Jumpstart Your Cybersecurity Career at Illinois Tech

There is a huge demand in the cybersecurity field but not a lot of people and resources available to teach it to the next generation of students.

2018 Award Nominees and Winners

Innovative STEM Student Program Innovative Partnership
These past few months has been so exciting at NCSSS!

From our best-attended Professional Conference to our first ever Awards Program and then to our new Leadership Summit, it’s been a great time for NCSSS and STEM education.

“We have schools in nearly 10 countries that have partnered with 10 U.S. member schools on myriad areas of mutual interest…”

As you have seen by now, the call for session proposals and Awards nominations was sent out for the Professional Conference in Seattle. We are expecting a huge turnout, so I would encourage you to submit as soon as possible.

Our Leadership Summit was revamped this year, and the topics were outstanding, ranging from mental health climate issues to recruiting and retaining staff. But more than that, it was the format. Attendees had in-depth discussions among peers that left each person more informed and a bucket of actionable take-home items. We also built in lots of networking time, further enhancing the development of relationships.

We are also continuing our Global Partnership program. We have schools in nearly 10 countries that have partnered with 10 U.S. member schools on myriad areas of mutual interest. Due to the success of the pilot last year, the Board has given us the go-ahead to expand the program to 10 more schools abroad, and 10 more domestic schools. If you are interested in participating, please let me know.

Equally as exciting is the Student Research Conference hosted by The Mississippi School for Mathematics and Science, June 13 to 16. For the past few conferences, each year we seem to build off the preceding conference that had already set the bar very high. Like our previous conferences, space is limited, so we encourage you to get your students signed up soon. This is a STEM adventure like no other.

And finally, in this issue of the STEM Edge, we are pleased to bring you the 2018 nominations for our Awards Program. Each one highlights one of our member schools and their innovative programs or partnerships in their community. I can’t speak highly enough about the caliber of the nominations we received. I’m looking forward to seeing what 2019 brings!

All the best,

— TODD MANN
NCSSS Executive Director | todd.mann@ncsss.org
To our NCSSS Colleagues,

It has been an exciting few months for the NCSSS. As I reflect on the series of successful and energizing events that I had the opportunity to participate in, including our professional conference in Houston and the Leadership Summit in Savannah last week, it reinforces the importance of active membership in our consortium, the importance of sharing best practices with colleagues from similar schools, and the power of collaboration.

“We anticipate that our Professional Conference in Seattle will be our most well attended conference to date…”

NCSSS is an organization that continues to get stronger and more diverse. Through a shared vision of serving as the resource for secondary STEM schools by supporting collaboration and knowledge sharing and providing professional development for teachers and administrators to positively impact student achievement in authentic STEM educational environments, we have an exciting year unfolding in 2019.

Our student research conference in Mississippi will be an opportunity for students from around the country (and around the world) to share ideas, discuss their research, and meet students from “schools like theirs.” We anticipate that our Professional Conference in Seattle will be our most well attended conference to date, and we encourage every NCSSS member school to be represented. It will be my seventh conference, and I know that at every conference I’ve attended, I have gained valuable knowledge and new insights, and most importantly, things that I could use to help improve the educational experience for my students.

We have also formed a new committee which will focus on student wellness, a topic which continues to be a priority for educators, students, and families across the country. As a board, we have already begun work around this topic, collecting preliminary survey data, and contacting national organizations specializing in both research and practice around wellness and mental well-being to help us develop further resources to support our member schools.

I urge you to be an active member of our network. We have so much to learn from each other, and our students will be the beneficiaries of this powerful collaboration.

— Michael Barney

President of the NCSSS Board of Directors
Jumpstart Your CYBERSECURITY CAREER at Illinois Tech

by Angela Jarka with Marcia Faye
According to a 2018 report conducted by McAfee, in partnership with the nonprofit Center for Strategic and International Studies, the economic impact of cybercrime is estimated to cost between $445 billion to $600 billion, or 0.8 percent of the global gross domestic product. This cost is only expected to rise as consumers increase their exposure to cyberattacks through the purchase of a variety of wearable devices and the possibility of self-driving cars.

“The everyday person who wishes to have more devices that allow the ability to be connected needs to be aware of what threats they could be potentially exposing themselves to. Additionally, the unknowing consumer of everyday products needs to be aware of what it means to have sensors, radiofrequency identification, Bluetooth, and Wi-Fi-enabled products.”

The 2017 Global Information Security Workforce Study found that there will be an estimated gap of 1.8 million cybersecurity workers by 2020, a 20% increase from the 2015 study. Organizations worldwide are beginning to understand the gravity of the situation and are looking to increase the size of their cybersecurity workforce. Illinois Tech’s SAT offers undergraduate and graduate degrees along with certificates in cybersecurity and forensics—and is designated as a National Center of Academic Excellence in Cyber Defense Education by the National Security Agency and Homeland Security.

“There is a huge demand in the cybersecurity field but not a lot of people and resources available to teach it to the next generation of students,” says Akvile Kiskis, a fourth-year student in Illinois Tech’s Information Technology and Management Program. “Illinois Tech is one of the few universities that teaches this as a degree and has strong faculty to back it as well.”

In 2003, the United States Department of Homeland Security and the National Cyber Security Alliance established October as National Cybersecurity Awareness Month to inform individuals of their responsibility to make the Internet a safer and more secure place. Illinois Institute of Technology’s School of Applied Technology’s Information Security (SAT) is doing its part 365 days each year by educating a new generation of cyber sleuths—computer forensic specialists, malware analysts, vulnerability assessors, among others—who will be equipped to respond to and even prevent cyberattacks in a world where digital technology is ever-evolving.

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The center plans, organizes, and conducts activities and student competitions that advance its mission including the annual ForenSecure conference each spring. An industry-focused technical conference with multiple tracks, ForenSecure attracts 200+ professionals for an intensive one- and a half-day schedule that includes discussion and debate over forensics, security, data/information governance, cybercrime and cybersecurity, legislation and legal issues in cybersecurity, ethical hacking, eDiscovery, cloud forensics, steganography, policy and compliance, privacy, wireless security, cloud computing, identity theft, and more.

Illinois Tech and SAT are also committed to increasing the number of women in STEM fields as well as in the cybersecurity workforce, and as such, hosted the Women in Cyber Security (WiCyS) conference, held in Chicago in 2018. Founded by Ambareen Siraj, a professor in the Department of Computer Science at Tennessee Tech University, WiCyS is a nonprofit membership organization that brings together women in cybersecurity from academia, research, and industry to share knowledge and experience, and to network in the cybersecurity sector. The conference also features a job fair for employers to search for the best and brightest cybersecurity talent. WiCyS 2019 will be held at the Wyndham Grand Hotel in Pittsburgh and hosted by Carnegie Mellon University.

If you are interested in doing your part as a responsible user to keep cyber theft, fraud, harassment, and abuse at bay, keep abreast of current scams and report your suspicions to the Internet Crime Complaint Center (https://www.ic3.gov/default.aspx). But if you would like to enter into a much-needed and rewarding career in cybersecurity and learn from experts in this growing field, contact Illinois Tech’s Office of Undergraduate Admission at admission@iit.edu.
Innovative Student Program Award
North Carolina School of Science and Mathematics

Innovative Partnership Award
Gwinnett School of Mathematics, Science, and Technology

Program Description
Student Instructors Developing Enrichments, or SIDE, is a component of NCSSM’s outreach programming as well as its student service and leadership opportunity. SIDE is an incredibly unique program which pairs the exceptional talents of NCSSM’s residential, online, and distance education students with the school’s state-of-the-art Interactive Videoconferencing (IVC) infrastructure to develop and teach, in real-time, STEM enrichment lessons to elementary, middle, and high school students in their home schools from Cherokee County in the mountains to Dare County on the coast. A number of senior NCSSM SIDE student-teachers also travel off campus to local K-8 classrooms to deliver programming face-to-face. In 2017-2018, nearly 3,000 students located in schools in every region of the state participated in these STEM enrichment sessions.

NCSSM offers more than fifty enrichment activities, each meeting various NC and national competencies and objectives. These live enrichment sessions serve as resources, providing North Carolina public school teachers and their students with engaging, hands-on activities designed to reinforce concepts taught in science, mathematics, technology, and engineering curriculum. During these enrichments, participating students learn about various scientific processes, discuss the design of the experiments, and consider what can be concluded from their outcomes. Whether they are trying out binary code for the first time, converting used cooking oil from their school cafeteria to biodiesel fuel, or extracting their own DNA with household items (like rubbing alcohol, detergent, and protease / meat tenderizer), students gain confidence through trial-and-error exploration and the failure-informed, iterative design process.

In addition to the live-sessions, prerecorded do-it-yourself enrichments have been produced and made available online to classrooms across the state, providing guidance, teaching materials, and videos that allow for flexible, asynchronous learning experiences. More Information about NCSSM Enrichments is available at https://sites.google.com/a/ncssm.edu/stem/enrichments/home

How this event has advanced the mission for your school
SIDE helps NCSSM Mentor and inspire younger students to look at the world through the lens of a scientist, testing ideas and learning from their success and failure to consider the potential for continued study in STEM and working toward STEM careers. IVC has increased access to STEM courses in high school has been correlated to STEM pipeline persistence and STEM careers, the STEM trajectory of these students began before high school. Early exposure, encouragement, and support in real-world, relevant STEM activities provide students with experiences necessary to develop and sustain early interest and aspirations. Interest drives enrollment, and the interest begins in elementary and middle school.

This program also provides NCSSM SIDE student-teachers with an opportunity to lead, communicating science through curriculum development and modeling success, helping younger students to see where they may be in 5-6 short years. SIDE student leaders gain first-hand experience with live, on-camera communication. Perhaps more importantly, they receive anywhere from 33 hours for juniors, to 100 hours for seniors, of rigorous curriculum development training and instructional experience. SIDE leaders gain valuable experience developing and teaching content that is engaging and accessible.

Finally, SIDE helps NCSSM target more rural communities, with specific focus on recruiting into the program more students typically underrepresented in STEM fields. Likewise, NCSSM recruits underrepresented NCSSM students to serve as SIDE student teachers. In doing so, SIDE provides younger underrepresented students with role models who can speak to the challenges and rewards of their path to success in academically challenging subjects.

Description of innovative nature of this program
This program is innovative because it effectively bridges distance, it can be replicated easily at another school, and it provides an opportunity for digital asset development and shareable open content. NCSSM’s strategic goal is to reach 100,000 teachers and 1,000,000 students, and one way this ambitious goal will be realized is through the publication of multimedia content, including lessons, activities, videos, graphics and other instructional materials, on the school’s active and established online channels. SIDE provides the time, resources and access to groups of students needed to build out the collection of resources to address as many as 35 new topics in the curriculum per year.

NCSSM’s digital content reaches tens of thousands of teachers and students every day. Teachers in North Carolina’s public schools can book a live session based upon the content developed or they may integrate a DIY activity in their teaching, pull a video from a module into their class presentation, or even provide students with centers for advanced learning or remediation that feature this content. Schools may also use these materials to provide their students with ready-made club and afterschool activities.

Program Name
Student Instructors Developing Enrichments [S.I.D.E.]

Institutional Member School Name
North Carolina School of Science and Mathematics

Nominator’s
Melissa Thibault

Video link
https://www.youtube.com/watch?v=exhWPuJAWa8&feature=youtu.be
The students met once each week after school for approximately three months to research, 3D print, and assemble a new arm and hand for Harun. Earlier this month, the students were honored at the ASD Board of Trustee meeting. On Monday, May 15th, Harun was able to put on the red, white and blue arm that was 3D printed just for him, and to the sound of applause, flexed his new hand for the first time! Harun had some input over his new prosthetic arm, and he even helped select the colors. The colors were chosen based on the second graders’ love of Captain America. In addition to the new prosthetic, the students also presented Harun with a cape and mask that matched his new hand.

Video link
https://youtu.be/yuIDPB3HAhc

The group of students were so inspired by the impact that they made on Harun, that they have decided to continue their work making prosthetics for those who can not afford them by using the e-NABLE network. According to the website (enablingthefuture.org), the e-NABLE Community is made up of teachers, students, engineers, scientists, medical professionals, tinkerers, designers, parents, children, scout troops, artists, philosophers, dreamers, coders, makers and everyday people who just want to make a difference and help to “Give The World A Helping Hand.”

Description of innovative nature of this program

The hand that the students from the Academy for Science and Design (ASD) made will allow Harun to do all kinds of tasks, it opens and closes as he bends his elbow. That creates tension on the strings inside the device which moves the fingers.

The hand created at ASD only required about $13 in materials, as well as a great deal of patience and precision from the dedicated students, which is much more affordable than the thousands of dollars they typically cost. This local New Hampshire family would not have been able to get a prosthetic for their son if not for the dedicated students at ASD along with computer science teacher Madge Smith.

How this event has advanced the mission for your school

After the band was finished, the entire community heard about this wonderful after school program at the Academy for Science and Design and the response was incredible. It showed what students with an interest in STEM are capable of, even before they enter college when they have a goal to accomplish.

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Program Description

The Science Research and Engineering Program (SREP) at Hathaway Brown School (HBS) in Shaker Heights, Ohio has been working to build the next generation of leaders in science, technology, and engineering fields for over 20 years. Students in grades 9-12 conduct real-world research projects alongside scientists and engineers in professional laboratories at local hospitals, universities, and scientific institutions. This elective course along with the extracurricular research attracts students curious to learn more about scientific careers. For the first semester students use activities and presentations in class to help them identify the kind of research they might be interested in pursuing. Students then apply to be placed in a local laboratory they have personally identified through SREP. Students are matched and start in a lab during either the second half of their freshman year or during their sophomore year. their first goal once in the lab is to transition from a liability to the lab to an asset as quickly as possible. They continue to work alongside professional researchers for most of their high school career ranging from 2-4 years, to allow the student to not only train breadth and depth but also to conduct their own original research in a real-world research environment of a graduate school model. This time occurs throughout the academic year as well as for several weeks each summer.

From its inception, the SREP has focused on providing students with an opportunity to learn how to conduct research alongside professionals while daily witnessing those with advanced degrees exemplifying "learning for life" by embracing inquiry and knowledge through research.

Description of innovative nature of this program

The Science Research & Engineering Program (SREP) partners students in high school with professionals for multi-year projects while maintaining a parallel Research Seminar Class where there is consistent coaching, advisement, and professional development from a high school mentor. Any amount of time in a professional research laboratory is beneficial for a budding high school scientist or engineer, but it takes more than one summer to learn, digest, and contribute to a lab’s research goals or even a specific project. SREP student’s 2-3 year time commitment truly differentiates the SREP and allows students to transition to an asset rather than a liability in the lab. This requires becoming proficient at techniques, linking multiple experiments together intellectually so they make sense as a story, and finally, understanding how a specific project fits in with the “big picture” research goals. From its inception, the SREP has focused on providing students with an opportunity to learn how to conduct research alongside professionals while daily witnessing those with advanced degrees exemplifying "learning for life" by embracing inquiry and knowledge through research.

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The young ladies who attended this event gained many valuable skills. The goal of the workshop was to get young ladies interested in this area at an early age. Over 80 fourth and fifth grade girls from Rockaway and Denville Township Schools took part in the two-day workshop. Working in small groups with a high school student serving as their mentor, the participants learned how to code, design, prototype, and eventually build a robot that they designed. The young ladies who took part in the workshop also met the requirements for three Girl Scout Merit Badges: Programming Robots, Designing Badges, and Showcasing Robots. Upon returning for the second session, the results were astonishing. When questioned about their interest in STEM-related classes when they reach high school, an overwhelming majority indicated they will be signing up for these classes. When asked about what skills they gained from the workshop, the young ladies responded that team work, coding, and the engineering design loop were key elements. By receiving these results, it is clear that our program will have a profound impact on the number of females enrolled in STEM classes when they reach high school.

Description of innovative nature of this program

This program is innovative as it is the only program of its kind in our area. We were able to recognize a deficit in STEM and longitudinally plan out a course of action. It was rewarding to see how each team was able to leave the first day of the workshop with the tools to design a robot on their own. Upon returning for the second day, each group of girls had brainstormed ideas and sketched rough versions of the product they planned to build.

By sparking the interest of these young ladies at an early age, we are creating a love of STEM at a crucial point in their lives. As these students enter middle school we will continue to be a presence in their lives. With addition programs in place, such as a hour of code and Tech Day, we plan to continue to spark their interest. By creating a passion for STEM through our program, we are optimistic that we will see growth in female enrollment in our program.

Name of Program
First Annual Girls in Robotics
Institutional Member School Name
Morris Hills Regional District
Nominator’s Name
Keith Bigora

Program Description

On April 24 and May 1, 2018, the Morris Knolls High School Technology Department hosted the first ever Girls in Robotics workshop series. Given the shortage of female representation in Science, Technology, Engineering and Mathematics (STEM) fields, the goal of the workshop was to get young ladies interested in this area at an early age. Over 80 fourth and fifth grade girls from Rockaway and Denville Township Schools took part in the two-day workshop. Working in small groups with a high school student serving as their mentor, the participants learned how to code, design, prototype, and eventually build a robot that they designed. The young ladies who took part in the workshop also met the requirements for three Girl Scout Merit Badges: Programming Robots, Designing Badges, and Showcasing Robots. Upon returning for the second session, the results were astonishing. When questioned about their interest in STEM-related classes when they reach high school, an overwhelming majority indicated they will be signing up for these classes. When asked about what skills they gained from the workshop, the young ladies responded that team work, coding, and the engineering design loop were key elements. By receiving these results, it is clear that our program will have a profound impact on the number of females enrolled in STEM classes when they reach high school.

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Name of Program
MSSM Summer Camp
Institutional Member School Name
Maine School of Science and Mathematics
Nominator’s Name
Ryan McDonald

Program Description

For the past 21 years, the Maine School of Science and Mathematics (MSSM) has hosted a STEM summer camp. The camp, with the tagline “Opening Curious Young Minds” brings in over 150 middle school students per summer and introduces them to various STEM topics such as robotics, bridge engineering, calculus, dissection, game theory, aerodynamics, astronomy, rocketry, geology, and more.

One result has been an increased statewide interest in LEGO and VEX Robotics and how problem solving relates to real-world issues. Some things from the camp cannot be measured for effectiveness, such as how teaching STEM also teaches the scientific principles of formulating a hypothesis, testing it, and evaluating the results. The same applies to the engineering process of having an idea, finding the faults, resolving them, and then testing. Campers learn these ideas through STEM and can apply them to all other aspects of their lives.

Outside of the STEM classroom, some of our success comes from the activities that promote critical thinking and problem solving. One such activity is Breakout, where campers must work together and solve puzzles to get lock combinations that open a box. The classes, along with the afternoon activities, promote collaboration and show the campers there can be multiple solutions to any problem. The student-generated solutions give campers confidence in their decisions and allows them to debate the path they took to get there, the obstacles and resolutions, and then their final result.

How this event has advanced the mission for your school

The MSSM STEM Summer Camp espouses a younger population of kids to STEM in a non-traditional way. A secondary effect is how it introduces STEM to children that may not be interested in pursuing a STEM career, but will need the decision making skills learned through STEM education to enhance their adaptability to not only work, but also thrive in a technology-driven society.

The MSSM Summer Camp is held at the school itself and gives campers a chance to see the school, dorm, campus, and facilities. The camp’s purpose is to introduce STEM, but it also acts as a feeder program for the school, because the students learn about STEM topics and then ask about how they can pursue it beyond camp. MSSM is a public, residential, STEM Magnet school serving Maine students and many campers realize the direct connection between what they have learned at camp and what value attending the school would provide. In previous years, we have hosted an Educator’s Camp where teachers from around Maine can experience new areas of STEM and learn how to effectively teach them to their students.

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Video link


https://www.youtube.com/watch?v=PkJLitQYN4w
Program Description

The Gatton Research Internship Grant is a model for other schools who seek immersive, authentic experiences that guide students through an outcomes-based model designed to replicate the roles scientists fulfill. From developing research questions, seeking grant support, carrying out work through empirical-supported scientific processes, and documenting the outcomes, the program trains Gatton Academy students to become the next generation of leading scientists. Every dimension of the Gatton Research Internship Grant program is designed to mirror the roles scientists fulfill. From developing research questions, seeking grant support, carrying out work through empirically-supported scientific processes, and documenting the outcomes for distribution to the scientific community, the program trains Gatton Academy students to become the next generation of leading scientists.

Description of innovative nature of this program

The Gatton Research Internship Grant creates student research internships through an outcomes-based model designed to replicate the roles of a professional researcher’s career. While the research itself takes place in a full-time, dedicated summer internship, the process plays out over a year’s time. By design, the program offers students age-appropriate and tangible outcomes, while giving them an authentic experience that contributes new knowledge to the science community. Through careful guidance and grant requirements monitored by Gatton Academy staff, students’ research outcomes are designed to ready students to enter high school STEM competitions and college.

Program BCA Flash

BCA Flash is a one-day event where Bergon County Academies students teach middle school students topics in the STEM field. Prior to the event, each student, with guidance from his or her parent/guardian, went onto the BCA Flash website and registered for his/her classes on a first come, first served basis. This STEM Student Program began at 10 a.m. when the sixth through eighth grade students split into their respective classrooms. BCA Flash consists of 24 distinct classes that tackled topics in evolving and emerging STEM fields such as electronics engineering, immunology, website building, and even different types of energy.

Preparation

BCA Flash was possible due to the student teachers, the teachers, parents, and administrators who supported the program. The parents assisted in the logistics of BCA Flash and supported our mission, but also provided the middle schoolers with some of the knowledge and skills that are essential to achieving their goals and advancing their future in the STEM field. BCA Flash gave the middle school students an experience of a lifetime by enabling them to learn topics in the STEM field they might not have otherwise learned. The parents recognized the program with a better understanding of the content and importance of the fields, and an appreciation of the possibilities they could pursue. Many choices were available for the middle school students to encourage their creativity and broaden their exposure to STEM. Bergon County Academies, on a daily basis, serves education at its finest by preparing students for their college and future careers. Thus, BCA Flash fostered an idea of constructing an ideal education that consists of the perfect mix of engagement and learning. In this specific environment, these young students were exposed to important fields early on so that they can be better prepared to contribute to them. This program showcased the unique learning environment at the Academies and the various STEM-related opportunities and experiences in that students can pursue.

Description of innovative nature of this program

BCA Flash is a one-of-a-kind program because it showcased topics that have great relevance to the modern world. The middle schoolers who attended BCA Flash were able to choose from a variety of STEM classes. These classes were not about any general science, instead, they were focused on one topic within the field. For example, students had the opportunity to engage in hands-on-experiences via participating in experiments, coding, and robotics. Students were encouraged to think outside the box and use what they learned to create, innovate, and lead. One engineering class involved building a self-propelled car. In doing so, students were instructed to utilize their creativity in order to build the best possible model. Of course, prior to this construction, they learned the foundation of engineering design and mechanics. Students learned everything from basic dimensional analysis to how to solve challenging chemistry problems with the help of the student instructors. BCA Flash incorporated technology in innovative and compelling ways, often by utilizing laptops, video cameras, interactive whiteboards, and much more. The middle school students received an assorted taste of the evolving world. BCA Flash showed innovation by presenting various sectors of the STEM field through intriguing courses that enabled the students to learn in an engaging way. This program was unique because BCA student teachers also served as role models for the middle schoolers, who were able to gain a better understanding of what type of STEM careers they may pursue at the secondary level.

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Video link

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**Program Description**

For the past ten years, Rockdale Magnet School's (RMSST) Freshmen Poster Session has served as the capstone event for the school's ninth grade Research 1 Students. The April event, held in the school’s cafeteria and judged by RMSST’s junior class, gives ninth graders the opportunity to share their proposed research ideas in a “low stakes” environment. Participants are organized into science fair categories and compete against each other with a 11x17” poster that outlines their proposed research for the following school year. Parents and extended family are invited giving the event the celebratory feel of a student showcase. While attendees mingle among the presentations, the RMSST juniors are busy judging the poster presentations using an ISEF adapted rubric. Furthermore, the junior class judges utilize the same electronic judging platform that is used at the junior class judges utilize the same ISEF quality projects. The event helps students identify and troubleshoot problems that, if left unidentified or unaddressed, would become obstacles to success later in the research process. Family and friends are invited to attend, and the skills and experience of the RMSST juniors are leveraged as they judge the projects and provide feedback. The inclusion of these groups coupled with the excitement brought to the event by the freshmen helps build a “culture of research” at Rockdale Magnet School. “What are you researching” is part of the daily dialogue at RMSST, and, in many ways, our mission is to empower students to effectively answer this question. For many of our students, the answer to that question begins to be revealed during the Freshmen Poster Session.

**Description of innovative nature of this program**

One limitation of traditional science fairs is that they provide feedback at the conclusion of the projects. RMSST provides an incentive for students to take the feedback and use it to improve their work. The most significant innovation of the Freshmen Poster Session can be found in the event’s timing. Because freshmen are presenting their proposed research plans rather than completed projects, the poster session provides students with the opportunity to receive and react to that feedback at the beginning of the research process. Ultimately, this leads to better, more competitive student projects.

**Video link**

https://www.youtube.com/watch?v=Gq3FPqjPZQg

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**Name of Program**

Freshmen Poster Session

**Institutional Member School Name**

Rockdale Magnet School for Science and Technology

**Nominator’s Name**

Scott Bolen

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**Name of Program**

SEA STEM Fest

**Institutional Member School Name**

John Jay Science and Engineering Academy

**Nominator’s Name**

Jean Karst

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**Program Description**

For the past two years, our STEM Student Program, known as STEM Fest, has served almost 12,000 members of our community by teaching them what it means to work in a STEM field. This annual event is powered by over 200 student volunteers each year. The student volunteers are passionate about science and engineering and share that same passion with the community at large. STEM Fest is a an array of workshops that include, but are not limited to, behavioral and social sciences, biology, chemistry, computer science, engineering, health sciences, mathematics, physics, robotics, zoology, and astronomy. These divisions consist of students that take on various roles such as director, lead, and team members. The directors are students with high levels of responsibility, and they each specialize in one of the many divisions of science or engineering. These directors then must design and organize STEM-based activities for a variety of grade levels. They are also responsible for training the lead so that when the director graduates, the lead can step up and become the director of the division.

Since the activities for STEM Fest have to interest a wide range of ages, our directors come up with new activities yearly to attract more and more people. For example, this past STEM Fest saw several new additions such as the bottle rockets in the astronomy division. These rockets were powered by air pressure, and used a small amount of water in order to keep the air pressure inside. The volunteers running this activity would explain how the rockets worked via air pressure to the guests, changing the level of detail in their description depending on the guest’s age, and have them launch the rocket. This was an amazing learning experience for all guests who participated, as they not only got to see hands-on how air pressure works, but were able to use what they learned to launch a bottle 100 feet in the air.

STEM Fest was first started with the intent to teach the community in a hands-on and interactive way what it means to work in a STEM field, and since its founding, that tradition has continued. We have been able to expose students who may not otherwise have been exposed to STEM fields. STEM Fest has been and will continue to be successful because it allows passionate students to share their love of science or engineering with the community, and to inspire the next generation of young minds.

**How this event has advanced the mission for your school**

Rockdale Magnet School for Science and Technology (RMSST) is a STEM focused high school that emphasizes original student driven research. The Freshmen Poster Session has proven to be an essential tool in helping our youngest researchers design and ultimately complete competitive, ISEF quality projects. The event helps students identify and troubleshoot problems that, if left unidentified or unaddressed, would become obstacles to success later in the research process. Family and friends are invited to attend, and the skills and experience of the RMSST juniors are leveraged as they judge the projects and provide feedback. The inclusion of these groups coupled with the excitement brought to the event by the freshmen helps build a “culture of research” at Rockdale Magnet School. “What are you researching” is part of the daily dialogue at RMSST, and, in many ways, our mission is to empower students to effectively answer this question. For many of our students, the answer to that question begins to be revealed during the Freshmen Poster Session.

**How this event has advanced the mission for your school**

STEM Fest is an event that is predominantly run and organized. Adults have limited involvement in the planning and organization. This whole event is about students teaching other students. Students are not required to be a part of STEM Fest, but the majority of our students choose to. Why? The students at our school love to share their passions with everyone. So if a student was passionate about biology, they could sign up for the biology division and teach other students what biology is and why that student is passionate about it. This makes STEM Fest unique. We have students teaching students about the things they love in STEM, and the passion that our volunteers have ends up being shared with the students and the community.

STEM Fest also focuses on giving people a hands-on, interactive experience of the many different possibilities in STEM, such as learning how stitching and suturing can heal a wound or learning about how density works, then applying that knowledge to suture a banana or even make a functional lava lamp. That’s what STEM Fest is for. Giving students a unique, hands-on look at every aspect of STEM.

**Description of innovative nature of this program**

The mission of our school, the John Jay Science and Engineering Academy, is to teach and inspire the next generation of STEM students, and STEM Fest allows students to inspire others in their community.

STEM Fest allows our students to inspire the next generation of young engineers and scientists. By having students teach students, it helps the next generation see what others enjoy about a certain field, and opens them up to the possibility of what that field could entail. For example, if you ask a student what a civil engineer does, most probably couldn’t tell you. However, at STEM Fest, our volunteers not only help students learn about any given activity, but are able to tell them which careers those activities are modeled off of. To give an example, our engineering division has an activity called the ‘shake table’, which demonstrates how buildings need to have strong supports in order to withstand something like an earthquake or a flood. Our volunteers would explain that civil engineers do things like that on a daily basis. It is through STEM Fest that our school can both teach the community about careers in STEM and inspire the next generation of students.
PROMISE is designed to meet these needs as well as challenge and motivate participants toward even higher achievement. Designed to increase the diversity of the enrollment at IMSA, PROMISE assists students in their preparation for advanced study in secondary and post programs, whether or not they choose to apply.

IMSA PROMISE consists of three programs which focus on activities that are curriculum-based and develop skills in problem-solving, communication, collaboration, and making connections among the areas of science, math, and the humanities. The academies are designed and led by IMSA faculty to provide students a true IMSA experience. As a result, approximately half of the participants apply for admission.

Leading Students to Success (LLS) provides math, reading, and other enrichment classes designed to help students who struggle in areas such as critical thinking and problem-solving. Programs that provide math, reading, and other enrichment classes for students who need additional support.

Getting Started (GS) provides rising 9th graders with a ten-day summer residential experience on IMSA’s campus. Students learn first-hand the joys and challenges of our living and learning environment. Students attend classes in the core subjects of mathematics, science, and English as well as receive SAT preparation instruction in preparation. Participants also take part in residential living programs and activities. In the classroom, they are engaged in hands-on challenges that are focused on real-world problems, such as energy, food safety and forensic technology.

I learned how to take a leadership role in groups. My math and science understanding is amazing. I gained lots of confidence from the IMSA program (SEAMS participant).

The Early Involvement Program (EIP) provides 9th grade students who attend advanced discovery-based and collaborative activities during the 12 Saturday sessions. Students develop research skills, decision-making, and self-motivation. Curriculum covered in EIP most closely resembles IMSA content and it’s during this stage of PROMISE that many students make the decision to apply.

I think this PROMISE program is an invaluable resource that every underrepresented student should take advantage of because it truly presents a once in a lifetime opportunity and changes lives just like it changed mine (EIP participant).

How this event has advanced the mission for your school

The mission of the Illinois Mathematics and Science Academy is to ignite and nurture creative, ethical scientific minds that advance the human condition. As an academy, we recognize and acknowledge the historical underrepresentation and marginalization of culturally, linguistically, and economically diverse (CLED) groups in STEM education and careers. Another unique aspect of PROMISE is that current IMSA students are tutors and mentors for the program, a cross-age cooperative learning model. The current IMSA students gain leadership skills, which assists with retention, while the participants are able to create a vision of themselves as a STEM as a result of these interactions. One IMSA student tutor put it this way: “PROMISE programs have taught me so much and make me feel as though I am making a difference. I love the feeling of being able to help a student understand a new concept or see the spark of excitement during lab. Diversity in the classroom creates so much more potential and PROMISE has made me realize the importance of varying opinions and perspectives.”

PROMISE participants experience the journey of inquiry-based learning, and gain an understanding of complex problem-solving, experiences that prepare them for the world of problem-solving through inquiry-based learning. These CLEGG groups have experienced academic, academic, and social pressures, that have defined them as “at-risk” for future academic success, especially in STEM. However, through the PROMISE program, IMSA continuously develops a group of leaders that will ultimately advance the human condition.

A Chicago Public School teacher stated the following:

“Your PROMISE Program has been the life-line and enhance the knowledge base for these students… by providing them with the time to develop seemingly outstanding ideas or tease their brains with the “what if” possibilities… you are making such a huge difference in the lives of these inner-city youth who, otherwise, would not be privy to this level of academic exposure until much later on in their academic pursuits.”

Description of innovative nature of this program

One unique aspect of PROMISE is that it’s a culturally, geographically and intellectually diverse program. The premise of PROMISE is to assist those who have been under-served in becoming STEM literate. Ultimately, this diversity can assist in bridging the racial divide in STEM majors and careers. Another unique aspect of PROMISE is that current IMSA students are tutors and mentors for the program, a cross-age cooperative learning model. The current IMSA students gain leadership skills, which assists with retention, while the participants are able to create a vision of themselves as a STEM as a result of these interactions. One IMSA student tutor put it this way: “PROMISE programs have taught me so much and make me feel as though I am making a difference. I love the feeling of being able to help a student understand a new concept or see the spark of excitement during lab. Diversity in the classroom creates so much more potential and PROMISE has made me realize the importance of varying opinions and perspectives.”

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**Program Description**

The Future Scientist Program (FSP), at LSMSA is designed for students who desire to become tomorrow’s scientists and engineers. By enrolling in the program, it gives the students a structured pathway with mentored guidance, opening up avenues to achieve what would normally be an overwhelming process if they attempted on their own. The students are required to complete the following components: 1) be an ambassador to LSMSA’s Science which includes actively pursue learning, abide by high ethical standards, supports peers and community, 2) be an active member in a science “society” (i.e. science-themed club), 3) document a minimum of 48 hours of web/involuntary science research, and/or science programs, 4) complete a minimum of Biology, Chemistry, Physics and an additional 18 hours of science courses to include. Science Research Seminar, Science Research Seminar, Computer Science I and Computer Science II, 5) maintain a minimum 3.25 GPA in science courses, and 6) participate in some type of science themed competition. LSMSA’s FSP was established in 2006 and as of to date we have had 200 students complete the program. Since instituting FSP we have observed a noticeable increase in enrollment in science electives, more hours of electives taken, and higher number of students desiring. One could argue that by accelerating the academics, the lifelong growth is significantly more than it would have been otherwise. The requirement of participating in research, science programs, and learning across different, science research projects, science programs, and volunteerism. Over 200 students have been connected with science or engineering research. The University of FSP has resulted in significant opportunity for FSP alums to give back to the program by offering research internships, giving guest speakers, and donating resources. Another offshoot of FSP is a dramatic increase in the number of science

**How this event has advanced the mission for your school**

FSP has advanced LSMSA’s Mission statement in several ways. Although LSMSA’s graduation requirements are rigorous in their own right, FSP mandates a little more. LSMSA’s graduation requirements call for Biology, Chemistry and 2 additional units of Science, FSP requires Physics, Computer Science, and an additional 12 hours of high-level science electives that are comparable to sophomore through senior level college courses. Examples of these courses, most of which have a lab component, are Microbiology, Meteorology, Modern Genetics, Organic I & II, Inorganic, Analytical, Electrodynamics, Quantum Mechanics, and Astrophysics. This is just the type of academic menu that these high-achieving, highly motivated students are desiring. One could argue that by accelerating the academics, the lifelong growth is significantly more than it would have been otherwise. The requirement of participating in research, science programs, and learning across different, science research projects, science programs, and volunteerism. Over 200 students have been connected with science or engineering research. The University of FSP has resulted in significant opportunity for FSP alums to give back to the program by offering research internships, giving guest speakers, and donating resources. Another offshoot of FSP is a dramatic increase in the number of science

**Program Description**

“When Asa Hutchinson was elected Governor of Arkansas in 2014, he launched his “Arkansas Tech County” platform—and the signature component of his education stump—was requiring all Arkansas high schools to offer computer science classes. Combining only 25 high schools in the state were doing so at the time, the notion that all schools would be ready nine months later presented an opportunity for ASMSA to step forward and provide both leadership and support to hundreds of students across the state beyond our residential experience. Rather than focusing onturnkey solutions, Coding Arkansas” functions in three primary ways: distance education, educator development, and facilitating a professional learning community for teachers. In this format, a master teacher provides all instruction to both local faculty and students. Framed around a cohort experience that consists of a summer “boot camp” and ongoing professional development throughout the year, ASMSA’s Computer Science Education Specialist guides the cohort of teachers through the state’s new, year long high school computer science classes. The specialist also provides direct instruction to the students through blended online learning. Unlike traditional asynchronous distance education, students would have an active voice in the support of their own teachers as well. Teachers are learning to master these concepts. Additional digital resources that are used are the PRAIS exam and gain licensure to teach the subject.

Since Coding Arkansas’ Future was announced, more than 3,000 students have gained new skills through its opportunities. Last year alone, the program accounted for one-in-five young Arkansans exploring computer science at the high school level. Twenty-five percent of the state’s licensed computer science teachers have gone through the yearlong cohort experience, and ASMSA has provided some form of professional development to 40% of the state’s licensed CS teachers. Indirectly, we estimate the program has impacted 7,000 students to their learning. The initial successful of introductory courses has led to the development of higher-level experiences such as Advanced Placement Computer Science “A” as well as an Independent Study in Computer Science elective that combines computer science, mobile apps development, and principles of entrepreneurship. Beyond the day-to-day instruction of students, the program has resulted in a variety of out-of-school and co-curricular programs that have helped students draw connections with real-world and project-based learning. Arkansas is the U.S. Flagship Apps For Good. The British organization provides students around the globe with access to mentors and resources to develop apps that address critical needs within their local communities and solve problems of concern. The Arkansas Apps for Good Festival brings together 200 students from across Arkansas to explore how technology can benefit our state. Students participating in the program have also connected with the Congressional App Challenge, Women’s Foundation of Arkansas’ Tech for Good competition, Governor’s All-State Computer Science Competition, Computer Science Education Week/Missouri of Code, NYU Tandon School of Engineering Cybergals Challenge, and a host of other events and competitions that had never been on the radar of these students and schools.

**How this event has advanced the mission for your school**

“Coding Arkansas” Future combines four distinct components of ASMSA’s legislated mission: advanced coursework, distance education, professional learning and development, and a commitment to the state’s overall K-12 computer science training ecosystem. Historically, these changes were thought of as individual activities. Through the development of the initiative, our campus stakeholders worked to establish new ways of thinking on how to connect the concepts into a seamless approach for meeting the challenges of our stakeholders. Most of all, it reimagined our concept of outreach as something more than a turnkey service for districts that lack resources. Rather than simply providing solutions to small and rural districts, we have committed to building capacity within those schools and their educators that creates the potential for a lasting impact.

When Governor Hutchinson helped ASMSA formally announce the program in spring 2015, his chief of staff asked our Director, ‘ Aren’t you concerned that this new push for computer science education will make ASMSA less special?’ ASMSA’s Director replied, ‘Of course not. It ensures our campus embraces its role in leading the way, developing new approaches to learning, and ensuring all Arkansas students have access to quality experiences.’ The program has been so successful in computer science that it has been replicated in Advanced Placement Biology, and initial planning is underway to offer upper-level mathematics classes. We continue to work with the Arkansas Department of Education to assess other areas of need for the state and how this model can be effective across all STEM subjects.

**Description of innovative nature of this program**

In a very short time, we were able to marry our institutional computer science content and pedagogy expertise with our existing distance learning infrastructure to create a new model for remote teacher professional development and team teaching to implement the Governor’s vision. The approach proved to be effective and scalable for supporting computer science instruction, and we have now leveraged it to support Advanced Placement Biology courses as well. To fully realize the Governor’s vision, each school will need to have a confident, competent computer science teacher. Current teacher preparation programs aren’t equipped to meet this demand, and qualified graduates of a new program would be at least half a decade away. Coding Arkansas’ Future’s innovative use of existing technologies to support a nimble, scalable form of professional development addressed an immediate need within months, and serves as an example that shows promise for a variety of STEM disciplines.

Finally, the model represents a new spin on team teaching. Traditional approaches rely on two teachers in a shared space. Our model allows students to interact with a variety of instructors, professionals, and other content experts across the state and nation as they explore computer science. Moreover, students develop deeper connections with both their local teacher and the primary ASMSA instructor who is available by email, Slack, Skype, and even on-campus visits to support their learning.

**Video link**

[https://youtu.be/fhn2WfnNAB0](https://youtu.be/fhn2WfnNAB0)
In 2009, then superintendent of the Hemet Unified, Phil Pendley had an idea that would benefit students of Hemet as well as ensure the financial viability of a local gem, the Western Science Center. WSC was created when Diamond Valley Lake was constructed and bones, fossils, and artifacts were discovered. The museum is a treasure trove of anthropological, paleontological, and cultural artifacts. With the museum, 12 classroom-sized spaces were also built without a plan for what they would be used for.

Dr. Pendley’s idea was to fill the classroom spaces with a charter school focused on high quality STEM education in a community fraught with unemployment, homelessness, and crime. The lease payments from the school would keep the museum afloat, the classroom space would allow the school to begin immediately, and the partnership between the two would result in some amazing and unique experiences for students.

The school began with 6th grade, but demand was so strong, that 7th and 8th grades were added that first year. The school was ranked at the top of all schools in California for 5 years when parents began to request that the school expand into high school grades. After a capital campaign between the school and museum, WCA Middle School expanded into high school. We have now had two graduating classes with a 100 percent graduation rate and a 100 percent college/charter/religious service rate.

The partnership between the school and museum has led to innovative and unique clubs, programs, and classes. The museum creates a ‘Simulated Dig Site’ for the school and in a partnership between museum staff and WCA teachers, 6th and 7th graders learn to be field archaeologists and paleontologists. They grid, measure, photograph, and dig up the sites to discover the treasures that the museum has buried into different scenarios such as buildings, animal skeletons, fire pits, or cultural sites. Groups of students spend up to 3 years excavating the entire site. Museum staff has also guided students in molding and casting activities where students make silicone molds of specimens in the museum’s collection. They then make plaster casts from the molds and paint the casts to look like the originals. Typically, only experienced museum staff have experienced such techniques. The students used some of these techniques as well as others learned from the museum staff to work with students in South America to create a permanent display for the museum.

The campus sits on a nature reserve and museum-connected staff have supported the school in scientifically studying the success of the reserve in preserving the animals within. Students applied for permission to collect insects, collected inside and outside of the reserve, extracted DNA, and analyzed the DNA to conclude that the reserve insects are genetically healthy.

This unique partnership has been a great benefit to both the students of the Western Center Academy as well as visitors to the Western Science Center. Without the other, each partner would not have experienced the success that has been realized.

How this has advanced the mission for your school

The Mission of the Western Center Academy is to prepare students for STEM majors in college as well as STEM careers. This partnership with the museum has allowed us to give our students real-world applications of their learning and a hands-on experience in the classroom. We have had multiple students work on original research with the museum collection and submit the projects to the science fair. Few students get such a hands-on, research-infused experience as WCA students do.

The museum has benefitted from the relationship by giving them an outlet for their outreach, partners in their research, and a testbed for new ideas. They are constantly involved in our activities and we are involved in theirs. Our students volunteer at their Science Saturdays and we have participated in scientific research together. Additionally, it would be nearly impossible to keep a museum open in Hemet, CA on ticket sales alone. The public would have lost out on this incredibly educational experience had the museum not remained open. The relationship between the two has become so influential, that the school uses a unique educational method that we have termed “Museum-Discovery Learning. Besides the individual benefit to each, the synergy between the two provides the energy, excitement, and curiosity missing at many other schools. Neither of the partners could have been successful without the other.

Description of innovative nature of this program

There are only a handful of schools around the country that exist on museum campuses. It is the depth of the relationship between WCA and WSC that is so innovative amongst those schools. Rarely is a museum so involved in the initial planning and implementation of the school. In fact, the school’s founding principal (now the Executive Director) was the museum’s educational outreach coordinator before opening the school. Dr. Pendley had been planning such a relationship and decided to pay for the outreach coordinator from the district budget while his work was all through the museum. He then went on to found the school, write the original charter, and has led the school to where it is today.

Between the international collaborative projects, the novel research, the simulated dig site, the molding and casting experience, the Science Saturdays, Science Under the Stars, and the Inland Empire Science Festival, the two organizations work so closely together that they can almost be seen as one. The synergy between the two and the depth of the relationship make this such a unique experience for students as well as museum visitors. This relationship has inspired the school to host the museum in our multi-purpose room from what we have learned being housed on a museum site.
The mission of the Academy for Science and Design (ASD) is to graduate well-rounded students with the capacity for high achievement and leadership in their colleges and careers, who have in-depth subject mastery, who hand-on hard, real-world experiences. Our success in achieving these goals depends upon the students’ experiences while enrolled at ASD. Our skilled teachers and challenging curriculum depend heavily on the availability of partnerships with local employers to provide opportunities for inspiring our students and preparing them to succeed. To this end, we call upon community members such as OMRON Microscan to support our students by providing mentorship opportunities within their businesses. OMRON Microscan is a company that strongly believes in supporting local science and technology education. ASD student internships at OMRON Microscan and other companies, in a real-world setting, what they’ve learned in their preceding years at ASD including interview skills and creating a resume. The students who are hired are able to work side-by-side on projects that deliver real results and have a direct impact on OMRON Microscan’s business.

Description of innovative nature of this program
The Academy for Science and Design has partnered with the OMRON Foundation in order to establish the “ASD Center for STEM Invention” to tap student leadership in helping to expand New Hampshire’s STEM pipeline. Studies indicate a shortage of students in the pipeline to STEM-related industries of New Hampshire’s envisioned future. The Academy for Science and Design is working to reduce this gap through its identity and high performance as a STEM-specialty school willing to develop its students’ capacity to help address the state’s STEM education priority. OMRON proposes to establish a “the Center for STEM Invention,” serving first as a “Spark lab” for students involved in intensive studies of novel STEM ideas, but also as a design center for engaging students statewide in STEM inquiry and invention activities through unique, student-designed, student-led competitions. In some ways similar to Ashoka’s Catapult and Changemakers programs that join students with other students and with thought leaders in technology and other industries to develop enterprise solutions to worldwide problems, the purpose of the Center will be to support individual and collaborative studies of novel STEM concepts for subsequent development into student-led competitions for participation by teams of students in other New Hampshire schools, including advisors from colleges and industries.

Name of Partnership
OMRON / ASD
Institutional Member School Name
Academy for Science and Design
Nominator’s Name
Jennifer Cava

Name of Partnership
Future Leaders DREAM STEAM Event
Institutional Member School Name
The Mississippi School for Mathematics and Science
Nominator’s Name
Rick Smith

Description of innovative nature of this program
This collaboration brought together a very diverse group to focus on providing this STEM event, and their willingness to be flexible throughout the process allowed them to capitalize on the strengths of each group. The event, itself, is innovative with its structure composed of 10 interactive modules, 5 focusing on mathematics and 5 on science. On the day of the DREAM STEAM event, the adults took supporting roles and allowed the MSMS students to drive the activities. Student leaders met the buses and greeted the students as they arrived before introducing them to the students who would provide additional instructions and guide them through the interactive presentations, which were led by other MSMS students who served as the instructors for the day. While the Toyota and Tupelo YPs and MSMS faculty and staff were available to facilitate and provide logistical support, the focus was all on the students.

How this has advanced the mission for your school
As evidence of the group meeting its goal of engaging students in “fun, interactive STEM-related activities that would help introduce and broaden their perspectives in STEM-related knowledge,” can be found in the quotes from the teachers, the event also helped all partners advance their individual goals. Toyota already had STEM-education programs for early childhood and high school students. They had nothing, however, for middle-grade students; so the Toyota YPs intended to plan the event with some support from the Tupelo YPs and asked MSMS during our annual Science Carnival, however, the event that MSMS had extensive experience in planning and coordinating this kind of event. The partners also recognized that, with a real-world perspective, the event could become much larger and significantly more impactful.

MSMS took the lead in developing the content and planning the logistics of taking over 500 fourth, fourth, and 40 public school teachers through a series of 10 mathematics and science hands-on demonstrations. The Toyota YPs made the arrangements for the facilities and coordinated all the activities. The Tupelo YPs worked on locating sponsors so the students could be provided sack lunches and could give gift bags of STEM-related items, among other things. Toyota did also provide much of the logistics and transportation arrangements necessary for the participation. On the day of the event, the MSMS brought its entire student body, who served as the greeters, guides, and presenters. The Toyota and Tupelo YPs provided the logistical support, setting up, distributing lunches and gift bags, and cleaning up afterwards. The students who attended the “Future Leaders’ DREAM STEAM” seemed excited and genuinely interested and took active roles in the demonstrations. The next day, MSMS’ Director of Academic Affairs received an email, from the TPS Communications Director, expressing the district’s appreciation. In that email, she stated, “Yesterday’s event was really awesome. MSMS students were as excited about teaching as our children were about learning. Thank you for the many hours of planning to make this memorable and for connecting the school-to-career dots for our students.” We’ve already received feedback from our teachers and here are a few comments:

- “Thank you for engaging our students in all the ways math and science are implemented outside the classroom.”
- “They pulled off a wonderful day of learning for our students.”
- “My students loved the gift bags. It was a very worthwhile trip.”

This collaboration was effective because the partners were willing to modify the original plan to capitalize on the skills and expertise of each group. Shared decision-making was a key component of the planning meetings, and the result was an extremely effective event that met the group’s goal.

How this has advanced the mission for your school
In Tulipelo, MSMS is “to enhance the future of Mississippi in career dots for our students.” We’ve already received feedback from our teachers and here are a few comments:

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**Name of Partnership**

Education for Tomorrow Alliance

**Institutional Member School Name**

Academy of Science and Technology

**Nominator’s Name**

Susan Caffery

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**Partnership Description**

**EFTA** is a partnership with Connie ISD to prepare students for success in careers. With a focus on STEM, EFTA coordinates volunteers to serve several programs, such as hosting our district science fair; connecting students with future careers in Next Generation Leadership; helping students to make positive choices with Future Focus; and creating a venue for 24 science/math-related competitions known as SCI://TIECH. I have served on the board for EFTA for many years and have found the organization to be a vital component to our culture.

**How this has advanced the mission for your school**

EFTA has a focus on STEM advancement with the many competitions it sponsors. The organization brings together mentors and sponsors to further the goal of preparing students for careers and socially responsible behaviors.

**Description of innovative nature of this program**

The partnership was created by a former Science Coordinator who brought industry and other science-related businesses together with educators to sponsor competitions in science fairs, robotics, technology, and mathematics in addition to helping all students connect to careers.

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**Name of Partnership**

Introduction to Surgical Techniques

**Institutional Member School Name**

Bergen County Academies

**Nominator’s Name**

Russell Davis

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**Partnership Description**

The traditional high school Biology lab has had a complete makeover thanks to a unique partnership between the Bergen County Academies and Englewood Hospital and Medical Center. Bergen County Academies (BCA) and Englewood Hospital and Medical Center (EHMC) have created a medical environment that exposes high school students to the elements of proper surgical techniques. It is our hope that this high school experience will encourage more students to make the decision to pursue careers in vascular or cardiac surgery, and that our collaboration with EHMC will inspire other schools, throughout the nation, to follow our lead and thereby address the anticipated shortage of vascular and cardiac surgeons.

As part of this program, our students work in a hospital environment and learn the fundamentals of in vivo surgical methodologies. Under the guidance and mentorship of medical doctors and surgeons, we have created a “surgical suite” where 24 of our students have weekly access to current surgical techniques and methodology, thereby elevating the secondary education curriculum in the fields of biology and medicine.

Overall, the partnership’s goals are to educate students about the rigor of scientific thinking and problem solving, offer them hands-on surgical experience, provide unique opportunities for medical research, and encourage them to consider medical careers at an earlier age than in the past. The potential impact of such a curriculum on high school student’s lives is life changing.

Students who have participated in this partnership report tremendous satisfaction from the experience. The collaboration of doctors and students provides unique and important opportunities for students to learn about career options that they might otherwise not have considered at this stage of their lives. The hands-on surgical techniques and access to hospital laboratories make this a very rewarding and unique experience for high school students.

**How this has advanced the mission for your school**

By working with medical doctors and surgeons, the students gain confidence and understand the core concepts and methods of medical and surgical procedures. This partnership has demonstrated how helpful it is to expose students to surgical techniques during high school, and help them understand the critical steps needed to prepare for a future career in science.

**Description of innovative nature of this program**

In the physician workforce, from primary care to nearly all specialties, a shortage comes down to the intersection of not just supply and demand, but increasingly, changing demographics as well - notably the aging population. By exposing secondary education curriculum to medical procedures and practices (mainly vascular and cardiac surgery), we provide high school students an insight into a professional life that they might not even think about until their undergraduate or graduate academics.

Based on the Association of American Medical Colleges’ recently updated projections, by 2025, the country will have a shortfall of between 63,700 and 84,700 physicians. The shortage range AAMC projects is 14,900 to 35,600 in primary care, and between 37,400 and 63,100 in non-primary care specialties, with a large focus on cardiology and vascular surgery. This is important because these specialties are already coping with the growing influx of baby boomer patients and increasing rates of cardiovascular disease. Additionally, the profession is dealing with an aging workforce (more than 40% of general cardiologists were over 55 in 2013). (Bonnie Davies, New England Journal of Medicine, 11/30/2017).

Our partnership provides students with an introduction to medical and surgical procedures with willing teaching partners that are experts in their field. This innovative curriculum offers a framework to how to address the anticipated doctor shortage at an earlier stage in a student’s life.

Our hope is that by exposing high school juniors and seniors to this career option, they may consider this career choice at an earlier stage in their education. This would translate into students enrolling in post-secondary coursework directly related to this field and helping them achieve their personal goal while simultaneously addressing the expected shortage of practitioners in these fields.

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Video link

https://vimeo.com/160756654/c6c3490ffb

Video link

https://www.youtube.com/watch?v=hSBWILXrcJ8&feature=youtu.be
Partnership Description

The Architecture, Construction and Engineering (ACE) Mentor Program mission is to engage, excite and enlighten high school students to pursue careers in architecture, engineering, and construction through mentoring and to support their continued advancement in the industry. The mission of the Science and Engineering Academy (SEA) is to provide students of diverse backgrounds an advanced and rigorous curriculum in all core subjects with a focus on science, engineering, math, and technology that shows real-world relevance and will prepare them for further study in higher education and their chosen careers. One of the Eight Defining Characteristics of the Science and Engineering Academy is to build strong community and business partnerships and that is exactly what defines the relationship between the ACE Mentor Program and the SEA.

In order for a student to participate in the program, an open application process takes place in which all interested juniors and seniors fill out an online application and also complete a questionnaire including an essay. A team of 25 students is selected by a board of professional engineers, architects and professionals in the construction industry. Once the team is selected, they get to meet at the engineering classroom every other Wednesday after school for the entire school year and be mentored by engineers, architects and construction managers during a project of their choosing. The project is usually with the city of San Antonio’s community in mind. Last school year’s project was the design of a multi-use activity center as part of the San Antonio Zoo. During the project, mentors guide the students as they learn about the design process and how their design decisions impact their approach to sustainability and the various related engineering disciplines. Our mentors are professionals in their fields and, with their superior’s permission, volunteer their time, talents and skills in order to work closely with the students. Long lasting relationships have been formed and partnerships between the firms and our school have been developed to the point of these firms sponsoring and assisting the program in raising funds for scholarships. Some of the students have developed even deeper relationships leading to internships and even summer employment.

John Jay High School’s Science and Engineering Academy students have benefited in their professional development and ultimately, pursuing a career in these disciplines. As was the case of Cassandra Daloney-Grey who after receiving a $4,000 scholarship was offered this past summer a paid summer internship with one of our mentor’s architectural firm, Open Studio Architecture. During her time in Open Studio, Cassandra was introduced to the real environment an architect would be exposed to in the industry. This internship allowed her to share experiences and knowledge with her mentors and supervisors and allowed her to understand and work the area of urban planning which ultimately she chose as her major area in Architectural School. She is attending her freshman fall semester at Texas A&M University’s College of Architecture.

How this has advanced the mission for your school

John Jay Science and Engineering Academy has benefitted from this partnership because it has allowed our students to be engaged into relevant industry applications and share experiences and knowledge with professionals in the fields of architecture, construction management and engineering. This results in the ACE Mentor Program enabling the SEA to advance its mission of providing students the opportunity of applying the knowledge acquired during their advanced and rigorous core and STEM curriculum in relevant industry problems, and furthermore, prepare them for the rigors of higher education in their chosen fields. Bridging the Gap between education and career is key in building the workforce. ACE accomplishes this by building relationships between educators, students, and mentors. John Jay Science and Engineering is a partner in that they promote the ACE Mentor Program in their school. As a result, there are often more students applying than can fit into the program and it provides a group of enthusiastic students. Mentors respond well to students when students are excited about the program. This reciprocal relationship enables both students and mentors to learn from each other and grow as leaders. The San Antonio affiliate of ACE is comprised of all volunteers. That means that every board member and mentor has a full-time job within the A-C-E industry. When a school is an active partner, it facilitates the ease at which ACE is able to focus on the mission of mentoring.

Description of innovative nature of this program

One of the biggest challenges for any partnership, which involves education, is the level of student engagement in the program. For the SEA, ACE Mentor Program has been an excellent way to engage our students. Its innovative approach allows us to reach a great number of students who are interested in pursuing a degree and subsequently a career in these fields, including a great number of female and underrepresented students. Giving them the opportunity to spend hours after school for the whole school year, without the pressures of grades, with professionals in the areas that they are interested in. It allows them to ask questions, learn different applications of their knowledge and simply be mentored and establish relationships with professionals in these fields. By providing senior students with opportunities to compete for scholarships and forge meaningful, professional relationships which could lead to future internships, summer employment or even full employment once they graduate from college.

Name of Partnership
ACE Mentor Program of Greater San Antonio

Institutional Member School Name
John Jay Science and Engineering Academy

Nominator’s Name
Luis Rivera

Video link
https://youtu.be/9ik20qJGHIs

Partnership Description

In Spring of 2018, Wheeling High School and a local manufacturing industry member, Hydraforce LLC created a collaborative team to help combat the growing skills gap in the manufacturing industry. As more and more manufacturing industries turn to automation, robotics, and mechatronics, finding qualified employees becomes a difficult task. After numerous meetings with the CEO of Hydraforce, Jim Brizzolara, Wheeling High School Principal, Jonny Cook and the engineering instructors developed a plan of action to create a pipeline of workers in the field of manufacturing.

How this has advanced the mission for your school

Hydraforce has donated $150,000 to create the Wheeling Robotics & Automation Cell which will feature (4) industrial robots manufactured by ABB. These robots are seen in countless industries ranging from automotive assembly lines, shipping and packaging in CVS, and even one of the nations largest companies, Amazon’s warehouse. We are hoping that exposing students to industrial robotics will create that exciting spark that draws our students to the manufacturing field.

Description of innovative nature of this program

Additionally, these robots will not sit idle at night. District 214’s Community Education program is working to provide Adult Education classes and industry certifications for our community to increase employment opportunities in such a booming field. Nearly 50% of Wheeling’s students come from families of “low income”, and these adult education classes will hopefully lower that number.

Name of Partnership
Hydraforce LLC Automation & Robotics Program

Institutional Member School Name
Wheeling High School

Nominator’s Name
Tom Steinbach

Video link
https://www.youtube.com/watch?v=N7_AZzhChyk
THE STEM EDGE   |
helps them fill the gaps in their education.

Benjamin Franklin High school is proud to
partner with a community-minded company
because of the partnership with Capital One.

Capital One has made a commitment to
their students graduate from
and grammar skills by 50% or more.

Partnership Description
One of the daunting problems facing all rising
high school organizing literacy and STEM
across the country that equip people with skills to thrive
in life.

In response, Gateway for Math Success
recognized as the top Advanced Placement
school.

Word Report. BFHS has been ranked
such as Newsweek, BusinessWeek, and U.S.
universities in the world. More importantly
they succeed. Franklin also was named a 2015
National Blue Ribbon School. It has been
been recognized nationally as one of the finest
students graduate from
the community, to help children succeed in

Institutional Member School Name
Benjamin Franklin High School

Nominator’s Name
Dr. Patrick Widhalm

Description of innovative nature of this program
Benjamin Franklin High School (BFHS) has
be recognized nationally as one of the finest
schools in the nation by leading publications
such as Newsweek, BusinessWeek, and U.S.
News & World Report. BFHS has been ranked
$1 in Louisiana. These are just a few reasons
why 100% of our students graduate from
our school and go on to some of the finest
universities in the world. More importantly
they succeed: Franklin also was named a 2015
National Blue Ribbon School. It has been
recognized as the top Advanced Placement

targeted at providing a rigorous and uncompromising academic
environme

the high school setting.

Participating schools and parents praise
Gateway, as many parents do not have the
finances means to pay for tutoring.

Partnership Description
Over the last four years, between January
and May, teams of students from the Mass
Academy of Math and Science partner with
clients from the Seven Hills Community to
develop life-changing assistive technology
devices. This collaboration is a win-win for all
parties involved. For many students, it is the
first time they have interacted with people,
both young and old, with intellectual and/or
physical challenges. For the clients, it is an
opportunity to work with a dedicated team of
“engineers” specifically focused on developing
a product to improve an aspect of their life.
Examples of past projects include sensors to
remind a pre-Alzheimer patient to not forget
his walker, a custom keyboard designed in
solid works and 3-d printed for a visually
impaired person, and a TV remote that uses
symbols, programmable to a clients favorite
stations. These relationships have continued
beyond the curricular year and morphed
into community service projects that extend
into senior year. As the partnership enters
its fifth year, we are proud to have Seven Hills
Staff as an integral part of our formal and
final design reviews, and fully integrated into
the STEM II Assistive technology course as
partners.

How this has advanced the
mission for your school
The mission of Seven Hills Foundation is to
promote and encourage the empowerment
of people with significant challenges so that
each may pursue their highest possible degree
of personal well-being and independence.
Part of Mass Academy’s mission is to promote
life-long learning, by providing the tools,
skills, and strategies for students to engage
actively in their own education. I think these
two statements dovetail nicely. By working
brought together, we can empower and promote
independence, while at the same time be
given the independence to think outside
the box on how to make it happen. A few
comments from student participants is the
best way to explain it.

“Stem 2 was my favorite part of the year by far.
Working closely with our client and helping
someone in need was so fulfilling. I am now
considering working in assistive technology
because it combines my love for medicine
and engineering. Making multiple designs
and working with my other group mates was
great fun. The challenges that my group faced
really pushed me to work harder every week
and improve our project every day. I cannot wait
to continue with my project over the summer.”

“This was a class that surprised me in how
valuable it turned out to be. I learned some
great skills, from team dynamics to hands-on
engineering to interacting with people with
disabilities. Overall, a great experience.”

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actively in their own education. I think these
two statements dovetail nicely. By working
brought together, we can empower and promote
independence, while at the same time be
given the independence to think outside
the box on how to make it happen. A few
comments from student participants is the
best way to explain it.

“Stem 2 was my favorite part of the year by far.
Working closely with our client and helping
someone in need was so fulfilling. I am now
considering working in assistive technology
because it combines my love for medicine
and engineering. Making multiple designs
and working with my other group mates was
great fun. The challenges that my group faced
really pushed me to work harder every week
and improve our project every day. I cannot wait
to continue with my project over the summer.”

“This was a class that surprised me in how
valuable it turned out to be. I learned some
great skills, from team dynamics to hands-on
engineering to interacting with people with
disabilities. Overall, a great experience.”

Description of innovative nature of this program
This partnership is innovative because it
models the real-world engineering design
process, many of the prototypes and final
designs are in use by clients, and last year, 2
provisional patents came out of the course.
STEM II gives students the opportunity to help
gain independence through use of
assistive technology. They participate in an
iterative design process. At the end of the
year, the goal is to present clients with functional
assistive devices that support their interests,
abilities, and independence, not just receive
a “grade.”

Name of Partnership
Gateway for High School Success

Institutional Member School Name
Benjamin Franklin High School

Nominator’s Name
Dr. Patrick Widhalm

Name of Partnership
Mass Academy/Seven Hills Assistive Technology Partnership

Institutional Member School Name
Mass Academy of Math and Science

Nominator’s Name
Michael Barney

Video link
https://youtu.be/JeOeAEX0CTs

Video link
https://youtu.be/uEoACEX0CTs
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2019
Consortium Connects

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HAVE A GREAT IDEA TO SHARE?
Email jen.mcally@ncsss.org with your topic idea for a Consortium Connects roundtable.

Name of Partnership
Micromeritics Instrument Corp Partnership

Institutional Member School Name
The Gwinnett School of Mathematics, Science, and Technology

Nominator’s Name
Kerri Napoleon

Partnership Description
GSMST has partnered with Micromeritics Instrument Corporation for the past five years in various ways. GSMST’s Partnership Program establishes a 4-4-4 infrastructure for organizations and businesses to get involved with the school. Micromeritics’ partnership with GSMST involves events in all four levels of this structure, including professionals who have participated in the 9th Grade Speaker Series, guided tours and job shadowing experiences through the 10th-grade STEM Site Visit program; short-term projects and research-based internships for 12th-grade students in the Junior Fellowship Experience (JFE) Program; and year-long, immersive, deliverable-based internships for 12th-grade students in the Senior Capstone Experience (SCE) Program. Although GSMST has a vast list of partners, very few of those organizations are as dedicated and involved as Micromeritics.

The results of this partnership have provided myriad benefits for both organizations. GSMST has gained the opportunity to expose students to a career field in STEM of which they may otherwise be unknowledgeable. Students first learn of the opportunities at Micromeritics in their 9th-grade year through the Speaker Series. Three years into our partnership, we saw students specifically asking for internships at Micromeritics because of what they learned in that 9th-grade year. Moreover, the impacts from these internship experiences have followed students into their college careers. For the past two years, student alumni who have interned as part of the GSMST SCE program with Micromeritics have returned to the corporation as paid interns in either the summer or during the school year as part of their college-degree programs, making their time at Micromeritics not only enduring, but a vital component of their college-degree completion.

For Micromeritics, professionals have been able to generate student interest in Micromeritics and demonstrate the return on investment available from volunteering time and expertise. Student interest has helped advertise for Micromeritics as a local, career opportunity in the STEM field. As for a return on investment, this return is firstly being seen with the hiring of student interns for their college internship programs. Secondly, the publicity of this partnership has already been covered in local newspapers, including the Gwinnett Daily Post (https://tinyurl.com/ybyzy3h9) and the Atlanta Journal-Constitution (https://tinyurl.com/ybyzy3h9), who both covered a hosted “signing day” for two GSMST students whose work was published during their SCE. However, the depth of this partnership transcends just a snapshot for public relations. Instead, this publication, which was an application note discussing a new use of a chemical enzyme for particulate research methods, was published within the global Micromeritics’ network. Not only is this publication itself another example of a return on investment for Micromeritics, but also it is the first time within their corporation that such an innovation in method was discovered and authored. The fact that it was done by two secondary-school interns, under the guidance of their mentor, was an accomplishment that impressed an international field of researchers.

How this has advanced the mission for your school
The mission of GSMST is “to nurture the talents and high potential of all students through a unique, challenging, and integrated curriculum with a focus on mathematics, science, and technology that will result in a world-class school.” The Partnership Program that brought Micromeritics and GSMST together is part of that curriculum, as each component is required of all GSMST students in order to be eligible for graduation. Partnerships like that with Micromeritics allow GSMST students to nurture their talents and potential because they are inclusive of all students, not just those with exemplary academic records. As one GSMST student alumni, Jeffrey Jacob, remarked about his time at Micromeritics, “I threw my internship with Micromeritics’ curveballs and professional skills that will be invaluable in the future. Micromeritics is a great place for students to learn and grow and develop into professionals.”

The mission of Micromeritics is based on its greater commitment to serving its clients and the community through the development of material characterization instruments designed both to make research more accessible and “to advance the speed of innovation and improve the products that touch each of our lives” (https://tinyurl.com/yd9sc5qe). With GSMST, Micromeritics employees support their company’s mission by mentoring students in the development of STEM-specific skills and knowledge. When asked about the program, Randy Byro, Global Head of Marketing for Micromeritics, stated of the onsite coordinator, Erin Hendrix, that “her enthusiasm for these programs [is] infectious (in a great way) that it is exciting to all of us at Micromeritics to get on board and follow her lead.”

Description of innovative nature of this program
This partnership is innovative for two primary reasons. Firstly, it is innovative because of Micromeritics’ depth of involvement, which outstrips a one-time-volunteer commitment. Although many businesses partner with schools for short-term or limited experiences, Micromeritics’ 5-year dedication to the entirety of GSMST’s Partnership Program has shown the true power of combining business and education resources to provide STEM-centered education. Not only do students receive the academic support for their education from GSMST faculty, but also they get to apply and practice those skills in a real-world setting in Micromeritics’ labs under the supervision of senior researchers. This combination of knowledge and application is exactly the goal of STEM education and demonstrates an innovative way that businesses and schools can make it a reality.

Secondly, this partnership is innovative in its strategic planning and demonstrable return on investment that is already being seen in just 5 years of partnership. Convincing a corporation to devote its resources and time to secondary-school education is a daunting task. Many want to know what benefits they will gain from such a commitment. Now, this partnership provides the evidence and proof that these upfront investments do reap invaluable rewards. With an eye towards multidisciplinary alignment, future commitments, and long-term goals, both GSMST and Micromeritics have created a unique and sustainable model that engages students at all levels of their secondary education and beyond in their college and career pursuits. This model can, and should, be replicated by all businesses who are looking for similar opportunities in education.

Video link
https://www.youtube.com/watch?v=Fwh_1yuq6FU&feature=youtu.be
Partnership Description
In 2017-2018, The Maine School of Science and Mathematics (MSSM) partnered with John T. Giblin, Jr. (Tom), Ph.D., a 1999 MSSM alumnus who is currently an Associate Professor of Physics at Kenyon College and is an Adjunct Associate Professor of Physics at Case Western Reserve University. As a result of our partnership, Professor Giblin was able to advance his work on a grant for developing content for students in high school physics and, through regular video conferencing, he delivered advanced physics classes for six of our students.

One outcome for Professor Giblin’s National Science Foundation (NSF) Grant, The Non-Linear Universe: Precision Numerical Cosmology and Fundamental Physics is to develop classroom modules that can be used to bring contemporary research topics to high-school students, an initiative called Fundamental Physics in the Classroom. MSSM is providing both high school teacher perspective on the project and actual high school students to test drive the content. At the same time, Professor Giblin offered college level classes in Fields and Spacetime (Fall 2017) and Astroparticle Physics (Spring 2018) to MSSM students who previously completed the AP Physics C curriculum. In 2018-2019 we again built upon these distance education experiences when a long-time faculty member moved several hundred miles away and we were able to retain his class enrollments for this year. He delivers three classes a week into our teched-up classroom we refer to as our outreach room. Part of our mission has always been outreach and these experiences in distance education help us to be better prepared to utilize technology in ways to not only advance the learning of our on-site students, but throughout our State and beyond.

Description of innovative nature of this program
“Throughout the globe, educators are attempting to use technology to deliver quality distance education. The innovation here is to use technology in such a way that the teacher student relationship are cultivated despite the geographic separation. Much of the success of this partnership can be attributed to the perspective our partner brought. As an Alumnus of our school he understands the unique character of our school and the sacrifices our students make when they leave the comforts of their homes and schools to attend a small residential school in a rural area far removed from any population center. As someone who left our small state to study at Holy Cross, Brown and Yale, he served as a role model of the places one could go with a diploma from a NCSSS consortium school.

How this has advanced the mission for your school
Ten years ago we first partnered with The Jackson Laboratory in a computational biology class. In the first year, a team of scientists would meet with a small group of our students in a virtual visual meeting space and the class would meet separately with an on campus instructor. The 10-year success of this program paved the way for us to further explore distance education when we found ourselves weeks before school was to start, down a physics instructor. With confidence from our earlier successes we pushed the envelope a bit further with this latest partnership because no on-site teacher was involved. Reports from the students in the class were most favorable. They not only found the class engaging, but reportedly scored comparably to students in Professor Giblin’s concurrent class at Kenyon. In 2018-2019 we again built upon these distance education experiences when a long-time faculty member moved several hundred miles away and we were able to retain his class enrollments for this year. He delivers three classes a week into our teched-up classroom we refer to as our outreach room. Part of our mission has always been outreach and these experiences in distance education help us to be better prepared to utilize technology in ways to not only advance the learning of our on-site students, but throughout our State and beyond.

Video link
https://www.youtube.com/watch?v=IHEMD-QHD7Y
The National Consortium of Secondary STEM Schools (NCSSS) was established in 1988 to provide a forum for specialized secondary schools focused on science, technology, engineering, and mathematics (STEM) disciplines to exchange information and program ideas.

**NCSSS Mission**

Our mission is to advance STEM education by providing professional development and networking opportunities for educators and learning experiences for students; to serve as a national resource for STEM schools and programs in partnership with educational, corporate, and international organizations; and to inform policymakers on STEM education.

**NCSSS Vision**

Our vision is to serve as the resource for secondary STEM schools by supporting collaboration and knowledge sharing and providing professional development for teachers and administrators to positively impact student achievement in authentic STEM educational environments.

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