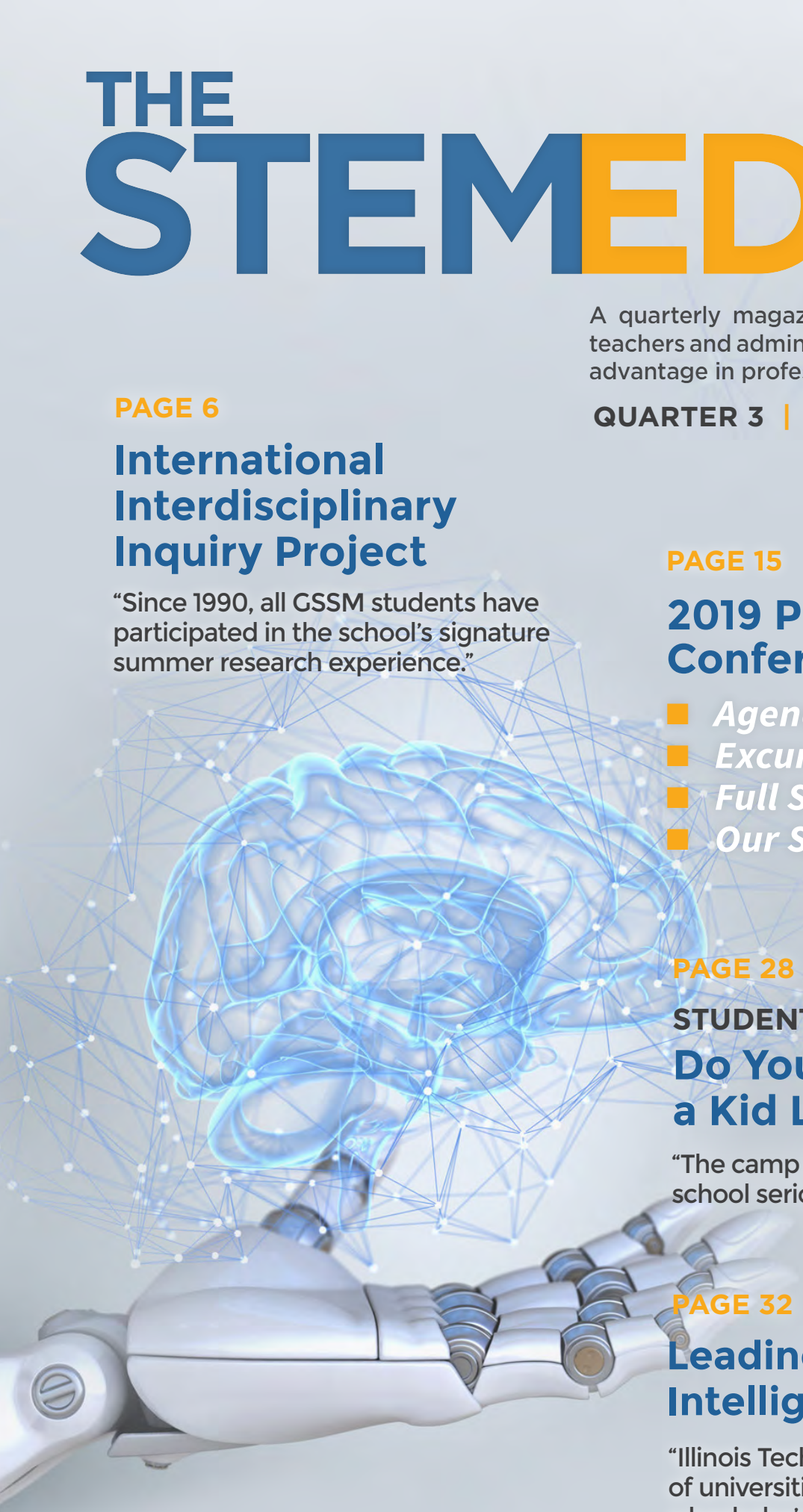
THE STEMEDGE

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

QUARTER 3 | 2019



CONTENT

VOLUME 3 | ISSUE 3

FROM THE EXECUTIVE DIRECTOR

As we approach another Professional Conference, I grow increasingly pleased with how far we have come in the past six years. In 2013, we were partnering with the National Association of Gifted Children, and we were co-locating our own conference inside theirs. While they were a great partner, we had lost our own STEM identity among the throngs of their attendees.

"We have reestablished ourselves on the map. Schools throughout the country plan on attending when they budget each year ."

So, in 2015 we went out on our own, something we had done years before. In 2015, we had barely 150 attendees. This year in Seattle, in 2019, I expect us to be double that number. We have reestablished ourselves on the map. Schools throughout the country plan on attending when they budget each year. And that's when you know you've arrived.

Equally as encouraging is the interest in our Leadership Summit. Repurposed last year, it is now attracting a contingent of school leadership that enables attendees to exchange thoughts and concerns openly and constructively. Many of the topics come from the attendees themselves. We're able to keep the registration cost low through the generous sponsorship of colleges that host us in order to have a chance to showcase their schools.

As I look at both events, to me it says two things.

1. There is clearly a need for schools specializing in STEM to be able to network and share with "schools like us."
2. It is becoming clear as well that NCSSS is providing that convening opportunity.

What more can you ask for?

Thank you as always,

Todd

NCSSS Executive Director | todd.mann@ncsss.org

LEADERSHIP SUMMIT 2020

JAN. 24-26

WHO ATTENDS

Current and emerging STEM school leaders focused on whole school challenges

KEY DETAILS

- Attendee-driven agenda
- Network and collaborate with STEM school leaders

Costs

- $150 for NCSSS members
- $250 for non-members

LOCATION

Hosted by
Loyola University
New Orleans

NCSSS
National Consortium of Secondary STEM Schools

PRESIDENT'S CORNER

The future of STEM education is more important than ever before, as evidenced by the young leaders of today bringing issues such as climate change, sustainability and other environmental concerns to the forefront of the world's stage. At my school, part of our mission is to prepare students to be

> "The future of our country, and the world, relies on our ability to provide the very best environment to support our students..."

leaders in global innovation, and the vision for our graduates is to prepare them to become creative problem-solvers and life-long learners who are passionate and resilient when facing challenges and pursuing new opportunities. I know that all schools in the consortium have similar aspirations for their graduates.

As educators in world-class STEM schools, we have a responsibility to maintain an innovative educational environment to challenge and inspire the next generation of leaders, who will not only understand the importance of scientific research and inquiry, but also promote and protect it.

As we prepare to gather in Seattle for our National Conference, we should keep this over-arching responsibility in mind as we collaborate with colleagues, University and Business Partners, and Alumni, and not lose sight of the critical mission we all have in common. The future of our country, and the world, relies on our ability to provide the very best environment to support our students as they prepare to take their place as the next generation of leaders on the world stage.

Michael J Barney

— MICHAEL BARNEY

President of the NCSSS Board of Directors

Summer Research Experience:

The South Carolina Governor's School for Science and Mathematics

International Interdisciplinary Inquiry Project

by Michael A. Newsome, PhD

Dean of Curriculum and Assessment
South Carolina Governor's School for Science and Mathematics

Five nervous American engineering students watched as their drone slammed against the side of the cage. They realized this could set them back several days and jeopardize the testing schedule. They only had two more weeks before they would have to leave Shanghai and their sister-school's well-equipped engineering lab. The drone's propeller casing was cracked, but the custom air filtration box was still intact. That was good. They had just spent a week designing that box, 3D printing it, outfitting it with a battery powered fan, and finding a way to attach it to the drone. Still, there had to be something wrong with the drone's automatic flight coding. Three American documentary film students had captured the flight pattern just before the crash. The footage might offer some guidance. And, just maybe, the local Chinese STEM students might have a solution. There was still hope.

These events all occurred in summer 2019 when eight students and three facilitators from the South Carolina Governor's School for Science and Mathematics (GSSM) visited the campus of the High School attached to Shanghai Normal University (HSSNU). For one month, the students worked on an inquiry-based project combining elements of engineering, statistics, and documentary filmmaking. They also confronted the challenges of doing research in a new country, eating new cuisine, and experiencing different living arrangements in the school's dormitories. The students learned to solve communication issues with the HSSNU students, function as a team, schedule events, meet deadlines, and solve unexpected technical difficulties.

GSSM'S SUMMER RESEARCH EXPERIENCE

Since 1990, all GSSM students have participated in the school's signature summer research experience. The goal of GSSM's research experience has traditionally been to have the students learn about the scientific process through personal real-world experience. However, some students have academic interests which do not align so neatly with traditional notions of professional laboratory research or scientific methodology. They are curious about answering broad questions or exploring open-ended lines of thought. Inquiry projects allow students to investigate questions without necessarily engaging in systematic hypothesis testing. Through the process of inquiry, students still learn professional and academically accepted methods of discovery.

THE INQUIRY PILOT PROJECT

Our international interdisciplinary inquiry project (3IP) pilot involved an internal component and an external component. The internal component was an air-cleaning drone experiment that focused on engineering, statistics and international teamwork. The external component was a reflective documentary film that captured the experiences and thoughts of the students completing the internal component.

Engineering, Statistics and International Teamwork

The driving question of the internal project was ***Compared to a stationary air filtration system, does a mobile (flying) air filtration system increase Particulate 2.5 (PM2.5) capture, holding other factors constant?*** In order to answer this question, the GSSM students worked with HSSNU students and staff. The students designed and built an air filtration system that could be attached to a drone. GSSM and HSSNU students also cooperated in learning how to program drone takeoffs. At many points along the way, the students had to solve unexpected problems. In order to account for various factors that might affect PM2.5 variation, the GSSM students ran multiple trials in HSSNU's drone cage and measured the difference in PM2.5 for each trial. They conducted regression analysis on the trial data to determine if filter mobility did make a difference. In the end they found that while flying the filtration system with a drone does increase PM2.5 capture, the difference might be due to the increased air circulation created by the drone blades.

Reflective Documentary Film

The driving question of the external project was ***Can a group of South Carolina high school students succeed in creating a drone engineering project in China?*** In order to answer this question, students had to be trained in the basic theoretical and technological aspects of making documentaries. Before traveling to China, the GSSM students took an interim term filmmaking course and participated in a one-day workshop on cinematography and documentary techniques taught by a university instructor. Throughout the 3IP, GSSM students wrote and revised their film treatment. They also collected footage of interviews, research activities, cultural interactions, and the international environment. The focus was on student reflections and lessons learned. While some editing occurred in China, the students did not have the time to complete the film there. Further editing was designated to be part of a research course in the fall semester following the summer experience.

LESSONS LEARNED

One of the greatest advantages of a 3IP is that students have more opportunity to own their learning. They help create the driving question to be answered. They learn to think about what they know, how they know it, what they need to know, and how to legitimately obtain the information. Students have to develop a reasonable plan for completing the project on time. Some level of quantitative or qualitative data analysis helps the students focus on results. By participating in a 3IP, students develop skills enabling them to better examine available information and generate new knowledge.

The open-ended nature of 3IP carries risks of the students becoming frustrated with the failures that can easily occur in the process. However, students can learn from the failures if properly coached by facilitators. During our project the GSSM students became accustomed to setbacks, especially as they had to change the experiment to adapt to circumstances in China. The students eventually pushed through the difficulties, thought of alternative approaches, and kept each other's spirits up. The students came to appreciate the need for more careful pre-project research and planning.

Leading a 3IP requires detailed planning. Adult facilitators act as coaches during the project. They create the boundaries that guide the students through the inquiry. The level of discretion best left to students is difficult to determine at first. So, facilitators must be continuously involved. For example, the GSSM film facilitator noticed that when left to their own devices the students were developing a documentary concept that sprawled and lacked direction. The facilitator guided the filmmakers in organizing the film into a coherent story structure.

Students generate new knowledge when they integrate information and methods from different disciplines. In a 3IP the disciplines should serve complementary roles in answering the driving question. For example, in our project the engineering-minded students would have been quite happy to build and fly a filter-attached drone. By integrating statistical analysis to test the effectiveness of the filter under various scenarios, the students gained a deeper understanding of evidentiary-based progress.

The authenticity of the 3IP experience is important. The driving question must be globally relevant. International locations allow for a more realistic adult-world experience. Students learn to work as a team and overcome cultural difficulties in order to complete the 3IP on time. Students learn to see their project from several different perspectives. The international environment promotes student seriousness, professionalism and maturity. For example, the students learned they had to maintain good personal relationships with their international hosts. The students acted as sister-school ambassadors: they gave presentations in English language classes, attended a school tea ceremony, and spent a weekend in Chinese students' homes.

STUDENT REACTIONS

Three times each week while in China, students were asked to reflect on their inquiry experience. One common theme was the growth in global awareness. For example, one student wrote, ***"…we are experiencing China in ways that a normal tourist could not because we are meeting so many new people and learning more than we ever otherwise could about the culture."*** Student conclusions about working in a foreign culture included ***"I was expecting something very different from American classrooms but…engineering is very similar around the world"*** and ***"even people from two totally different backgrounds can find common ground."***

All of the students recognized the importance of doing more research and building better team relationships before landing in China. For example, students wrote that if they could go back in time they would ***"make more backup plans"*** and ***"not assume that [they] would be able to fix everything."*** One student wrote that she should have invested more time in getting to know her project colleagues. She believes ***"it would've made communication smoother and the work go by better in the first couple of days."***

After a week of working in China, the students discovered everything wasn't going along as planned. One engineering student wrote ***"The last couple of days have been very interesting because we have been through an emotional roller-coaster with coding this drone…"*** A film

student wrote, ***"I am nervous about filming the Chinese students tomorrow because we hope to ask them questions, but since they [have] such a short period of time to work with the American students, we could really be getting in their way or 'wasting their time'…But it will work out (I hope)."***

By working through the difficulties, the students began to get a deeper understanding of inquiry. One student wrote, ***"I'm still worried that there will be no difference between the air before and after we clean it, but I guess that doesn't constitute a failure. To me, a failure would mean not even being able to fly the drone with the attachments so that we couldn't even do tests."*** And eventually the payoff came when the students solved the engineering problems for themselves. As one student wrote, ***"An experience that stood out was when we were able to fly the drone with the filter on top of it. This moment was the culmination of everything we had worked towards throughout the project and was an amazing moment for me."*** The students had become less focused on obtaining particular "correct" results and more aware of the nature of ensuring the proper quest for knowledge.

CONCLUSIONS

We believe that 3IP is worth continuing to pursue. It creates a holistic and intensive learning environment that allows for deep multifaceted reflection. The international and interdisciplinary aspects help create a realistic project environment. Students learn to perform when things don't go as planned, failure is a real possibility, and there are external demands on time and energy. We do have advice for those who plan to offer their own 3IP. Carefully consider student selection by looking for diversity of interests and temperaments. Look for team players and make sure that no student is focused on just one single discipline or project aspect. Explicitly define how the different disciplines will be integrated to answer the driving question. Require students to write out explicit project deliverables that match the driving question. Schedule dedicated time for facilitators and students to work together on the project before landing in the foreign country. Finally, choose a project with a high likelihood of being completed in the given project time period. ■

PARTNER WITH NCSSS

Reach top STEM high schools and their high-performing students

NCSSS advances STEM education by providing professional development and relationship-building opportunities for educators and innovative learning opportunities for students; serves as a global resource in partnership with educational, corporate, and international organizations; and informs policy makers on STEM issues.

Why Partner With NCSSS

PREMIER STEM GROUP

No one knows STEM education better than these schools that have been offering STEM curriculum, facilities and classroom technology for more than 30 years.

RECOGNIZED LEADERS

Schools like Bronx Science, Illinois Math Science, Thomas Jefferson, NC Math Science are among the NCSSS members who steward new ideas to the global STEM community.

INFLUENCE

NCSSS is now the go-to for Congress: The definition in ESSA of a STEM school was drafted by NCSSS's Board.

NCSSS
National Consortium of Secondary STEM Schools

Contact Beth Hartgen to engage with NCSSS
beth.hartgen@ncsss.org

AGENDA AT A GLANCE

WEDNESDAY, NOVEMBER 6	
12-6 p.m.	**Registration Open**
1:30-4 p.m.	**Excursion to Raisbeck Aviation High School** (Tukwila, WA)
5:30 p.m.	**New Attendee/First-Time Presenter Session**
6-7:30 p.m.	**Welcome Reception**
THURSDAY, NOVEMBER 7	
7 a.m.-4 p.m.	**Registration Open**
7:45-8:45 a.m.	**Breakfast**
8:45-9:50 a.m.	**General Session** **Keynote Address: Paul Misener, Amazon** "The Connection Between Science and Technological Innovation"
10-10:50 a.m.	**Concurrent Sessions**
11-11:50 a.m.	**Concurrent Sessions**
12-1 p.m.	**Lunch**
1-2 p.m.	**College Fair**
2-2:50 p.m.	**Concurrent Sessions**
3-3:50 p.m.	**Concurrent Sessions**
5:30-7:00 p.m.	**Reception** (Edgewater Hotel)
FRIDAY, NOVEMBER 8	
7:30 a.m.-12 p.m.	**Registration Open**
8-9 a.m.	**Breakfast and Business Meeting**
9-9:50 a.m.	**Concurrent Sessions**
10-10:50 a.m.	**Concurrent Sessions**
11-11:50 a.m.	**Concurrent Sessions**
12-1 p.m.	**Lunch**
1:30-2:20 p.m.	**Concurrent Sessions**
2:30-3:30 p.m.	**Awards Presentation**
3:30-4:30 p.m.	**Roundtable discussions**
5:30-7 p.m.	**Reception honoring alumni of member schools in the Seattle area**
SATURDAY, NOVEMBER 9	
8 a.m. - 1:30 p.m.	**Excursions**

EXCURSIONS

Wednesday, Nov. 6

Raisbeck Aviation High School | 1:30-4 p.m.

Located just south of Seattle in Tukwila, WA, Raisbeck Aviation High School is a small public school in the Highline School District. RAHS was founded in 2003 to be the premier public high school of choice for students in King County and the region who wish to pursue their passion for aviation and aerospace in a STEM learning environment that prepares them for higher education, citizenship, and the career of their choice.

Through a unique partnership between school staff and parents, local industry, universities and community mentors, Raisbeck Aviation has grown into a highly regarded STEM, college-prep school, serving approximately 400 students in grades 9 through 12.

Students are immersed in a college and career focused program of work through highly rigorous project based learning with the opportunity to present to industry partners on a regular basis. Application of work has taken students to such diverse opportunities as Robotics Worlds in Houston, International Space Settlement Design competition in Florida and the National Green Energy competition in Dallas.

Currently ranked as the No. 3 school in the state and 126th in the USA, RAHS has consistently been recognized as Gold Level by US News and World Report. Students are consistently supported by a staff who bring strong CTE backgrounds and a passion for developing the next industry leaders and they go on to study at a variety of universities throughout the United States and internationally.

Please note that buses leave the hotel at 1:30 p.m. and return at 4 p.m. There is no cost for this excursion, but we do need you to register ahead of time.

Saturday, Nov. 9

You have your choice of one of the following; each individual excursion has separate timing below:

The Bullitt Center | 9:30 a.m.-11:30 a.m.

The Bullitt Center, located in the heart of Seattle, is the greenest commercial building in the world. The Center, and the Bullitt Foundation, seek to inspire a movement toward commitment to high-performing sustainable buildings and resilient cityscapes. The building features an array of advanced sustainable energy systems, including: rainwater harvesting, solar panels, and a regenerative elevator.

On your tour, you will learn about these features and more, understand the Foundation's vision for a sustainable infrastructure, and learn firsthand what a truly green building looks and feels like.

Please note that this excursion is limited to 25 attendees.

Also note that there is a $25 cost to cover the entry fee and tour. Buses will leave for the event promptly at 9:30 a.m. and will return to the hotel by 11:30 a.m.

Bill and Melinda Gates Foundation Discovery Center | 9:30 a.m.-12 p.m.

The Bill and Melinda Gates Foundation Discovery Center gives visitors the opportunity to see, hear, and touch what the Foundation is doing to impact the world in a positive way. Their exhibits feature their global initiatives to fight poverty, cure diseases, and improve education, as well as special exhibits highlighting connections between a variety of issues related to the work of the Gates Foundation, its partners and the Seattle community.

On your tour you will explore these interactive exhibits and programs, see firsthand what educator programs are in place to bring technology to the classroom, and leave inspired to be an agent of change.

Please note that there is a $25 cost to cover the entry fee and tour. Buses will leave for the event promptly at 9:30 a.m. and will return to the hotel by 12 p.m.

Boeing VIP Tour | Tour 1: 9:30 a.m.-12:30 p.m. | Tour 2: 10:30 a.m.-2:30 p.m.

The Boeing Everett Factory VIP tour offers a unique look into the Boeing production system. On your tour, you will be taken through the manufacturing process and have the opportunity to see how Boeing builds the world's best aircraft. The Everett, Washington facility is home to the 747, 767, 777 and 787 Dreamliner production lines and is the world's largest building by volume. You will see firsthand how premier airplanes are built for Boeing's worldwide base of airline customers.

There are two tours for this excursion, and registrations for each are limited to 25 attendees! Those attending will be asked in advance fot identify their country of origin.

Please note that there is a $25 cost to cover the entry fee and tour. Buses will leave for the event promptly at 8:30 a.m. for the first excursion and will return to the hotel by 12:30 p.m. For the second excursion, buses will depart promptly at 10:30 a.m. and will return to the hotel by 2:30 p.m.

SESSIONS

Crossing the Discipline Divide

Interdisciplinary

In this session, participants will engage in discussion about the opportunities and challenges provided by interdisciplinary courses. Our discussion will include how to navigate the logistics of creating and implementing these courses as well as best practices for interdisciplinary offerings. Course ideas will be shared and participants will be encouraged to share their own experiences, both positive and negative, with interdisciplinary courses. Participants will also work collaboratively to brainstorm course ideas. Whether you are exploring interdisciplinary courses for the first time or have some experience, this session will provide a learning opportunity for all of us.

Presenters: Cheryl Gann, Letitia Hubbard, Keethan Kleiner

Integrating Sustainability into the Physical Science and Engineering Curriculum

Interdisciplinary

Global challenges like climate change, resource scarcity, and pollution are by nature interdisciplinary and interconnected. This presents difficulties and possibilities in bringing these topics into the classroom. In this presentation, we will discuss how teachers can incorporate sustainability into middle and high school chemistry and physics classrooms. We will also discuss a new class developed at Bronx Science,"Green Design and Clean Technology" in which students explore pertinent solutions and technologies for some of society's most pressing problems.

Presenters: Rachel Wax, Matthew Sarker, and Cailin Daly

Strategies for Integrating Life Skills and Wellness Outcomes in Academic Environments

Interdisciplinary

This workshop aims to encourage attendees to view life skills development and wellness as their own unique disciplines and to work to create interdisciplinary classwork that helps to promote the holistic development of students that are prepared for complex problem solving beyond the classroom. Attendees will be provided materials related to integration of life skills and wellness learning outcomes in the classroom and school environment. Work will focus on collaboration with educators in similar disciplines to develop new or modify existing materials using the pedagogy of interdisciplinary collaboration with life skills and wellness learning outcomes.

Presenter: Ian Oliver

Integrating Engineering Design & Computer Science Through Model Tiny Homes

Engineering

This session will provide insight into the engineering design, modeling, and programming of a smart tiny home model in a high school engineering classroom.

Presenter: Michael Croly

The State of Virtual Reality in 2019

Interdisciplinary

I presented at NCSSS in 2017 on the subject of Virtual Reality and in the two years since, prices have dropped and there are new headset options available on the market. This session will provide an overview of the current Virtual Reality environment and examine the state of VR in education in 2019. Examples of specific software will be featured as a way of illustrating how Virtual Reality can be used as "just another tool" in today's classroom. The challenges of using virtual reality will also be covered. Future directions will be discussed as a means of concluding the talk.

Presenter: Scott Lang

21st century Computer Science education using unplugged activities

Interdisciplinary

Computer science education is more and more pervasive with devices becoming more ubiquitous. Computers are everywhere. From the bank to the music player on one's pocket, it is more relevant than ever to be conscious of how to interact with machines. And to think like them.

However, not all classrooms are equipped with the technological tools. This session allows teachers from different backgrounds to discover means to teach computational thinking and computer science concepts by making it real to students who may only perceive computer science is only in the realm of computers.

Presenter: Adrian A. Angeles

When Counseling Services & Academic Success Unite: Creating Holistic Retention Initiatives for Academically Gifted High School Students

Outreach

Do gifted students struggle academically? What happens to the kid who was the tutor and now needs a tutor? This session will focus on combining the efforts of School Mental Health Counseling and the Office of Academic Success to present a holistic approach to retention. Through our 11 years of working together, April Gaskey (Coordinator of Student Success) and Pokey Bowen (Counseling Services) have developed a retention focused plan that is customized to the student's needs. Come find out what we are doing at the Gatton Academy.

Presenters: Christopher Pokey Bowen, April Gaskey

Professional & Community Development: a coordinated effort to enhance campus-wide growth

Administration

Joy and growth: wouldn't we all like our schools to provide both to faculty, staff and students? GSSM's 2018 strategic plan includes a focus on professional development with an emphasis on community well-being. We then added a Director of Professional Development and a committee charged with the same. Our efforts produced a series of offerings designed to spark growth and joy throughout the school, recognizing that a joyful learning environment for our students starts with the faculty and staff. This session will discuss the challenges, successes and next steps in our efforts to enhance living and learning at GSSM.

Presenters: Kyle Barnett, Danny Dorsel, Jennifer Taylor

IQ vs EQ: Helping the Smartest Person in the Room Become the Smartest Person in the Room

Wellness

Have you ever wondered why individuals with exceptionally high intelligence quotients sometimes find themselves working for individuals who may have more average scores? What is it that propels people with average to above average IQ's to positions of leadership, power, and success while others are left behind? Is there anything that can be done to develop the needed skills so that professional ceilings are not capped prematurely? This session will consider the answers to these questions and give definitive examples of how the South Carolina Governor's School for Science and Mathematics addresses them with their very intelligent, driven student population.

Presenters: Alison Y. Evans, Danny Dorsel, Emilye Mobley, Ph.D

Algorithmic Geometry w/ Java

Interdisciplinary

Geometric problem solving has undergone a quiet revolution in the hands of people who solve spatial problems by writing software. The theory foundation has morphed significantly for ease in thinking and writing algorithms. Courseware suitable for 11-12 graders has been successfully field tested. Students learn how to represent geometric objects and properties in software. Each student writes their own geometry library in Java, operationalizing and automating their problem-solving knowledge as they acquire it. Problem challenges are explored in STEM topics including 3D wireframe rendering, robotics, GPS positioning, and molecular mechanics. Girls and boys are equally enthusiastic about math with coding.

Presenters: Pierre Bierre, Gregory Duran

Evaluating Outcome of Experiential School Programming

Research

A major theme of STEM schools is to encourage and support students to pursue a STEM field. While many programs exist to achieve this goal, assessment and outcome are often not analyzed. At Hathaway Brown School, one-third of students participate in a student research program. In 2018, a formal 20-year survey was completed to measure long-term outcome. While the data are still being analyzed, preliminary results suggest that the program is successfully increasing interest and pursuit of STEM fields. The benefits, logistics, and potential uses of survey data for schools with similar experiential programs will be shared.

Presenter: Crystal Miller

Augmented Reality for All Workshop

Interdisciplinary

Paramount to our students success is their ability to create solutions with the very tools and techniques shaping our 21st century world. Using a project based approach, we transform the traditional classroom into a fully equipped research and design lab for augmented reality. Our students learn new skills via self paced tutorials, their progress incentivized by a gamified approach, adding a layered component that encourages healthy competition and collaboration. We move beyond thinking of AR/VR as only a tool for supplementing core curriculum, but rather introduce AR/VR as a hands-on tool in the creation of student inspired augmented reality experiences.

Presenters: William Forrester, Jessica Ann

Developing Authentic On-Site Research Students

Research

This presentation aims to describe how we develop the abilities of our students to conduct authentic research from the ground up. We will discuss laying the foundation in Research 1, the class in which we teach our students different lab protocols, how to read and use primary source literature, and how to use equipment such as Vernier probe ware, microscopes, incubators, centrifuges, steam sterilizers, among others. We will discuss supervising our students as they conduct original research studies in Research 2 & 3 and how to overcome challenges which inevitably occur with independent research and how we support our students in AP Research, the vast majority of which is conducted in-house.

Presenters: Jennifer M. Kinsey, Shelley Seagraves

Mathematical Explorations Using Desmos

Math

Desmos is a powerful tool for visualizing and exploring functions and data in a web browser or on a smartphone. In this session, we will discuss the platform and its uses in a high school or college classroom. Demonstrations will include visualizations of graph shifting, curve fitting, tangent lines, Riemann sums and area under curves, and Taylor series approximations. With each demonstration, we will discuss how to incorporate these visualizations into classroom discussions and explorations.

Presenter: Philip Benge

Year of Inquiry into Student Mental Health

Wellness

IMSA utilized a Year of Inquiry model to engage community members (staff, faculty and students) in an in-depth investigation of a current challenge that significantly influences IMSA's work and mission- student mental health. This educational session will provide an overview of the year-long model and the lessons learned through our first Year of Inquiry to aid in implementation at your institution. We will discuss IMSA's approach to engaging stakeholders in identifying the scope of and potential solutions to the selected challenge. Additionally, we will review our research findings and share the steps taken to address student mental health.

Presenters: Katie Berger, Dr. Amber Stitziel Pareja

IMSA's Reimagining Introductory Biology Pilot Study: Preliminary Findings

Research

In this session, preliminary findings from an innovative pilot study currently underway at Illinois Mathematics and Science Academy (IMSA) will be presented. The pilot study, which began in fall 2017 and will continue through spring 2021, compares and contrasts the effectiveness of a new, one-year introduction to Biology course called Advanced Biological Systems (ABS) with the traditionally offered one-semester Scientific Inquiries-Biology (SI-Biology) course. In addition to presenting preliminary findings from the first cohort, presenters will discuss the practical aspects of conducting a randomized control trial in a secondary education setting, including the advantages and challenges they have encountered throughout implementation.

Presenters: Amber Stitziel Pareja, Hannah R. Anderson

Microsoft Kinect: An Alternative Tool for Teaching Angular Kinematics

Science

Human movement is one of the best teaching tools for describing rotational motion. As limbs move about the joint, students can study how rotational motion influence movement technique. The video camera is a useful tool for studying angular kinematics of human movement. However, the video camera can only capture movement in two dimensions when the actual movement occurs in three dimensions. Expensive high speed camera systems are commonly used to describe rotational motion of human movement in three dimensions. Fortunately, the Microsoft Kinect Sensor can provide data which can be used for three dimensional angular kinematic analysis.

Presenter: Peter Fermin Dajime

Intro to Engineering: Energy Auditing

Engineering

The job of the engineer is to change the world. They do this through careful analysis of systems and development of solutions. Participants will get hands on experience getting the feel for engineering through an energy audit. They will be taught how to look at their surroundings with an engineer's eye, create technical documentation and provide varying solutions and their impact.

Energy is not infinite but we waste so much of it in our daily routines. An energy audit will help us determine these wastes and maximize.

Presenter: Alejandro Jose Tuazon

Be the Change: Re-ignite Student's Passion for Problem Solving & Mathematics

Math

Providing students with open ended (or open middle) problems where developing problem solving skills, math dialogue, and collaboration are the focus, will re-ignite their passion for mathematics. It allows a low floor/high ceiling approach, supporting students of all populations and levels, while promoting access (and ultimately equity). By moving away from an answer being the focus and reminding students how fun math can be by encouraging play and discovery, we show students a classroom where thinking and investigation is valued. Come and learn how to create & implement problem-solving experiences that re-ignites students' joy of mathematics.

Presenters: Marti Shirley, Joseph Bolz

Bringing STEM into the Humanities Classroom: The Study of Beauty

Interdisciplinary

Teach your students to think across disciplines by having them do exactly that.
The idea of beauty is deeply embedded in Western culture whether it is connected to the beauty of the natural world, Platonic forms, or a perfectly symmetrical human face. Once defined objectively and evidenced in the mathematical underpinnings of the universe, beauty today is a hotly debated topic in the discipline of physics. In this history of ideas class, whether the student's passion is math, biology, or history, discover the ways you can connect your student via collaborative research and hands-on learning to better understand ideas that are fundamental to the human experience. Session will also demonstrate how Office 365 can be used creatively in the classroom.

Presenter: Diane Gerard

IMSA STEM Pathways for the Future of Work

Diversity

Envision the workforce of 2050 – what occupations, opportunities, industries will be available to the current generation of youth? This session will explore how the new STEM Pathways program at Illinois Mathematics and Science Academy creates learning experiences to explore innovative careers of the future and how equity and inclusion are critical indicators for success. Be a part of the discussion to empower and prepare youth to transform the Future of the STEM workforce.

Presenter: Betty Hart

Collaboration and Inquiry for the Science Classroom

Science

Science is a collaborative endeavor, where most of the significantly influential advances are achieved by groups of scientists working together across varying institutions and disciplines. To reflect this, we should offer opportunities for our students to learn, research, and communicate with their peers. In this workshop, we share models that we have found successful for designing opportunities, as well as ideas for topics that promote real world application and cross disciplinary work for students, drawing from our experiences with the International Student Science Fair and other international strategies. We will help interested teachers in developing their own working groups to take ideas and plans back to their own institutions.

Presenters: Crystal Randall, Sarah O'Leary-Driscoll, Jessica Amacher

Bringing Galileo's Laws of Falling Bodies to Class

Science

Although we usually picture Galileo as a Renaissance man dropping objects from the Leaning Tower of Pisa, it was his use of the inclined plane which enabled him to make careful observations and measurements of falling bodies. His findings brought him to three laws that govern behavior of objects in free fall. His laws were simple mathematical expressions of the natural phenomenon of falling. Therefore, Galileo's laws of falling bodies are very cogent tools for a deep understanding of free fall. It is more usual for us to teach free fall using the kinematic equations, but the Galilean laws can be used as effective means for quick mental calculations and for solving free fall Physics problems.

Presenter: Delfin C. Angeles

Study Smarter to Stress Less

Wellness

The traditional high achieving student often doesn't know how to study effectively, leading to high levels to stress when they encounter challenging classes at the high school level. This session will discuss learning and study strategies based on cognitive science research that will support student learning both in and out of the classroom, thus reducing overall student stress.

Presenter: Pamela Word

Antidisciplinary Teaching: Creating Innovators and Problem Solvers for the Future

Interdisciplinary

Based on the MIT Media Lab's Manifesto, this workshop brings the 5P model of Projects, Passion, Peers, Play and Purpose to the high school level. Workshop attendees will learn how to blend curricular goals across subjects in meaningful ways for students to ask questions and solve problems that we have not defined in advance. Integration with CS tools and AI programming will be highlighted, including a detailed description of the Animal Perception Experience. Solving open-ended problems is a critical skill for 21st century learning!

Presenter: Charlotte Dungan

Three Breaths Together - Building Community Through MIndfulness

Wellness

Mindfulness isn't just crystals and new age music. This presentation will address how we as educators can go about meeting students' psychosocial needs through meditation to facilitate academic performance and stress reduction. We will dispel some of the myths about mindfulness, talk about what mindfulness is and the science behind it, practice a meditation, explain how we use it in a high school American Studies course, and brainstorm how participants can use it in their own teaching/counselling/administrative practices.

Presenters: Michelle Brenner, Katie Moulder

Educator Stress: Finding Solutions to Combat Negativity, Exhaustion, and Burn Out

Wellness

Working in education can be one of the most fulfilling jobs, but the current climate for many educators is filled with stress and frustration. With teachers feeling underappreciated and overworked, mental health issues are on the rise and the climate of many schools has had a negative turn. This session will discuss topics around compassion fatigue, negativity, not feeling connected, dealing with challenging students, and overall discomfort to change.

Presenters: Kevin Kusy, Sarah O'Leary-Driscoll

Computer Science Quest

Outreach

With the growing demand for computing skills across many disciplines, it is important to prepare students to think, communicate, and work in a technologically evolving environment, and empower students to better understand and appreciate how technology can have an impact on society. This session is geared for school administrators and/or teachers interested in offering a Computer Science day program for rising 6th–8th graders. The program is designed for students to explore a wide variety of topics through hands-on activities. Each activity promotes students to practice problem solving, creativity, collaboration, and communication while working in groups and peer-programming environments. Through outreach to younger audiences, computer science might feel less intimidating, and rather a paved roadway for future opportunity and advancement.

Presenter: Angela Taricco

A Co-Requisite Model to Increase Access to Upper-level Math Coursework

Administration

Students enter high-school with a variety of mathematical backgrounds, often with holes in their content knowledge that hold them back in their coursework. As a result, students are denied access to high-level math and science courses during their junior and senior years. NCSSM has implemented a co-requisite course model to advance student opportunities in math coursework, allowing them increased access to these high-level courses. Come learn about this approach and how to implement it at your school.

Presenter: Taylor Gibson

Supporting Transgender students in Residential and Academic settings

Administration

Have we created an inviting and inclusive environment for our transgender students? What are the best practices that are employed to show all students that they belong?

Presenter: Rheo Morris

Microcredentials - Promoting IMSA's Signature Strategy

Outreach

Explore how IMSA (Illinois Mathematics and Science Academy) has created a system of professional development leading to a micro-credential for educators across the state and beyond. This system focuses on our Signature Strategy representing the institutional core competencies.

Through face to face professional workshops, blended learning opportunities and interactive online choices, teachers anywhere can develop skills to provide competency-driven, inquiry-based, problem-centered and integrative instruction.

Join us to learn more about the development and structure of these offerings and our Signature Strategy.

Presenters: Angela Rowley, Dr. Nicole Ross

Autonomous Racing, Machine Learning, and More with MIT Beaver Works Summer Institute

Engineering

MIT Beaver Works Summer Institute (BWSI) is a rigorous project-based STEM program designed for rising high school seniors. Accepted students spend 4-weeks at MIT taking a course on an emerging technology such as autonomy, machine learning, or 3D printing. The presentation will highlight the BWSI summer program, application process, and testimonials from program alumni. Workshop attendees will have an opportunity to test drive our program by programming a state-of-the-art 1/10-scale autonomous racecar to compete against other workshop participants. The fastest team will win a free autonomous mini-RACECAR platform (a $600 value)!

Presenter: Andrew Fishberg

Holistic Approach to Academic Support

Wellness

Academic support is critical to the success of students, and gifted students are no exception. Students may need support with material learned in class, struggle with time management, be unable to meet interim deadlines for long-term projects, or struggle with other executive functions. The challenges become even more significant in a residential environment where students need to adjust to living and learning independently while also developing new social groups. We will share application-based approaches successfully implemented at IMSA. These approaches are multi-faceted and incorporate a team structure including the student, parents, teachers, counselors, and other staff.

Presenters: Amy Keck, Diane Hinterlong

Removing Stress from the College Application Process

Wellness

The college application and admissions process is a stressful time in a high school student's life. As counselors, we work with anxious parents and students year after year to try and make the entire process more transparent and less nerve racking. In this session, you will learn about tools and strategies that can be used at your own school when working with students and parents who are applying to college. This sessions is applicable to teacher and administrators as well to learn how to support your students during this stressful time in their lives.

Presenters: Kacey McAleer, Alexa Scott

Inquiry Driven Campus Hydrogeology Project

Science

Groundwater is used by over 50% of the population of the USA as drinking water supplies however, most people have a lack of understanding of the complexities of and issues surrounding access and sanitation of these systems. We have started a hydrogeology project as a collaboration between our academy and our local university. It is highly inquiry based and includes the installation and use of a well on campus. We will discuss the present course of this project as well as ways that it can be implemented in other schools who share our focus on environmental studies and sustainability.

Presenters: Sarah O'Leary-Driscoll, Melissa Lenczewski

Internship Curriculum and Program Development: Cognition at the Core

Interdisciplinary

Learn about The Gwinnett School of Mathematics, Science, and Technology's signature internship program and the accompanying curricular components that cognitively coach students through intellectual, social, and emotional development throughout their internship experience. Students at GSMST are concurrently enrolled in a credit-bearing course while they work on-site through their internship endeavor. This session will present in-class, seminar, and eclass Internship course content, performance benchmarks, evaluation tools, and student deliverables that asses and showcase students' skills crucial to success in post-secondary STEM endeavors. Participants will explore both the instructional resources and student work exemplars from GSMST's Junior Fellowship Experience.

Presenter: Nicole D'Antonio

Hands On Humanities: Using Interaction to Advance Understanding

Humanities

This presentation will explore using hands on learning in the Humanities that supply students the opportunity to interact with content on an advanced level. The lessons discussed are pulled from Social Studies classrooms, but the structures within are flexible enough to be implemented across disciplines. This purpose is to discuss how allowing students to practice a content through interaction can produce higher level knowledge while also creating the opportunity to practice important interdisciplinary skills.

Presenters: Kimberley Pettigrew, Jessica Vanover

Classroom Assessment Literacy: A Think-Pair-Share Workshop

Research

Classroom teachers spend a significant portion of their time in assessment-related activities, yet have not received commensurate time in formal training in evaluation and measurement techniques. This workshop will use the Think-Pair-Share collaborative learning strategy to discuss and implement assessment best-practices that educators can easily adopt for their own teaching.

Presenters: Hannah R. Anderson, Aryn C. Karpinski, Ph.D.

Arduino Basics & Applications

Engineering

Arduino Basics & Applications will be a hands on experience in coding Arduino and creating basic circuits with various sensors and devices. This intro to Arduino will give the participants some basic Arduino coding knowledge, list of economical Arduino kits and vendors, training with a free web based simulator for Arduino and circuits, along with ideas of how Arduino can be applied to various STEM classes.

Presenter: Eric Kotara

Beyond the GPA: A Recipe for Success and Student Wellness

Wellness

How does your school community define success? Do your students experience GPA stress? Are you seeing an increase in the number of students experiencing issues with mental wellness and life balance? Participants in this workshop will identify and discuss symptoms of stress in their schools. Time will then be provided to synthesize common threads in our collective experiences while diving deeper into possible root causes of stressors that are unique to our individual schools. Finally, participants will depart with at least one student wellness idea that is within their ability to influence at their school.

Presenters: Ann N. Bonitatibus, Mark Forgash

Chemistry Caravan: A STEM Outreach Program for Grade Schoolers

Outreach

Chemistry Caravan is a series of outreach events wherein high school students showcase chemistry experiments to elementary students in schools that lack materials to do so in their regular classroom setting. This project aims to advance STEM education outside the classroom, to develop and strengthen the interest of Filipino grade school students in science, and to inspire them to pursue secondary education in a science high school and eventually be the future scientists and leaders the Philippines needs.

Presenter: Arianne A. Won

Great Ideas: An Introduction to Humanities Course

Humanities

Great Ideas is a discussion and participation based course that covers multiple topics within the humanities. Specially we will look at our Media Unit which synthesizes the subjects of politics, entertainment, advertising, ethics, and education. We will have sample lessons and content covered within our course available.

Presenters: Chloe Cardinale and Sade Vallier

Ensuring Access and Opportunities for Success for Low-Income Students

Admissions

For twenty-five years, ASMSA has maintained a commitment to promoting both access and success for low-income students within the institution's nationally-recognized residential experience. One-in-three ASMSA students qualify for national school meal programs. This session spotlights ASMSA's "upwARd Promise" program, strategies for connecting with economically diverse students, on-boarding programs, and developing appropriate curricula that recognizes their opportunity gaps.

Presenters: Corey Alderdice, Charlie Feick

Community STEAM Outreach: Students Teaching Students

Outreach

This presentation will share lessons learned from programs involving high school students teaching middle school students in STEAM outreach programs in Bergen County, New Jersey and nearby communities. In addition, the presentation will explore new developments and open a discussion where participants can share ideas and reflections about peer mentoring and STEAM outreach. The goals of this presentation are to share different ways of organizing and managing programs in which high school students have the opportunity to design, implement, and participate in STEAM outreach for middle school students, to inspire and help to guide new programs like these, and to encourage networking among people interested in sharing ideas and promoting these programs.

Presenters: Ken Mayers, Mark Tronicke

'Integrating' Desmos into Calculus

Math

In this session, we will learn the basic rules for creating interactive Desmos models pertaining to topics such as sketching derivatives, methods of area approximation, and convergence and divergence of series, including Taylor polynomials. Access to fully-functional electronic materials and models will be provided at the end of the session.

Presenter: Kevin Malone

Do we always have to teach Shakespeare? Tradition and diversity in the literature survey

Humanities

When looking at the syllabus for a literature survey, we often notice a preponderance of male voices—Chaucer, Shakespeare, Wordsworth, Eliot, Hawthorne, Twain, and the like. Given that literature is so central to how we understand and construct our own selfhood, it's unfortunate that students are often only exposed to a survey curriculum developed around a traditional literary canon. This session will discuss syllabus design and course reading selections, ways to approach discussion and address issues that may arise in class discussion, as well as discuss my experience designing and teaching an all women writers British literature survey.

Presenter: Justin Barker

STEM Outreach Development Workshop: Campus, District, and Beyond

Outreach

In this session, attendees will participate in a hands-on workshop where they will learn about the eleven types of STEM Outreach our students lead within the campus, district, and community. We will share our triumphs and failures that we have experienced over the years and challenges that we face as we continue to grow. Session attendees will gain knowledge and ideas about how to start their own STEM Outreach program. Attendees will leave this session with several inexpensive and fun hands-on activities to add to their STEM toolbox as well as a blueprint for starting their own STEM Outreach program.

Presenter: Jean Karst

How can we make interdisciplinary really really work

Interdisciplinary

What do we mean when we say interdisciplinary education? How do we build teachers' capacity and prepare them to plan collaboratively towards integrating the different subjects, in a meaningful way, and at same time being able to achieve the different subject standards for targeted subjects at the same time to develop 21st century skills and to use inquiry -based learning methods?
What is required of administration to support and develop this kind of learning?
What is required from the teacher for this type of planning and learning?
What is parents' role in this type of learning?
How does this kind of learning affect and influence students' learning?
How does this learning looks like in the classroom?

Presenter: Duha Masri

Building the scaffolding to support independent student research and credentialing

Research

Want your seniors involved in Capstone Projects? That doesn't happen overnight or even in one year! This presentation will share how St. Teresa's Academy, an all-girls independent Catholic high school, took the beginning steps to develop independent student research and STEM credentialing. Participants will learn how this process is a cross-curricular effort starting freshman year. Critical building blocks in the develop of the four-year student experience will be shared as well as current efforts to expand off-campus research opportunities and professional mentorship for upperclassmen.

Presenter: Jo Weller

Music and Math: An Interdisciplinary Approach to Transformations of Functions

Interdisciplinary

A mathematics and a music teacher teamed up to create this rich project that connects music and geometric transformations. Students love using music composition tools and Noteflight to create their own melodies and then represent their melodies mathematically using data, regression and transformations of functions. We will demonstrate how the project engages students in a creative endeavor where the beautiful connections between music composition and geometry are amplified. No prior musical experience necessary.

Presenters: Maria Hernandez, Phillip Riggs

Teaching Academic Concepts Using Industrial Robotics

Interdisciplinary

This session will demonstrate how robotics can be used in the classroom to provide a relevant reinforcement of math and science.concepts. Topics will include industrial robotic platforms available to education, as well as available certifications and career prospects. Examples and methodologies related to implementing the curriculum to reinforce math and science principles will be shared and demonstrated.

Presenters: Michael Geist, Eric Race

What STEM Can Learn from the Digital Humanities

Interdisciplinary

What can NCSSS schools learn from the Digital Humanities, a field combining humanistic inquiry with computational tools that has emerged in higher education in the last fifteen years? This session introduces DH and demonstrates DH efforts already underway in traditional courses and a new Digital Literary Studies elective at the Illinois Mathematics and Science Academy. Positioning DH less as a STEM takeover of the humanities than as an infusion of humanistic thinking into the learning lives of technology-oriented students, the session argues that DH offers a model for bridging the "Two Cultures" of STEM and the humanities at NCSSS schools.

Presenter: Eric Rettberg

He, She, They, Them, Us: Teaching Gender Studies in a STEM Environment

Humanities

"He, She, They, Them, Us: Teaching Gender Studies in a STEM Environment

In this session, we will share the importance of teaching Gender Studies as an English elective in a STEM school. We will introduce our curriculum, including biological and socially constructed theories of gender and how these inform gender-related legal and social challenges in our world. Areas of focus include the role of gender in: politics, sports, media, literature, and culture. Our aim is to share our experiences and course materials with other humanities teachers and discuss and strategize ways to eliminate gender bias in our own schools as well as prepare students for the post-secondary world.

Presenters: Erin Micklo, Dr. Leah Kind

Starting and Sustaining a STEM After School Program

Outreach

The ENGAGE and SPARK programs offered by the South Carolina Governor's School for Science and Math are delivered throughout the school year to 6th-8th grade students from culturally and economically diverse backgrounds who are interested in STEM. These programs offer a variety of enrichment opportunities. In this session we will discuss the creation, current focus and future of the programs as well as the role our students play in how they develop as teachers, leaders, and mentors within the program.

Presenters: Irene Middleton, Randall M. LaCross

Mentoring: A Symbiotic Experience

Outreach

In a mentor/mentee relationship there are opportunities for each to grow professionally in content and pedagogy. We share a framework and strategies for supporting this symbiotic growth. Our discussion includes reflections on our goal of fostering student voice and broadening our collaborative work to enhance mentor/mentee relationships within the broader school community.

Presenters: Nicholas Koberstein, Maria Hernandez

The Value of an Authentic Audience and Professional Presentation Setting for Student Research Initiatives

Research

How important is an authentic audience and a professional setting to a STEM school's priority of student research? We think it develops our students' ability to communicate their learning and deepens the research projects, as students realize they will present just like a "real" scientist. At an annual science symposium held at a major university, our seniors present research to judges, teachers, families, and peers; and report that they benefit from the experience. Lessons learned from working with students on how to communicate to an audience will be shared, to extend these ideas into daily instruction.

Presenters: Terri Perkins, Bethany Smith, Dr. Kevin Goff

Tools, Tips, and Tricks for Making Statistics Stick

Research

Tired of just notes and practice problems? This session offers varied ways to master topics in statistics (mostly from the AP curriculum) including technology, interactive notebooks, manipulatives for constructing knowledge, mnemonics, and various other study tools. Participants will walk away with handmade interactive notebook pages as well as digital copies. They will explore valuable technology tools and learn various tricks to help make statistics topics stick. Sampling distribution manipulatives will be on hand for participants to try, along with ways to create or order your own.

Presenter: Rebecca Gaillot

Engineering Interest in Science

Science

Are you looking for ways to spur student interest in science through hands on and minds on activities? This session will provide examples of ways in which small engineering projects can be integrated into traditional science classrooms. Example projects from oceanography, AP chemistry, and engineering classes will be shared. Session participants will leave this session with lesson plans and sample rubrics.

Presenter: Diana Kennen

Integrating AP Capstone into established STEM research curricula

Administration

AP Capstone and established STEM (hard science) research programs can be successfully integrated and scheduled within a school's curriculum to maximize student engagement in the research process. This presentation will show how the Baltimore Polytechnic Institute introduced and integrated AP Capstone into its two existing laboratory research programs, nearly doubling the number of students engaged in active research programs throughout the school, over a three-year period.

Presenters: Josh Headly, William Wolfe

Leveraging Community Partnerships

Administration

Uxbridge High School, a small, suburban, public high school in central Massachusetts, has leveraged partnerships with local industry to create authentic learning opportunities for students and curriculum support for students. Additionally, UHS and the Blackstone Valley Ed Hub model are being seen as an opportunity for public school and industry collaborations across the Commonwealth.

Presenters: Michael Rubin, Jeannie Hebert

Matchmaking in Humanities: connecting content across disciplines

Humanities

We go together like History and Literature. Right?!
Come hear about the triumphs and lessons learned from a Language Arts teacher and a History teacher who teach Humanities in a STEM program. In this session, we plan to share our units of study, lesson planning methods, shared projects and assignments, best practices, and samples of student work. Our goal is to provide participants with applicable knowledge and ideas that they can take information back to their schools and classrooms regardless of their school setting and demographics.

Presenters: Katie Massey, Jessica Copeland

"Post-Calculus" course offerings

Math

Come hear a brief presentation about 'post-calculus' math courses Thomas Jefferson High School for Science and Technology (TJHSST) is offering students.

Also, feel free to participate, or listen to, a discussion of what is happing, or you'd like to happen, in your schools. We will discuss everything from courses, to roll outs, to dual enrollment, etc.

Presenter: Myra Spoden

Teaching Physics with Passion

Science

Based on my multifaceted experience in academia, including both research and teaching, I will address what constitutes good physics teaching, for the student's learning and from the teacher's professional and personal satisfaction perspective. I will provide some basic, but very important suggestions, recommendations, challenges, and discussion points for teachers and administrators at STEM schools. My goal is to encourage and challenge us to continue the education revolution that is the NCSSS schools trademark.

Presenter: Anders Gårdestig

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Illinois Institute of Technology

Illinois Institute of Technology is a private, technology-focused research university offering undergraduate and graduate degrees in engineering, science, architecture, business, design, human sciences, applied technology, and law.

One of 21 institutions that comprise the Association of Independent Technological Universities (AITU), Illinois Tech offers exceptional preparation for professions that require technological sophistication, an innovative mindset, and an entrepreneurial spirit.

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MathWorks

MathWorks is the leading developer of mathematical computing software. Engineers and scientists worldwide rely on its products to accelerate the pace of discovery, innovation, and development.

PCS Edventures

PCS Edventures works to instill a passion for Science, Technology, Engineering and Mathematics (STEM) in students all over the globe. Through exciting, experiential learning, our learners quickly develop the foundations of scientific inquiry, engineering design principles and spatial mathematical awareness while also exercising problem-solving, communication, reflection and collaboration skills.

Society of Women Engineers

SWE is the world's largest advocate and catalyst for change for women in engineering and technology.

Project Lead The Way

Project Lead The Way (PLTW) is a nonprofit organization that provides a transformative learning experience for PreK-12 students and teachers across the U.S. Through our pathways in computer science, engineering, and biomedical science, students develop in-demand knowledge and skills necessary to thrive in an evolving world.

St. John's College Cambridge

The University of Cambridge, founded in 1209, has a world-wide reputation for outstanding academic achievement and is consistently ranked as one of the world's best universities. It is formed from a variety of institutions, which include 31 Colleges and more than 100 academic departments. The Colleges are governed by their own regulations, but are integral to the make-up of the University of Cambridge. All students are members of a College; this is the place where they eat, live, socialize and receive their supervisions.

St John's College, which was founded in 1511, is one of the biggest Colleges in Cambridge and one of the most stunning places in the world for students to live and learn!

Teaching Channel

Teaching Channel is a thriving online community where teachers can watch, share, and learn diverse techniques to help every student grow.

The Science Coach

The Science Coach program is structured like a sports team. A Head Coach and five teacher coaches with 10+ students each make up a team. Students are coached to develop a high-level question/problem to be answered or solved, collect data with current equipment, analyze results, infer appropriate conclusions, and enter the project into juried competition.

THANK YOU!

Do You Know a Kid Like Me?

By John Wood

This summer, I went to a new camp for the first time. At first, I was reluctant to go. I had recently gotten out of school and was not happy to be headed off to a camp where I would study engineering for a week. I can now confidently say that I was wrong, very wrong. If you walked up to me and asked about the GoSciTech camp, it would take about 30 minutes of nonstop talking for me to get out everything I had to say about it (all good things). The camp is incredibly well-run, and is located on the beautiful South Carolina Governor's School campus, which is a boarding high school for juniors and seniors. The engineering class I took was great, and I learned a lot about each type of engineering, which will be helpful if I ever want to focus on just one. The fact that it was a sleepaway camp was one of the most beneficial parts of GoSciTech. It allows kids from all around South Carolina to be exposed to learning away from home, which is critical during college. I learned a lot about engineering and was happy to be able to attend this camp.

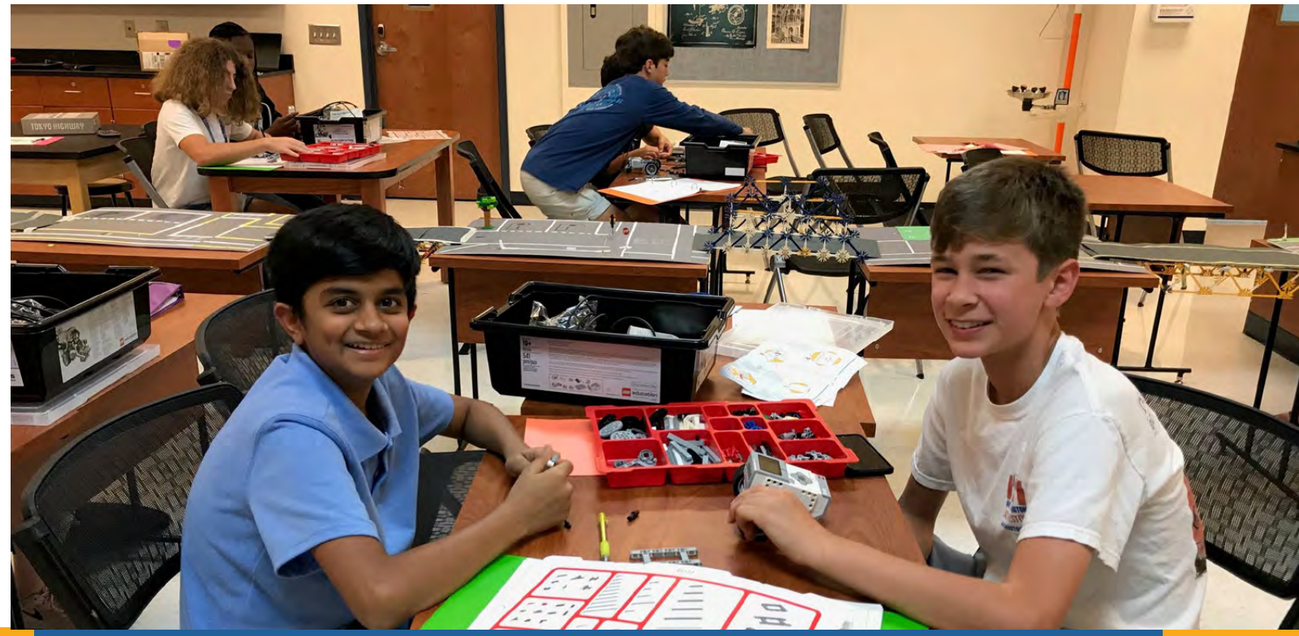
Why was it important for me to go?

The opportunity to go to a camp like this is hard to pass up. There were so many factors that made it an easy choice. First, all of the teachers have PhDs and many work at colleges like the Citadel and Francis Marion, which gave me a sense of what college professors might expect. When I picked a class I knew I was going to learn a lot, because the teacher had dedicated a lot of time studying this subject. Another reason I wanted to go to this camp was to be exposed to new subjects or dive deeper into subjects that I already knew about. As my mom and I scrolled through the list of classes, they all sounded like they would be interesting. They were about things that I wanted to learn, like physics and engineering. I believe that this camp is a great way for students to find things that they might want to study in college and eventually even in their careers. Finally, I chose to go to this camp to meet new people. The camp had 135 campers, and 17 were in my class. It was easy to meet new friends in class and at camp activities. The camp was full of kids that took school seriously. I was surrounded by students who were focused. We learned to work as a group to understand what we were doing in class. To sum up, going to this camp was important because it helped me in my academics and possibly working life and it allowed me to meet new people.

> "The camp was full of kids that took school seriously."

How do I think it will help me in the future?

The activities and learning at this camp will help me in several different ways. First, it introduced me to engineering, which will help if I want to pursue that subject. One of the great things about my class was that it used all different kinds of engineering, although most of what we did was in the civil branch. Some types of engineering that fell under civil were transportation engineering and architectural engineering. One day we designed complete streets, which we learned are actually designed by transportational engineers. On another day, we designed bridges that could support themselves. Toward the end, we even incorporated mechanical engineering when we designed Lego vehicles that could drive through our streets and cross our bridges. I learned a lot about different kinds of engineering, which might help if I decide to study a specific kind of engineering in college.



This experience will also help me in the future because it is like a crash course of college. You had to wake up in the morning to eat breakfast and prepare for the day, you had your class in the morning and afternoon, and you had free time to roam around and have fun. It taught me a lot of small things, like setting an alarm for yourself and not overusing the soda machine. This experience also seemed like college in that I met lots of friends that I hope to stay in touch with. The things that I learned at this camp and the memories I have from there will be with me for a long time.

How did it in general make me a better person?

This was a camp full of wonderful people. From the teachers to the counselors to the campers, everyone was nice. I was amazed by how understanding the counselors were and how they could help anytime. This environment caused me to act more maturely and be more considerate. If someone is nice to you, you generally want to be nice back. When you meet new people, you are also less loud and more understanding. And it was not just the way people carried themselves that made me feel like this camp was making me a better person. Seeing the perspective of other people that are interested in the same things as me was great. Those kinds of things helped me keep an open mind about what I was learning. Living with someone I did not know in the same room also was a learning experience. I learned that I had to be a little more tidy with my belongings. I also think that this camp helped me see other people's points of view, which is always good.

Overall I would say that this is the best camp I have ever gone to, and I am excited to be able to go for another two years. This means I get to spend more time learning about other subjects that were offered at this camp, like robotics or physics. From the learning to the people to the ping-pong, there are many good aspects of this camp. You have a ton of fun while learning important skills that can be applied in the near and far future. The experience that kids have at GoSciTech is one of the best, and I appreciate what they did and how it helped me and many kids in South Carolina. ■

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Aron Culotta, *Associate Professor of Computer Science and Co–Director of Illinois Tech's AI program*

Leading the Artificial Intelligence Charge

Illinois Tech Offers Pioneering Undergraduate AI Degree

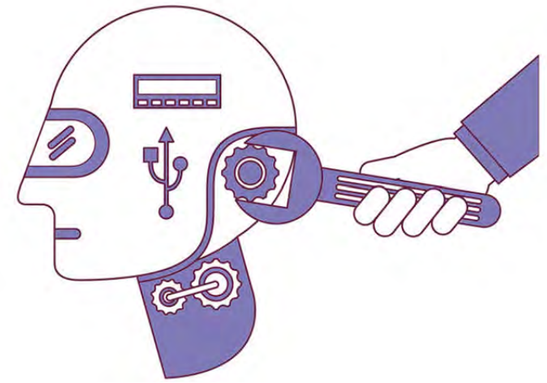
(Sponsored Content)

Applications of artificial intelligence are rapidly advancing across industries. Whether it is analyzing risk management in corporate finance, finding tumors on medical images, building an autonomous vehicle to explore other worlds, or designing a horrible supervillain for the next hot video game, AI allows computer scientists to flex their creativity to solve problems in all corners of society.

Ask the experts to define AI, and it will be difficult to find two people giving the exact same answer. Because it has so many aspects and so many uses, AI's very definition is loose. Natural language processing, computer vision, deep learning, and data mining all are aspects of AI, and it will be up to the computer scientist to use his or her creativity to utilize any and all of these tools to come up with solutions to solve today's complex problems. Understanding how components of AI work and how they can be implemented will be a necessity to keep up with technological trends.

The Department of Computer Science at Illinois Institute of Technology, the only tech–focused university in Chicago, is taking the lead in cultivating talent in this expanding discipline by offering a bachelor of science degree in AI beginning in fall 2019. Illinois Tech is one of just a handful of universities in the country to offer a bachelor's degree program in AI, and the only one in the Midwest.

"Artificial intelligence techniques and applications are having a substantial impact on society and across many fields and disciplines, especially in advancing new capabilities and discovery," says Eunice Santos, the chair of the computer science department, Ron Hochsprung Endowed Chair, and professor of computer science at Illinois Tech. *"The computer science department at Illinois Tech is excited to create undergraduate and graduate degree programs and courses in AI providing students with the opportunity to learn core AI concepts, be exposed to the multidisciplinary nature of using AI in problem-solving, and understand the importance of ethics and social impact."*



While many schools offer courses and concentrations in AI, Illinois Tech—with its long history of preparing innovators who have changed the technology landscape—made the bold decision to create this specially designed degree program.

"AI is the future," says Aron Culotta, associate professor of computer science and co–director of Illinois Tech's AI program. *"We want to train a workforce that can tackle the challenges and opportunities of the future, which includes AI and machine learning."*

Although it may be loosely defined, at its core AI aims to automate intelligent behavior. To do so, AI primarily relies on vast quantities of data and algorithms to allow the computer to learn from that data. Illinois Tech's program explores all the different ways this data and various algorithms can be used.

Introductory courses in programming, computer science, mathematics, and statistics provide a firm technical foundation to launch into the core concepts and techniques of AI, including state-space search, game playing, machine learning, neural networks, computer vision, and language understanding.

By its nature, AI is an interdisciplinary field, requiring an understanding of both computational and human sciences. To understand AI is to understand human cognitive sciences, learning theory, linguistics, and the philosophy of language, all of which are incorporated into the curriculum.

In addition to having a deep theoretical foundation, project-based experience in AI applications through participation in Illinois Tech's Interprofessional Projects (IPRO) Program is a key component of the curriculum. Three to five students form an IPRO team and work together with faculty to solve a real–world problem.

Moreover, the growing impact of AI on society demands that graduates are

equipped with a strong ethical base and are highly conscious of how biases can corrupt the fulfillment of AI's promises. Illinois Tech integrated ethical thinking into technical courses, which affords critical training in issues of algorithmic fairness, transparency, and bias.

"The growing impact of AI on society demands that graduates are capable and ethical collaborators, able to ensure the safe and effective adoption of new technologies across domains," Culotta says.

Faculty at Illinois Tech have been on the forefront of AI research, bringing this knowledge into the classroom and offering research opportunities to their students.

Culotta leads the Text Analysis in the Public Interest Lab, which investigates socially beneficial applications of natural language processing, machine learning, and text mining algorithms. His research, funded by the National Science Foundation, extracts knowledge from online social networks to track the spread of diseases, to inform first responders during natural disasters, and to reduce online harassment.

Mustafa Bilgic, associate professor of computer science and co — director of Illinois Tech's AI program, has done extensive research into machine learning, active learning, active inference, probabilistic graphic models, and statistical relational learning. He is the director of the Machine Learning Laboratory where research projects include interpretable text classification, deep collective classification of cells in microscopy images, active inference for predictive models of spatio–temporal models, learning with rationales, and interpreting image classification.

> ***"Moreover, the growing impact of AI on society demands that graduates are equipped with a strong ethical base and are highly conscious of how biases can corrupt the fulfillment of AI's promises."***

Shlomo Argamon, professor of computer science, researches computational methods for style-based analysis of natural language using machine learning and shallow lexical semantic representations, exploring applications in intelligence analysis, forensic linguistics, biomedical informatics, and humanities scholarship. Currently, he studies the connection between ideology and personality to language use, as well as extracting and analyzing the meaning of metaphors. Of particular interest to Argamon is demonstrating the relationships among linguistic structures, individual reasoning, and social context.

Illinois Tech's Mies Campus is located just minutes south of Chicago's bustling downtown. Chicago is home to a growing tech community loaded with hacking opportunities and a network of tech — based business incubators. The city government is extremely open with its data, allowing unusual municipal access for research opportunities. Many faculty have collaborations with city officials using their data for research projects, including Bilgic, who has collaborated with the city's Department of Public Health with the help of undergraduate researchers. But the city provides many more opportunities to put AI skills to use.

Chicago is a global hub of finance, health care, manufacturing, transportation and logistics, insurance, and financial markets. All of these industries are incorporating AI into everyday business practices, and need AI experts right away. This opens the possibility for internships, as well as a wide variety of career paths. Businesses, from startups to some of the largest corporations in the United States, call Chicago home, each with its own business style, practice, and culture that can lead to an array of career opportunities.

Illinois Tech offers the best return on investment among private colleges after student aid in terms of 20–year, mid–career earnings according to PayScale, and is #1 in Illinois for lifting students from families in the bottom 20 percent of income to the top 20 percent according to The Equal Opportunity Project and *The New York Times*. This has led *The Princeton Review*, *Forbes*, *Time*, and *Money* magazine to call Illinois Tech an educational best value.

Chicago is a vibrant city that fosters and rewards creativity. With the skills acquired from Illinois Tech's AI program, students can put their creative forces to work, choose their own path, and take control of their career. ■

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.

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