THE STEMEDGE

A quarterly magazine from NCSSS giving teachers and administrators the competitive advantage in professional development.

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NCSSS MAGAZINE

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FROM THE EXECUTIVE DIRECTOR

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.

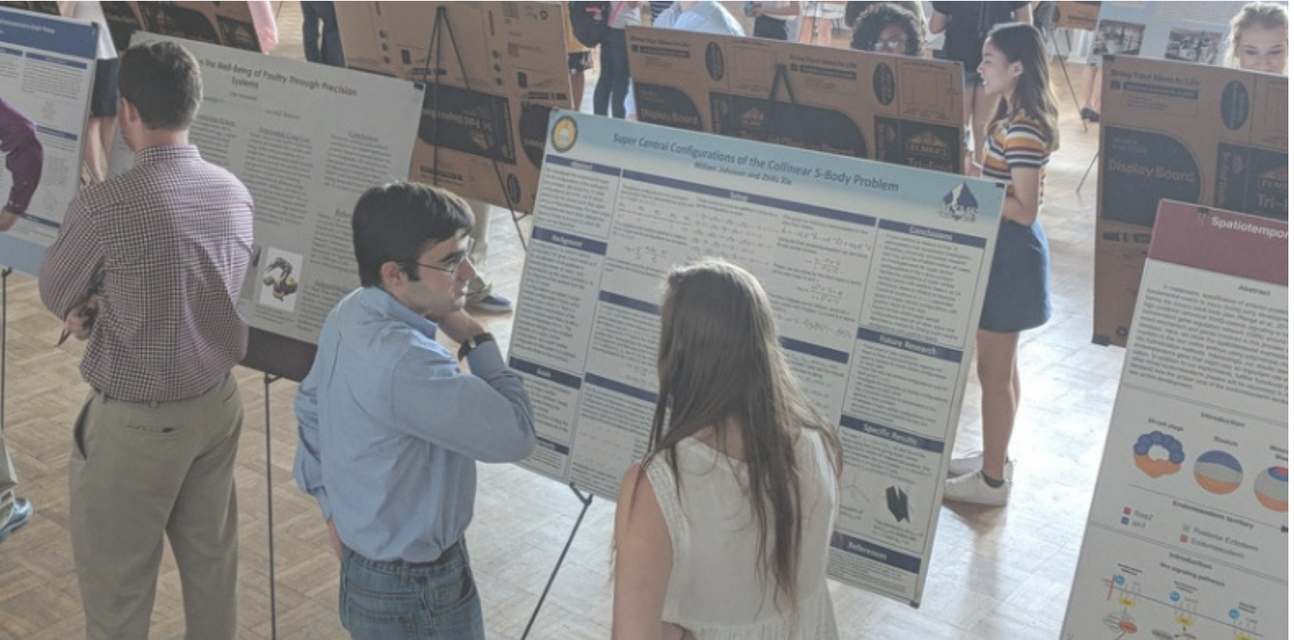
Equally as exciting is the Student Research Conference hosted by The Mississippi School for Mathematics and Science, June 13 to 16. For the past few conferences, each year we seem to build off the preceding conference that had already set the bar very high. Like our previous conferences, space is limited, 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



NCSSS National Consortium of Secondary STEM Schools | 30TH ANNIVERSARY

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STUDENT RESEARCH CONFERENCE

A STEM ADVENTURE LIKE NO OTHER

JUNE 13-16, 2019
HOSTED BY THE MISSISSIPPI SCHOOL FOR MATHEMATICS AND SCIENCE

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NCSSS.ORG/EVENTS/STUDENT-RESEARCH-CONFERENCE

PRESIDENT'S CORNER

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 J Barney

— MICHAEL BARNEY

President of the NCSSS Board of Directors

Jumpstart Your CYBERSECURITY CAREER at Illinois Tech

by Angela Jarka with Marcia Faye

Maurice Dawson Jr., director of Illinois Tech's Center for Cyber Security and Forensics Education (C2SAFE).

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 (SAT) is doing its part 365 days each year by educating a new generation of cybersleuths — 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.

According to a 2018 report conducted by the device-to-cloud cybersecurity company 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 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.

"Secure computing is essential as environments continue to become intertwined and hyperconnected. As the Internet of Things (IoT), Web of Things (WoT), and the Internet of Everything (IoE) dominate the landscape of technological platforms, protection within these complicated networks is important," explains Maurice Dawson Jr., director of Illinois Tech's Center for Cyber Security and Forensics Education (C2SAFE). *"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 WiFi-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.

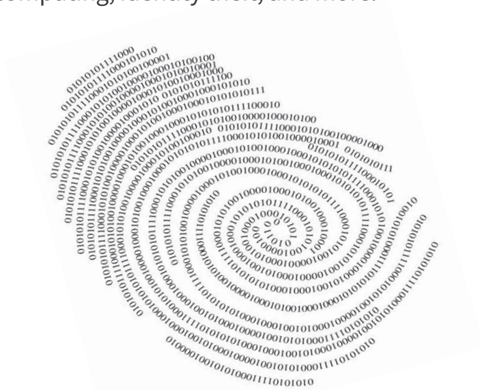
"There is a huge demand in the cybersecurity field but not a lot of people and resources available to teach it to the next generation of students," says Akvile Kiskis, a fourth-year student in Illinois Tech's Information Technology and Management Program. *"Illinois Tech is one of the few universities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


Akvile Kiskis, a fourth-year student in Illinois Tech's Information Technology and Management Program.

Two of the latest degrees offered are the Bachelor of Science in Computer and Cybersecurity Engineering through Armour College of Engineering and the Bachelor of Science in Applied Cybersecurity and Information Technology through SAT. As an assistant professor of information technology and management, Dawson teaches courses that are under the C2SAFE umbrella. The multidisciplinary facility has the following objectives:

- **Develop, promote, and support** education and research in cybersecurity technologies and management, information assurance, and digital forensics across all academic disciplines at Illinois Tech
- **Engage** with business and industry, government, professional associations, and community colleges to enhance knowledge, awareness, and education in cybersecurity and digital forensics, and to improve practices in information assurance
- **Coordinate** the designation of Illinois Tech as a National Center of Academic Excellence in Cyber Defense Education
- **Maintain** resources for education and research in cybersecurity and digital forensics; publish student and faculty research in the field; and sponsor, organize, and conduct conferences and other events to promote and advance cybersecurity and forensics education
- **Support** the university's academic departments in the delivery of the highest caliber cybersecurity and digital forensics education

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.

ANGELA JARKA

Angela Jarka is assistant director of marketing and administrative services at the School of Applied Technology, where she formerly served as assistant manager of the Information and Technology Management program.

MARCIA FAYE

Marcia Faye is a writer and editor in Illinois Tech's Office of Marketing and Communications.

2018
INNOVATION AWARD
WINNERS

Innovative Student Program Award
North Carolina School of Science and Mathematics

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

NCSSS AWARDS PROGRAM ★ STUDENT PROGRAM ★ 2018

NCSSS AWARDS PROGRAM ★ PARTNERSHIP ★ 2018

CONGRATULATIONS TO THE WINNERS!

2018 INNOVATIVE STEM STUDENT PROGRAM ENTRIES

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

Institutional Member School Name
North Carolina School of Science and Mathematics

Nominator's
Melissa Thibault

Program Description

Student Instructors Developing Enrichments, or SIDE, is a component of NCSSM's outreach programming as well as 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 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/stemenrichments/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 lense 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. While 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 provides 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 recruitmenting 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.

Video link
https://www.youtube.com/watch?v=exhWPuJAWa8&feature=youtu.be

Name of Program
e-NABLE Project

Institutional Member School Name
Academy for Science and Design

Nominator's Name
Amy Bewley

Program Description

Across the country, there is a big need for prosthetics, but they typically cost thousands of dollars. According to the Centers for Disease Control and Prevention, each year 1,500 babies are born in the United States without part or all of their arm. For children who are constantly outgrowing them, this expense often makes them out of reach for many families. A group of students from the Academy for Science and Design in Nashua worked together with two adult mentors, Madge Smith and Bob Kennett and made an elbow controlled prosthetic hand for Harun, a second grader from Peter Woodbury School in Bedford, New Hampshire. In addition, Harun has and will continue to receive tremendous support from Penny Demos and the staff at Peter Woodbury School. As Harun's Occupational Therapist, Penny was instrumental in connecting the two schools to collaborate on this incredibly meaningful project.

When the idea was first brought up to Madge Smith, who is the computer science teacher at the Academy for Science and Design, she was immediately on board. "This was an incredible project to work on with an awesome group of 7-10th-grade students. We all started off with minimal experience in prosthetics and 3D printing," said Smith. "However, with a can-do attitude, a little determination, a lot of interest, and resources on the Internet, we were able to print a hand for Harun. That feels pretty special!"

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.

ASD Director Jennifer Cava was full of enthusiasm for this project as she remarked "I am grateful that our students had the opportunity to use their valuable skills and talents to make a positive difference in the world. Their sense of compassion and their commitment to improving the lives of others fills me with optimism about our future.

How this event has advanced the mission for your school

After the hand was fitted, 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.

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, philanthropists, 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.

Video link
https://youtu.be/yuIDPB3HAhc

Name of Program
Science Research & Engineering Program (SREP)

Institutional Member School Name
Hathaway Brown School

Nominator's Name
Crystal Miller

Program Description

The Science Research and Engineering Program (SREP) at Hathaway Brown School (HB) in Shaker Heights, Ohio has been working to build the next generation of leaders in science, technology, and engineering fields for 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 strive 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 in breadth and depth but to also conduct their own original research in a real-world simulation of a graduate school model. This time occurs throughout the academic year as well as for several weeks each summer. The relationship is symbiotic; as students gain research experience and build passion for their fields of study, the lab furthers its research and builds rapport with the next generation. Graduate students and postdoctoral scholars obtain mentorship experience and SREP students gain confidence and empowerment through taking ownership of a project - from coming into the lab with little to no knowledge to becoming the resident expert. As a support, students continue meeting in Research Seminar Class during the academic year where they practice oral presentation skills before their peers and learning to offer constructive feedback. Ninth and tenth graders focus on learning to read the primary literature from their field of research and develop a literature review. More advanced students begin the outline of their scientific manuscript and start filling in details as their project in the lab develops. All students present a poster on their project yearly at the Hathaway Brown Poster Session & Reception and many share their work or compete at other local, state, and national pre-professional and professional scientific conferences. By linking interested, passionate students to professionals in STEM fields, the SREP encourages career-focused growth and development of critical analytical, presentation, writing, and other communication skills necessary for success in STEM. The authentic environment teaches students scientific literacy and makes a scientific research career feel intellectually more obtainable as students become empowered by their time in the lab. With just a handful of students in the program at its inception in 1998, the enrollment in SREP is currently at almost 150 dedicated future scientists, with alumnae numbering more than 550 talented women - many of whom are becoming leaders in their field.

How this event has advanced the mission for your school

Hathaway Brown School's motto is "We Learn Not for School, but for Life" and the Science Research & Engineering Program (SREP) clearly and steadfastly exemplifies that mission. The number of students completing an SREP placement (about 35% of each grade) along with the number and breadth of involved professionals (over 300) stands as testament to the success of the program and the opportunities enjoyed by SREP alumnae in the educational and professional spheres. The SREP specifically met the goal of the strategic plan at Hathaway Brown in the early 2000s to increase STEM programming and prepare students for leadership roles in these fields. At ten years out, in 2008, 58% of SREP alumnae had selected a bachelor's course of study in a STEM field, a number standing in contrast to the national average at the time, reflecting only 16% of female college students opting for a like educational path. Their experiential training is often only the beginning to sending girls on a lifelong path of scientific pursuit and discovery. The SREP continues to meet and excel at the mission of learning for life. Students build character and contribute to cutting-edge research by volunteering 2-3 years toward advancing projects that will save lives, develop new inventions, and advance knowledge. Their journey is one of empowerment as they prove to themselves that they can progress from a position of inexperience to complex understanding - while daily witnessing those with advanced degrees exemplifying 'learning for life' by embracing inquisition 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 long-term commitments to labs. The significantly deeper grasp of the science that occurs from this time-frame instills the empowerment that results from overcoming a seemingly insurmountable learning curve. Simultaneously, students are supported in a Research Seminar Class during the academic year where they learn aspects of research culture such as writing in scientific format, the grant process, and presentation skills as well as professional skills that will serve them in any career. The SREP was one of the first STEM programs of its kind in the nation and continues to innovate through attention to safety and legal administration, refreshed curriculum, and new and dynamic partnerships.

Video link
https://youtu.be/Kbux6L18EzM

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 26 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 Robots, and Showcasing Robots. Upon surveying the students at the conclusion of the workshop, a majority of the participants expressed their desire to pursue STEM either in high school or as a career choice.

How this event has advanced the mission for your school

The young ladies who attended this event gained many valuable skills. The goal of the program was to spark an interest in STEM related fields for young girls. It was clear after the two day event that this mission had been accomplished. Workshop participants completed a survey at the conclusion of 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 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 they enter middle school in the next year to two years, they will be provided options. Furthermore, as these students enter middle school we will continue to be a presence in their lives. With addition programs in place, such 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.

Video link
http://youtu.be/q-jlUDyPzhM?hd=1

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 500 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 exposes 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.

Description of innovative nature of this program

The MSSM Summer Camp was originally started as a three week camp for young ladies to get them interested in STEM related fields and persuade them to pursue advanced degrees and careers in the fields. What is truly innovative about the camp is the calculated blend of STEM academic classes and traditional summer camp fun. Many of the campers tell us the reason they keep returning to camp is the way they are exposed to new technology such that it doesn't feel like school and they still have all the fun camp activities in the afternoons.

The camp does not provide specialized knowledge or make campers an expert in any specific topic, but its goal is more, "this exists" and encourages campers to follow their passions. There is a hands-on aspect that directly connects STEM to real world problems. One class this year involved tearing apart old toys for the internal components and repurposing them as boats that will automatically clean the ocean. The campers had fun with the tactical component of destroying something and then creating with a purpose.

Video link
https://www.youtube.com/watch?v=PkJLitQYN4w

Name of Program
Gatton Research Internship Grant

Institutional Member School Name
Gatton Academy of Mathematics and Science in Kentucky

Nominator's Name
Dr. Derick B. Strode and Mrs. Cheryl Kirby-Stokes

Program Description

Since the Gatton Academy of Mathematics and Science's 2007 opening, we have followed peer NCSSS Institutional Member schools' guidance to provide students immersive research experiences. One strategy we seek is to involve students in summer internships. However, a challenge became routine: how do we convince Kentucky agencies to accept a high school intern? We discovered agencies' biggest obstacle was funding, not willingness to mentor our students.

Therefore, the Gatton Research Internship Grant was imagined addressing the challenge. Using a private gift from Mr. Bill Gatton, the Gatton Research Internship Grant started in 2010, directly creating 20 research internships annually that otherwise would not have existed.

Starting each fall and winter, The Gatton Academy supports interested 11th-graders in finding appropriate professional mentors for summer. Students and mentors then co-write internship proposals mirroring a professional grant-writing process by a March deadline. Through a competitive selection, 20 students' internship housing, meals, and transportation expenses are funded. Students then spend at least eight weeks of summer interning in devoted, full-time STEM research.

Mentors oversee students daily, and students and mentors alike continue receiving academic support from the school through summer. At summer's end, RIG recipients produce written research reports documenting their original findings, reports that become entry material to national competitions such as the Regeneron Science Talent Search.

Immersed in research with great mentorship, students make new discoveries and quickly develop expertise in their fields. As evidence of the program's effectiveness, past RIG recipients have presented 246 presentations at peer-reviewed conferences stemming from their Gatton RIGs since 2010. Nine recipients have published their findings in peer-reviewed journals before graduating high school. Seven RIG recipients have become national Siemens semi-finalists in the past three years.

The summer 2018 recipients are profiled at www.wku.edu/academy/academics/researchgrant/2018.php.

Having completed the program, these recent RIG alumni are currently preparing entries for the Regeneron Science Talent Search and for presentation and publication among peer-reviewed outlets during their 12th grade year.

Lessons Learned

The Gatton RIG is a model for other schools who seek immersive, authentic opportunities that guide students through an outcomes-based process. Over nine iterations, we have learned that potential mentors say "yes" to students' request for internships when funding challenges are off the table. These professionals become caring guides, providing levels of access and immersion rumored to belong only to the graduate experience. Additionally, we have learned that our students are ready for this incredible challenge. They've simply performed beyond expectations.

We recognize that the biggest obstacle for another member school to immolate our program is financial. Our total budget is $50,000 per year. This valuation of the 20 experiences is not lost on our students. RIG recipients write personal thank you notes to Mr. Gatton for funding the program, notes that are designed into a thank you book given to Mr. Gatton annually profiling each intern. Last summer's book for Mr. Gatton is viewable at http://www.blurb.com/books/8135471-infinite-possibilities-2017.

Directly introducing our program's benefactor to the students he assists maintains his affinity to continue supporting each class of Gatton RIG recipients.

How this event has advanced the mission for your school

The Gatton Academy of Mathematics and Science in Kentucky is the Commonwealth's premier public, specialized, residential high school for students interested in pursuing advanced careers in STEM. The school's mission includes the virtue of enabling Kentucky's exceptional young scientists and mathematicians to learn in an environment of advanced opportunities, preparing them to take leadership roles for the Commonwealth.

The Gatton Research Internship Grant delivers upon this mission. It provides the most-advanced learning environment a student can receive: one-to-one mentorship from a leading professional through an authentic STEM research internship.

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 our 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 rhythms 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 great high school STEM competitions as 12th graders.

The program is highly structured in many regards to provide necessary guidance to make it through the rigors of such an intensive program. For example, parameters are in place requiring committed 1:1 mentorship. All projects must have safety and ethical approvals documented from the get-go. Structures guide students and mentors through the call for proposals stage and benchmark research report deadlines.

In other respects, the program offers incredible freedom to imagine, propose, and create tailored internships for each individual. Some students find internships in their hometowns. These students are home at the family dinner table each evening. Other students, ready for far-greater levels of independence, have found fits requiring them to live across Kentucky for the summer or even farther afield at places like Argonne and Los Alamos National Labs, Case Western Reserve University, and Vanderbilt University."

Video link

https://www.youtube.com/watch?v=9MbMmceHtYA&feature=youtu.be

Name of Program
BCA FLASH

Institutional Member School Name
Bergen County Academies

Nominator's Name
Russell Davis

Program Description

BCA Flash is a one-day event where Bergen County Academies students teach middle schoolers topics in the STEM fields. 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 consisted of 24 distinct classes that tackled on topics in the evolving STEM field such as electronic engineering, immunology, website building, and even different types of energy. Although these topics may sound deceiving to a middle school student, the high school student teachers incorporated experiments or games into their lesson plans to promote active engagement, which is a crucial tool in learning. In addition to the aforementioned topics, BCA Flash dove into topics such as the enthalpy of reactions, astrophysics, bioethics, stress management through psychology, robotics techniques, mechanical engineering, and thermodynamics. With courses dealing with everything from computer science to biology, BCA Flash provided middle schoolers an assorted taste of the STEM field to stimulate interest and hopefully encourage more students to pursue careers in this field in the near future. Nearly 300 middle schoolers attended this event and based off of a feedback survey sent out to their parents, the vast majority of the students enjoyed BCA Flash due to the diverse and vibrant topics that suited each and every one of their interests. For example, one student exclaimed that "this experience was like no other for [her]." One parent said that, "[her] son loved it and he can't wait to come back." BCA Flash was a successful program due to the student teachers, the teachers, parents, and administrators of Bergen County Academies, and lastly, the middle school students. The student teachers have put endless amounts of effort into perfecting their classes and lesson plans: they created PowerPoint slides and poster boards, searched for interactive educational websites that the middle schoolers could use during class, wrote out problems for students to practice, and the list goes on. The administrators believed BCA Flash had potential and supported our efforts, and the teachers helped guide the student teachers with their lesson plans so that they were compelling and informative. The parents assisted in the logistics of BCA Flash by volunteering their time to register the middle schoolers, assisting with lunch, and supervising the classrooms. Lastly, the middle school students brought their curiosity about the STEM field and enthusiasm about participating in the program.

How this event has advanced the mission for your school

"Bergen County Academies' mission has always been to enrich students' learning experience through innovative and compelling opportunities. BCA Flash not only fulfilled this 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 have never heard of before. Students left the program with a better understanding of the content and importance of these 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. Bergen County Academies, on a daily basis, serves education at its finest by preparing students for their college and future careers. Thus, BCA Flash fostered this 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 student instructors. BCA Flash incorporated technology into classes by utilizing laptops, video cameras, interactive whiteboards, and much more in order to have the middle school students a taste of the evolving world. BCA Flash shows 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 present the material in a meaningful way and serve as examples of what type of STEM work they can pursue at the secondary level.

Video link

https://www.youtube.com/watch?v=fSsfGB0OsOs&feature=youtu.be

Name of Program
Freshmen Poster Session

Institutional Member School Name
Rockdale Magnet School for Science and Technology

Nominator's Name
Scott Bolen

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 I 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 an 11"x17" 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 school and regional science fairs. This judging format provides the students with authentic science fair practice and allows for immediate feedback while participant interest, energy and enthusiasm is at its peak. Most significantly, because the participants are presenting proposed research plans rather than completed work, they are able to utilize the feedback to strengthen their work prior to experimentation in the fall. The poster session has proven to be a successful blending of the best aspects of a student showcase, a science fair, and a pitch day.

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 trouble shoot 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 junior class 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 project. This timeline provides no 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

Name of Program
SEA STEM Fest

Institutional Member School Name
John Jay Science and Engineering Academy

Nominator's Name
Jean Karst

Program Description

For the past two years, our STEM Student Program, known as STEM Fest, has served almost 2,000 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 has a variety of divisions which 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 manning 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 guests' 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

STEM Fest is an event that is predominantly student 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 our 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 open them up to the possibility of what that field could entail. For example, if you ask a elementary 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 not only teach the student about protecting tall buildings from these natural disasters, but 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.

Video link
https://www.youtube.com/watch?v=z2ENQ4KwBlM

Name of Program
PROMISE

Institutional Member School Name
Illinois Mathematics and Science Academy (IMSA)

Nominator's Name
Anita White and Adrienne Coleman

Program Description

Since 1995, The Illinois Mathematics and Science Academy (IMSA) PROMISE (Providing Opportunities for Math and Science Enrichment) Program has served gifted culturally, linguistically, and economically disadvantaged (CLED) students in grades 7-9 from across the state of Illinois. Although talented, these students require access to programs that (a) encourage excellence as opposed to avoiding failure, (b) place a value on learning and education, and (c) create an engaging and relevant learning environment. IMSA PROMISE is designed to meet these needs as well as challenge and motivate participants toward even higher achievement. Also designed to increase the diversity of the enrollment at IMSA, PROMISE assists students in their preparation for advanced study in secondary school programs, whether or not they choose to apply.

IMSA PROMISE consists of three programs which feature 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 academic classes 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 (LS2S) provides students in 7th and 8th grades, when their critical decision-making skills begin to develop, with an introduction to inquiry-based learning. Students engage in activities in mathematics, science and humanities during twelve Saturday sessions throughout the school year on the IMSA campus. Former PROMISE participants who are current IMSA students serve as tutors and mentors.
"I gained knowledge that will stay with me a life time. It helped me enrich my problem solving. It helped me understand science and math more than I ever did before. The people have been so nice and helpful in these steps of discovering myself. It has been a joy to attend!"(LS2S participant)

Summer Enrichment for Academics in Mathematics and Science (SEAMS) 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 courses in the core subjects of mathematics, science, and English as well as receive SAT preparation instruction in preparation. Participants also take part in residential life programming 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 with advanced discovery-based and collaborative activities during the 12 Saturday sessions. Students develop skills in research, decision-making, and self-motivation skills. Curriculum covered in EIP most closely resembles IMSA content and it is during this stage of PROMISE that many students make the decision to apply.

"I think the 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 professions. We are committed to advancing equity in STEM education and creating a diverse, inclusive community of global citizens who can realize their full potential, and execute our mission to advance the human condition. PROMISE has provided Black, Latino, Rural and Low-Income students with the opportunity to engage in inquiry-based learning, work with an array of STEM educators, become STEM literate, and contribute to solving the world's problems through inquiry-based learning. These CLED groups historically have experienced academic program deficiencies, economic inequities, 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 future STEM leaders who will ultimately advance the human condition. A Chicago Public School teacher stated the following:
"Your PROMISE Program has been the life-line to extend and enhance the knowledge base for these students…by providing them with the time to develop seemingly outlandish 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 entering 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 and see the spark of excitement during a 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 following benefits: (a) an increase in their understanding of inquiry-based and problem-centered learning; (b) demonstration of greater mastery of critical thinking skills; (c) expression of a greater interest in STEM subjects and experiences; (d) demonstration of increased academic achievement in science, mathematics, and writing skills; (e) improvement of SAT performance; (f) expression of positive change in the areas of self-esteem, peer relationships, and social and emotional development.

Video link
https://youtu.be/UANf4CEwt-M

Name of Program
Eastern North Carolina STEM (ENC STEM)

Institutional Member School Name
North Carolina School of Science and Mathematics

Nominator's Name
Tamar Avineri

Program Description

Eastern North Carolina STEM (ENC STEM) is a rigorous, student-centered summer enrichment program that was established in 2012 by three Teach for America teachers "to provide high quality STEM learning opportunities and leadership training to high school students living in economically disadvantaged communities in Eastern North Carolina in order to increase growth mindset and college readiness in the pursuit of STEM majors/careers."

While teaching in Northampton County, the co-founders realized that students were not adequately prepared for advanced mathematics classes and were completing college degrees at an alarmingly low rate. They established the program to serve rising 9th through 12th grade students with two primary goals: 1) provide hard working students with high quality STEM courses that would challenge and prepare them for advanced coursework in high school and college; and 2) provide teachers with professional development and teaching experiences to become stronger educators. The co-founders also ensured that the program was free to all students, including meals, transportation, and field trips. Since its inception, the program has served over 250 students and expanded its number of partner districts from an original two to five.

Prospective ENC STEM students submit an online application, and accepted students spend two weeks in Eastern North Carolina in the summer, taking hands-on classes in science, technology, math, team-building and leadership development.

In 2015, ENC STEM began a partnership with the NC School of Science and Mathematics (NCSSM) to offer their students the opportunity to participate in an additional one-week residential program at NCSSM, where students would take classes taught by both NCSSM and ENC STEM instructors during the day and participate in community activities at night. This part of the program provides students a college-like experience and opportunities to strengthen skills needed to succeed in college.

Over the years, students have shown great interest in returning to ENC STEM. For example, half of all students who attended ENC STEM in the summer of 2017 had attended the program at least once before (excluding rising ninth graders). Recognizing students' interest in remaining connected to ENC STEM, the co-directors began offering opportunities in which students could be involved with ENC STEM throughout the year and after graduation, including Student Representative, Alumni Leader, Intern, and Teaching Assistant positions. Students have seized those opportunities with great enthusiasm. These student leaders receive additional leadership training throughout the year and assist in recruitment efforts at each of the partner schools. Since the inception of the ENC STEM Student Representative Program, ENC STEM has experienced a 28% increase in the size of its student body, demonstrating a focus on student leadership and development of the program. Even further, some ENC STEM students have gone on to graduate college in STEM fields and begin careers in STEM education within ENC STEM partner districts. Students who completed one or both of the first two years of the ENC STEM Program have higher college persistence rates than the typical UNC system student; and the success and impact of the program continue to grow.

How this event has advanced the mission for your school

Part of the mission of NCSSM is to "educate academically talented students", "advance public education in North Carolina" and inspire innovation for the betterment of humankind." ENC STEM closely aligns with NCSSM's mission in its focus on providing students from economically disadvantaged communities with opportunities to learn STEM content and leadership skills in a collaborative, rigorous environment at no cost. The program challenges these students to think deeply, model, design and build, and take intellectual risks. It gives students opportunities to grow in their content knowledge, confidence and commitment to education, identify their passions, ask their own questions, and consider possibilities they haven't before, thereby "inspiring innovation".

ENC STEM also has a significant effect on its faculty and staff, "advancing public education in North Carolina." During collaborative workshops leading up to the summer program, NCSSM and ENC STEM instructors engage in professional development activities that inspire them to think creatively, learn pedagogical techniques from each other, enhance their content knowledge and reflect on their identities as educators. ENC STEM has offered 152 hours of professional development to both ENC STEM instructors and NCSSM faculty, and 81% of ENC STEM instructors have continued to work in education. Through this unique, collaborative structure, the diffusion of knowledge and skills from NCSSM faculty to other ENC STEM staff helps to increase NCSSM's reach to provide sustained development of teachers in Eastern North Carolina and instruction for students who have limited access to the professional expertise and content knowledge that NCSSM faculty offer.

Description of innovative nature of this program

ENC STEM is the first of its kind in serving students from economically disadvantaged regions in Eastern North Carolina. Not only does ENC STEM provide students the opportunity to take unique classes not available at their home high schools, it motivates students to be active in their own learning, reflect on themselves as citizens, and realize the impact they could have on others' lives. Through leadership courses, community building activities (e.g., social justice seminars; field trips) and completion of collaborative projects, students build confidence in themselves, strengthen their interpersonal skills, and challenge themselves to persevere through perceived failure and vulnerability. Students who apply for the program tend to consider NCSSM as "out of their reach" until they have the opportunity to experience the campus and conquer rigorous classes. ENC STEM's collaboration with NCSSM helps to increase students' confidence in their ability to thrive independently. Indeed, eight ENC STEM students have gone on to apply and be accepted to NCSSM, through the residential and online programs.

ENC STEM's professional development impacts ENC's highest need counties through the 81% of teachers who continue to teach. ENC STEM is a student-driven culture, with community building and leadership development activities designed by Alumni Leaders and Student Representatives. The program offers a unique collaboration for students from nine high schools across five districts and for NCSSM teachers with other public school teachers.

The program offers new and creative options for students each year, and its impact and demand grow with it.

Video link
https://youtu.be/TdHJBjTRgcw

Name of Program
LSMSA Future Scientist Program

Institutional Member School Name
Louisiana School for Math, Science, and the Arts

Nominator's Name
Chris Hynes

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, support peers and community, 2) be an active member in a science "society" (i.e. science themed club), 3) document a minimum of 80 hours of work in volunteering, 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 Methods, and Computer Science, 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've had over 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 seeking/attaining extra-curricular research projects, science programs, and volunteerism. Over 100 students have been connected with science or engineering research.
The longevity of FSP has created the opportunity for FSP alumni to give back to the program by offering research internships, being a guest speaker, and donating resources. Another offshoot of FSP is a dramatic increase in the number of science speakers that visit our campus, typically 18-20 per school year. These speakers represent a cross section of academia, industry, government, and business and hail from local, regional, and in some instances national origins. The presentations educate FSP students about career pathways, job descriptions, current research, and networking.

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 Astrobiology. 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/or volunteer work insures that the students are performing service in a "global society" and validating their imagined career path. As a member of FSP, each student is amongst a community of learners. The connection with LSMSA Science faculty, FSP alumni, and science speakers also engages the students in an exchange of ideas with mentors and role models.
The success of FSP has inspired other academic departments to create their own specialized programs such as Artist in Training program, Classical Scholars Program, and Excellence in Computer Science program.

Description of innovative nature of this program

We believe LSMSA's FSP has one main innovative idea: it is not solely an academic program, but it is holistic. Students do not merely take coursework and maintain a specific GPA. It puts equal weight on all aspects of building a student into an outwardly visible, conscientious, ambassador of science. Several smaller innovations contribute to the main idea. LSMSA FSP requires multiple components to be completed: 1) "compete", perform volunteer work, research, and/or participate in science programs, 2) develop public presentation skills, and 3) enlist in a science themed club. The LSMSA Science faculty contribute several innovations: 1) personalized mentoring of each student, 2) tailoring student's science coursework to meet their individual potentials and desired profession, 3) frequent scheduling of science speakers, 4) connecting students with research opportunities and science programs tailored to the students' desires, and 5) when the students complete their FSP requirements, we host an annual, semi-formal, banquet to celebrate the students' success.

Video link
https://youtu.be/XI1O1npydXU

Name of Program
Coding Arkansas' Future

Institutional Member School Name
Arkansas School for Mathematics, Sciences, and the Arts

Nominator's Name
Corey Alderdice

Program Description

"When Asa Hutchinson was elected Governor of Arkansas in 2014, a central tenet of his platform--and the signature component of his education stump--was requiring all Arkansas high schools to offer computer science classes. Considering 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 on turnkey solutions, Coding Arkansas' Future functions in three primary ways: distance education, educator development, and facilitating a professional learning community for teachers. In this format, a master teacher provides dual 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 benefit from having local support of their own teachers as well. Teachers are learning to master these concepts. Additional training prepares instructors to pass the PRAXIS 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 date. The initial success 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 of 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 100 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/Hour of Code, NYU Tandon School of Engineering Cyber 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/digital learning; teacher training and professional development; and a commitment to improving learning across Arkansas. Historically, these charges 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 has reinvigorated 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 new, 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/hfnZWFnNAB0

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2018 INNOVATIVE PARTNERSHIP ENTRIES

Name of Partnership
Western Center Academy and Western Science Center Museum

Institutional Member School Name
Western Center Academy

Nominator's Name
Michael Horton

Partnership Description

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 archaeological, 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/military/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. The 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 these school. 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 start our own museum next summer in our multi-purpose room from what we have learned being housed on a museum site.

Video link
https://youtu.be/BrZ2vX9UHD0

Name of Partnership
OMRON / ASD

Institutional Member School Name
Academy for Science and Design

Nominator's Name
Jennifer Cava

Partnership Description

Established as a STEM-focused public Charter school in 2007, the Academy for Science and Design (ASD) has endeavored to meet the challenge of economic and societal change following the decline of the state's textile industry and expansion of Boston's high-tech corridor into the southern New Hampshire region. The school is located on the outskirts of Nashua, New Hampshire's second largest and increasingly diverse city, reflecting an expanding immigrant population and its integration into the community.
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 hand-on, real-world experiences. Our success in achieving these goals depends upon the students' experiences while enrolled at ASD. Our skillful 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 help students to apply, 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.

In the spring of 2018, the Academy for Science and Design was awarded a $50,000 grant from the Omron Foundation in order to establish the "ASD Center for STEM Invention",an area within the school devoted to supporting students' pursuit of novel STEM ideas, as well as a design center for engaging students across the state of New Hampshire in STEM inquiry and invention activities through unique student designed, student-led competitions and exhibitions. The Center will include a computer lab for research and videoconferencing with students and corporate partners in other parts of the state, a space for collaborative work, and a makerspace for students to invent, create, and explore.

How this has advanced the mission for your school

Since its inception, OMRON Foundation, Inc. has been committed to supporting projects that achieve the greatest social impact possible, offering support to projects that support education, social and cultural programs, disaster relief, and improving the lives of individuals with disabilities. Omron Americas Corporation CEO Nigel Blakeway stated that "At Omron, we understand firsthand every day in our work how crucial innovation is to foster new ideas and perspectives. When students benefit from innovative STEM education, the world benefits."

New Hampshire faces a critical shortage of students who develop and sustain their interest in STEM fields from elementary school through college. The health of New Hampshire's economy will depend upon addressing the challenge that our state has made a priority: to educate more "homegrown" students capable of entering and contributing to the development of STEM-related industries in New Hampshire. As the state's top-performing public school and largest STEM-specialty school, the Academy for Science and Design has strong potential for peer leadership in spearheading initiatives aimed at expanding students' interest and ability in STEM locally and statewide.

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. ASD proposes to establish a "the Center for STEM Invention," serving first as a "skunk works" 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 enterprising 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.

Video link
https://youtu.be/snFsAslDBZc

Name of Partnership
Future Leaders DREAM STEAM Event

Institutional Member School Name
The Mississippi School for Mathematics and Science

Nominator's Name
Rick Smith

Partnership Description

This was a partnership between the Mississippi School for Mathematics and Science, Toyota Young Professionals, Tupelo Young Professionals, and Tupelo Public Schools. This partnership's goal was to host an event that would help engage Tupelo Public School students in fun, interactive STEM-related activities that would help introduce and broaden their perspectives in STEM-related knowledge and create self-awareness among Generation Z students in STEM-related technology. Initially, the Toyota YP's intended to plan the event with some support from the Tupelo YP's and asked MSMS to provide a few students to present science demonstrations. When they visited MSMS during our annual Science Carnival, however, they saw that MSMS had extensive experience in planning and coordinating this kind of event. The partners also recognized that, with a redistribution of responsibilities, the event could become much larger and significantly more effective.

MSMS took the lead in developing the content and planning the logistics of taking over 500 fourth graders and 40 public school teachers through a series of 10 mathematics and science hands-on demonstrations. The Toyota YP's made the arrangements for the facilities and coordinated all the activities. The Tupelo YP's worked on locating sponsors so the students could be provided sack lunches and could be given gift bags of STEM-related items the group felt would reinforce the level of excitement for STEM that the event would generate. Tupelo Public Schools provided the students and made the transportation arrangements necessary for their participation. On the day of the event, MSMS brought its entire student body, who served as the greeters, guides, and presenters. The Toyota and Tupelo YP's 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 for 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

While 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 YP's wanted to plan and present a STEM-focused event for students in that age group. The event provided the Tupelo YP's with an opportunity to connect with the Tupelo business community and develop relationships as they found event sponsors. The Tupelo Public Schools found a way to raise the STEM awareness and help make the school-to-work connection for students and teachers. Finally, the mission of MSMS is "to enhance the future of Mississippi in the global society by meeting the individual needs of gifted and talented students through providing innovative learning experiences and leadership development in a residential environment. In addition, we will provide quality educational leadership for other educators and aggressive outreach programs that impact students across Mississippi." This partnership allowed the school to provide both an innovative learning experience and leadership development opportunity for its students and another aggressive outreach program to impact students in another area of the state.

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 YP's and MSMS faculty and staff were available to facilitate and provide logistical support, the focus was all on the students.

Video link
http://www.wtva.com/content/news/Tupelo-4th-graders-learn-STEM-education--477417553.html

Name of Partnership
Education for Tomorrow Alliance

Institutional Member School Name
Academy of Science and Technology

Nominator's Name
Susan Caffery

Partnership Description

EfTA is a partnership with Conroe ISD to prepare students for success in careers. EfTA coordinates volunteers to serve several programs, such as hosting our district science fair; connecting students with future careers in Career Connections; preparing future leaders in Next Generation Leadership; helping students to make positive choices with Future Focus; and creating a venue for 14 science/math related competitions known as SCI://TECH. 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.

Video link

https://vimeo.com/160756654/c6c3490ffb

Name of Partnership
Introduction to Surgical Techniques

Institutional Member School Name
Bergen County Academies

Nominator's Name
Russell Davis

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 antcipated 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 partnerships' goals are to educate students about the rigors 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.

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.

How this has advanced the mission for your school

BCA's innovative approach to learning as well as our enviable record of student success, have set the standard for educational reform in our county and beyond. One of the key missions of BCA is to expose students to scientific inquiry, research and instrumentation, and to provide transferable, first-hand experiences with the techniques, practices and perspectives of professional scientists. By expanding the capabilities and context of secondary science education, we believe that students will be better equipped for, and more likely to pursue leadership positions in science, scientific research and global-scale problem solving. Never satisfied with the status quo, this partnership will be evaluated and updated as needed, in order to continue to provide our students with first class opportunities and the most current information. For us, progress is about more than having the newest equipment or adopting the latest procedure; it is about providing students with unique, rewarding and practical experiences in order to make our vision a reality.

For Englewood Hospital and Medical Center, the program offers doctors and surgeons the opportunity to work with bright young students and to make a difference in their lives. Participants form long-term bonds with their protégés and take great satisfaction is seeing how this program influences their career and life choices. These relationships are invaluable.

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 61,700 and 94,700 physicians. The shortage range AAMC predicts is 14,900 to 35,600 in primary care, and between 37,400 and 60,300 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 Darves, 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 of 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.

Video link

https://www.youtube.com/watch?v=h5BWlLXrcJA&feature=youtu.be

Name of Partnership
ACE Mentor Program of Greater San Antonio

Institutional Member School Name
John Jay HS Science and Engineering Academy

Nominator's Name
Luis Rivera

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 elbow to elbow 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 Science and Engineering Academy students have benefited in their professional development and ultimately, pursuing a career in these disciplines. As it was the case of Cassandra Delaney-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 benefited 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 forging meaningful, professional relationships which could lead to future internships, summer employment or even full employment once they graduate from college.

Video link

https://youtu.be/9ik2OqJGHis

Name of Partnership
Hydraforce LLC Automation & Robotics Program

Institutional Member School Name
Wheeling High School

Nominator's Name
Tom Steinbach

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 Jerry 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 warehouses. 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.

Video link

https://www.youtube.com/watch?v=N7_AZZHChgk

Name of Partnership
Gateway for High School Success

Institutional Member School Name
Benjamin Franklin High School

Nominator's Name
Dr. Patrick Widhalm

Partnership Description

One of the daunting problems facing all rising middle school students is the adjustment into high school. The social issues alone impact these children greatly; added to that is the stark reality of academic success. The problems are dramatically magnified at Franklin where students from over 90 different schools with different curricular objectives converge into a ninth grade setting that fosters a rigorous and uncompromising academic environment. These issues can constitute a challenge even for the most talented students. In response, Gateway for Math Success was launched in August 2014, and quickly recognized an opportunity to add English the following year. This year, students will also gain experience in design and programming with an added robotics module.

Approximately 100 eighth grade students (95% African American and 88% under Free or Reduced Lunch status) attending 20 underserved local middle schools participate in the 12 Saturday sessions free of charge because of the partnership with Capital One.

Capital One has made a commitment to enhance the well-being of individuals and families in its local communities through its Future Edge program -- a $150 million dollar, five-year investment in programs across the country that equip people with skills to thrive in the 21st century economy.

When solicited about Gateway, Capital One immediately saw the potential of a leading high school organizing literacy and STEM activities to meet the social and academic needs of local middle school students. Benjamin Franklin High school is proud to partner with a community-minded company of the caliber of Capital One.

Results:
Gateway "meets the kids where they are" and helps them fill the gaps in their education.

A. In the post-program surveys, the students have expressed that…
1. They have gotten better grades in their regular classes.
2. They felt more confident about their math and English skills.
3. Gateway has armed them with enough confidence to apply at some local high-profile high schools that they would not have deemed "accessible" to them if not for Gateway (not just Franklin).
4. They made friends, met new teachers, and enjoyed the high school setting.

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

C. Academics:
Math: Thanks to the Khan Academy data-driven platform, everyone involved gained unprecedented visibility into their student's learning. The program is self-paced, individualized and mastery-based. By the end of Gateway last year, all 88-120 (depending on the year) regular participants had completed the eighth grade math curriculum with success.
English: The post-test determined that 83% of the students had improved their vocabulary and grammar skills by 50% or more.

How this has advanced the mission for your school

Capital One has supported the project enthusiastically since the inception of its pilot. As Gateway's goals perfectly align with Capital One's will to "help people develop skills for the jobs of today and tomorrow", the bank has generously increased funding through Future Edge as Gateway grew to include math, English and then robotics/STEM. Representatives of Capital One regularly come visit Gateway in session and adhere to the concept and execution of the program.

Description of innovative nature of this program

Benjamin Franklin High School (BFHS) has been 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 testing school in the southern region of the United States.

These successes have convinced the administration to take a leadership role in the community, to help children succeed in school.

To our knowledge, this is the first effort of its kind in the city and in the state to reach out and offer a space and expertise to give individualized, self-paced, and mastery-based tutoring to local middle school students. We hope to encourage middle school students so that they can attain academic success in their lives.

Capital One agreed to partner with Benjamin Franklin High School providing the financial resources to establish the program. Gateway is the marriage of expertise and good will.

Video link
https://www.youtube.com/watch?v=QyUoxk0KAVM&feature=youtu.be

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

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 pre 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 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 very 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 2 gives students the opportunity to help people 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".

Video link
https://youtu.be/uEoACEX0CTs

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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-tier structure 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 project- and research-based internships for 11th 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 this 9th grade year. Moreover, the impacts from these internship experiences have followed students into their college careers. For the past two years, student alumnae who have interned as part of the GSMST SCE program with Micromeritics have returned to that 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 their time and expertise. Student interest has been generated both through the Speaker Series as mentioned above and through exposure to a wider audience during the STEM Site Visit. This 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/yco963nu) and the Atlanta Journal Constitution (https://tinyurl.com/yd9sc5qe), 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' time, 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 alumnus, Jeffrey Jacob, remarked about his time at Micromeritics, "[t]hrough my internship with Micromeritics I gained technical 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/yda4c4o8). With GSMST, Micromeritics employees support their company's mission by mentoring students in their development of STEM-specific skills and knowledge. When asked about the program, Randy Byrne, Global Head of Marketing for Micromeritics, stated of the onsite coordinator, Erin Hendrix, that "her enthusiasm for these programs [is] so 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 outshines 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 multiyear 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 for all businesses who are looking for similar opportunities in education.

Video link
https://www.youtube.com/watch?v=Fwh_Lyuq6uM&feature=youtu.be

Name of Partnership
Physics Through Space and Time

Institutional Member School Name
Maine School of Science and Mathematics

Nominator's Name
Deborah McGann

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 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. On our end, this involved the use of learning management software, google hangouts, a powerful desktop computer and video card, camera, speakers, microphones, and a very large display. Having Professor Giblin as large as life on the screen was augmented by visits to MSSM in person on two occasions. During one of these he gave a lunch talk, From Einstein to the Nobel Prize in 2017: Gravitational Waves and our Unknown Universe, open to all students and staff.

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 scientist 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. As for our partner, we provide ready access to current high school students who can test the development of computational modules designed to better prepare today's students to confront the great questions of fundamental physics.

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.

Video link

https://www.youtube.com/watch?v=lHEMD-QHD7Y

NCSSS
National Consortium of Secondary STEM Schools

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.ncsss.org