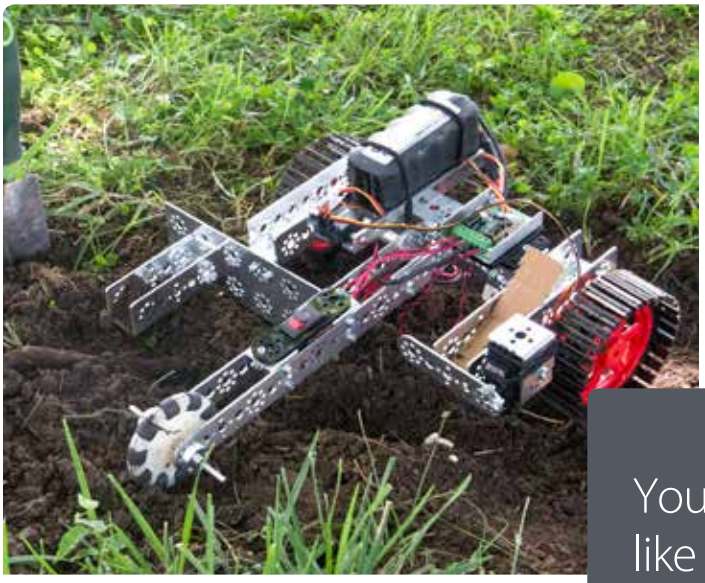
In this issue's Blog Log feature, Educational Account Representative Preston Frazier explains our sales team's goal to build a different TETRIX® robot each quarter in 2017. And be sure to check out some of our other blog posts as well at blog.pitsco.com.

Preston Frazier
Educational Account Representative
pfrazier@pitsco.com

During this time of year, it is often customary to look back at what has been accomplished in the past months. So, we're going to do that in this post. In late summer, we shared with you a garden bot that I built. If you'll remember, I had joined the Pitsco team in April and wanted to try my hand at creating a unique TETRIX® robot to help increase my familiarity with the product and to test my skills. It was a fun experience resulting in a pretty awesome garden bot!

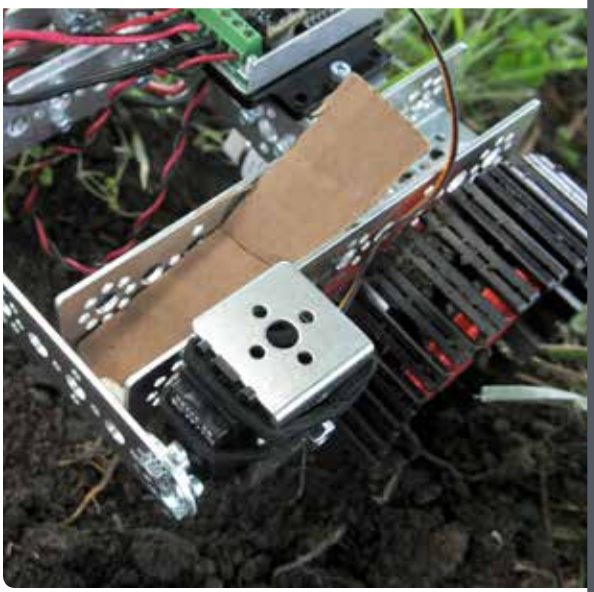
In that same vein, my colleagues and I have been collaborating to build a robot every quarter using TETRIX parts, other Pitsco products, an assortment of other items, and even some 3-D-printed parts. Our creative juices have been flowing, and we've come up with some fun and innovative ideas.

But enough talk – let's get a look at them! Here's a brief glimpse into our builds this year.



REAL-WORLD READY

For the first quarter, we designed a backhoe/digger of sorts. The build has a shovel mechanism on the end that can scoop up whatever item you'd like. You can see we filled our bucket with corn to show that the backhoe can pick up very specific items. We found a lot of really cool real-world connections while assembling this robot. Can you think of any? P



ONLY ONLINE:
Visit blog.pitsco.com to read more!

You can also read more great posts, like the ones below at **blog.pitsco.com**.

Pumpkin chunkin' makerspace style – By Nevin P. Jones
We don't just teach STEM – we live it! As part of our Fall Festival fund-raiser at Pitsco, we held a Pumpkin Chunkin' competition. The result? Seven unique catapults designed and created by Pitsco employees.

An educator's take: The NEW TETRIX® PULSE™ Robotics Controller – By Jessica Born
Aaron Maurer, the STEM lead for the Mississippi Bend AEA and founder of 212 STEAM Labs, Inc., shared his initial thoughts on the new TETRIX® PULSE™ Robotics Controller. You'll want to hear what this STEM leader has to say!

Does your robot's motor have enough power? – By Nevin P. Jones
Learn all about the new TorqueNADO™ motor for TETRIX MAX! With a built-in encoder, this powerful motor might be just what robotics teams have been waiting for.

By Kristina Davis, Educational Program Designer • kdavis@pitsco.com

New webinars geared toward Pitsco lab teachers

Register for upcoming webinars or watch recorded segments at webinar.pitsco.com/curriculum

As a service to the many great teachers – current and those to come – who use Pitsco products, we are offering in 2018 a series of webinars hosted by customer relations representative Trisha Hoffpauir and me. The idea to hold regular webinars on a variety of timely and relevant topics was hatched near the end of 2017. We held our first webinar, on Expedition digital logbooks, at the end of November. The positive feedback we received from that experience led us to plan a series of webinars for 2018.

These will be held on the last Thursday of each month, and we will hold at least eight webinars throughout the year. The webinars will be live but will also be recorded and made available for anyone who cannot participate in the live event. You can access the recordings via our webinars landing page (webinar.pitsco.com/curriculum).

Attendees who register for the webinars will be asked to complete a quick 10-question survey that will give our team at Pitsco insight for selecting future topics.

Upcoming Pitsco webinar schedule

Note: Topics are subject to change.

February – What's new with STREAM Missions?

March – Career Expeditions: What are they and when are they available?

April – The end of the school year is upon us! Pitsco tips and tricks for wrapping things up in your lab.

May – Pitsco Hacks: Hear from Pitsco teachers on classroom management, organization, and so much more!

June – Review games for Expeditions and STREAM Missions.

July – It's about that time! Pitsco tips and tricks for how to start the year off right in your lab.

Watch recorded sessions or register for upcoming webinars at webinar.pitsco.com/curriculum. Links will also be posted to the *Synergy ITC* Help pages (synergyitchelp.pitsco.com/webinars).

A variety of topics are already slated for the first half of 2018. Among them are *Synergy ITC*, curriculum, labs, and products. While Trisha and I have some ideas in mind (see sidebar), we would love to hear from you. If you have topic suggestions, or if you would like to be a special guest and help facilitate a webinar, please send an email to webinars@pitsco.com.

The goal of the webinars is to connect with our teachers on the issues and challenges they face in a Pitsco lab and offer solutions – both from Pitsco employees and teachers who facilitate in our labs every day. We look forward to serving your needs through this exciting new offering.

Parents of this era are needing a pat on the back or a tap on the shoulder

While researching the topic of parental involvement in the science and tech classroom, I began to emit waves of jealousy to an unlikely group: English language arts (ELA) teachers. Why, you ask? You'll have to keep reading to find out.

DAVE THE SCIENCE GUY

David Meador

Curriculum Specialist | dmeador@pitsco.com

Science and tech are so much easier to wow parents with; why would I be jealous of ELA teachers? Well, the answer is one word, *levidrome*. It shows how parents can influence their children in a positive way. The story of six-year-old Levi Budd from Victoria, British Columbia, Canada, is a great example of how parental support of a child's interests and abilities can have an outsize influence on the child and potentially on society.

Levi's parents supported his keen interest in words of all types and his fondness for reading the dictionary to help propel him to international fame as a YouTube star. As a teacher who uses Pitsco products, you should think about the level of excitement and engagement your students have shown with a particular Expedition, Mission, or product. Think about how that can be shared with students' parents, and you can turn back the tide of parental apathy.

Several ideas come to mind, ranging from something as simple as a note home to as complex as hosting a lab open house or inviting parents to visit and see the lab in action. You could even have students take on the role of facilitator for their parents as they have a mini experience with your curriculum or activity. With that little peek, parents could become your biggest supporters and allies.

Offer parents strategies that can help extend students' excitement for different curriculum pieces. Here are a few more ideas:

- Encourage parents to apply some of the curriculum concepts to home situations, such as planning efficient routes and creating maps for daily family travels to reduce gas costs and vehicle wear.
- Students can tap into the skills they've learned to plan, design, and construct a dog house or a home for any family pet. Mom and Dad really don't want to do that on their own!
- Evaluate safety in the home. All of Pitsco's curriculum solutions offer safety tips. In the Expeditions, there is even a Safety Connection that talks specifically about safety in the home.

I am sure that you have plenty of ideas of your own along these lines. The subjects you teach are some of the most engaging by nature, so if Levi's parents can find inspiration in him reading the dictionary to launch him into international fame, maybe with your help, your students' parents can make their child famous in their home.

What was that? Oh rats, I forgot to tell you the story of the levidrome. Well, Levi wrote to the Merriam-Webster people to propose the word *levidrome*, which he defined as "a word that spells another word when spelled backwards." Fortunately, it didn't get filtered as spam, and Merriam-Webster said all he needs to do is get the word into common usage.

So here I am, doing my part for Levi because of his parents' involvement. The unusual title of this article even contains two levidrome pairs, and there are several other pairs throughout the article. It's even given our editing team something fun to edit. Offbeat challenges like this are why the editors think of me as a god. Loki is the one that comes to mind first, but you take what you can get! P

Maximum STEM: Range of offerings perfect for Las Vegas junior high *(continued from page 23)*

"Pitsco provided a foundation for us to launch our STEAM program. It provided curriculum supported by standards in a variety of areas. This reduced the amount of time needed to create our own," says Walz.

The program has remained dynamic since its start, seeing one major expansion in the second year and continual growth through homegrown lesson plans developed by both teacher and, interestingly, students – the advanced classes' writing lessons in *PowerPoint* and Google forms for the lower-level classes are based on experiments and activities they have conducted.

One significant factor shaping the program is the drive to make it keenly relevant to students' lives by tailoring it to the economy of Nevada. For example, the state's ever-growing tourism industry made *Hotel Management* a perfect pick for Silvestri students. And the important mining industry was a deciding factor in the purchase of the *Mining Mechanics* STEM Expedition. The state has also emphasized teaching students to code, and to this end, the TETRIX robotics, combined with the PULSE™ Robotics Controller, Arduino hardware, and a popular online coding resource library, was a perfect solution.

"It gives the students a firsthand experience completing online and hands-on activities in many different fields. For some of our students this is their first experience of taking charge of their own learning. . . . The STEAM program absolutely gives students exposure to careers and job possibilities. It also helps give students the knowledge they can look for programs and studies in high schools and magnet schools," he said.

The program has been a rousing success, and the emphasis on STEAM in the school will only increase.

Walz explains: "Silvestri JHS will become Silvestri STEAM Academy next school year. Pitsco products are the front-runner to the programs driving this upcoming change. . . . We get tremendous responses from parents about the labs and the opportunities their children receive. I can't count the number of times I've heard from parents, 'I wish I had this opportunity when I was in junior high.'"

UPCOMING EVENTS

Pitsco's family of companies will be represented at education shows and conferences across the country in the coming months. If you attend any of these events, stop by the Pitsco booth. Our representatives look forward to meeting you!

February

1-3	Texas STEM Conference, Galveston, TX
8-9	Virginia Children's Engineering Convention, Roanoke, VA
8-11	National Title I Conference, Philadelphia, PA
6-10	TCEA Annual Convention, Austin, TX
22-25	Texas Alliance of Black School Educators (TABSE), Houston, TX
27-M1	GESS, Dubai, UAE

March

15-18	National Science Teachers Association, Atlanta, GA
24-26	ASCD, Boston, MA

April

12-14	International Technology and Engineering Educators Association, Atlanta, GA
18-20	Association for Compensatory Educators of Texas, Austin, TX
18-21	*FIRST*® Championship, Houston, TX
25-28	*FIRST* Championship, Detroit, MI

QUICK CONTACT REFERENCE

Customer Service

- **Phone:** 800-828-5787, 800-774-4552
- **Fax:** 620-231-2466
- **Email:** support@pitsco.com
- **Contact us online:** www.pitsco.com/support

Websites

- **Home page:** Pitsco.com
- **Shop online:** Pitsco.com/Shop
- **Curriculum:** Pitsco.com/Our-Programs
- ***Network* magazine:** Pitsco.com/Network
- ***SySTEM Alert!* for students:** Pitsco.com/SySTEMalert
- **TETRIX® Robotics:** TETRIXrobotics.com

Sales and Professional Development

- **Main phone line:** 800-828-5787
- **Web:** Pitsco.com/STEMPD
- **Professional Development:** workshops.pitsco.com
- **Contact us online:** Pitsco.com/HelpDesk

Visit us on:

The Pitsco Experience

Products **Activities** **Curriculum** **Solutions**

Maker Integrator Implementer

Innovator

The learner is at the core of the Pitsco Experience. Experiential learning – delivered through products, activities, curriculum, and solutions – prepares students for a future no one can describe.

We are here to help all types of
educator-innovators succeed in our mission of . . .

Leading education that positively affects learners.

PITSCO
EDUCATION

THE PITSCO NETWORK

P.O. Box 1708
Pittsburg, KS 66762

CHANGE SERVICE REQUESTED

PRESORT STD
US POSTAGE PAID
KANSAS CITY, MO
PERMIT #69

Pitsco is the **STEM** *company!*

View back issues of *The Pitsco Network* at Pitsco.com/Network.

SEE RELATED ARTICLE ON PAGE 24.

PITSCO.COM

Navigate to the Our Programs section on the new Pitsco.com for rich details and samples about program specifics, as well as examples from getting started to successful implementations.

And there's so much more!

Be sure to check out these sections:

- **Shop –** Thousands of products are just a click away. Find them easier and faster.
- **Experience Pitsco –** Looking for resources? We've got 'em!
- **About Us –** Meet the Pitsco leadership team, learn the why of our operation, or check out the latest Pitsco news.