THE STEMEDGE

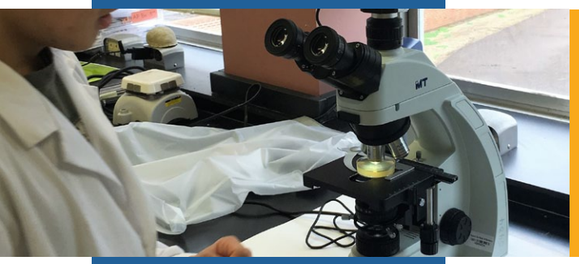
A quarterly magazine from NCSSS giving teachers and administrators the competitive advantage in professional development.

QUARTERS 1-2 | 2018

NCSSS MAGAZINE

CONTENT

VOLUME 1 | ISSUE 4



FROM THE EXECUTIVE DIRECTOR

This current issue of STEM Edge marks our fourth issue. I hope you find it chock-full of good reading. We are very pleased with the launching of the publication. We receive good feedback, and importantly, great content. If you or any colleagues within your school want to submit an article, please do so to jen.mcnally@ncsss.org.

This quarter finds us putting on the final touches for our Professional Conference in Houston. All the sessions are spoken for. We have an exciting pre-conference tour of a special Rice program. This tour is book-ended with a tour of NASA on Saturday. And of course, best of all are the sessions and networking in between.

New to the conference – and to NCSSS – is a program featuring two awards, one for Innovative Student Programs and the other for Innovative Partnerships. We have a Board committee that has developed a rubric on which to judge applications. Winners will be presented their awards in Houston at the conference. We will also be providing lots of publicity for our winners. So, I encourage our member schools to get your applications in early.

Also new to NCSSS is our job board. It is aimed at our niche of STEM teaching and STEM school leadership positions. But the beauty of the job board is that the net can be spread far and wide. For a little bit more, employers can be sure postings are distributed to a much broader national audience. We hope you will use the service and then let us know whether you had applicants responding to you through it.

It is always a pleasure to work for NCSSS. I say this not just for myself, but for the entire staff. We appreciate the support and look forward to seeing you in November.

All the best,

— TODD

Todd Mann | NCSSS Executive Director | todd.mann@ncsss.org

PRESIDENT'S CORNER

It is both an honor and a privilege to serve as the NCSSS president. My love for the Consortium stems back to a calculus reform conference sponsored by the Consortium and held on the campus of Smith College during summer of 1993. At the conference I met my soulmate, a math teacher who later agreed to be my wife. While we cannot promise you will meet your soulmate through the Consortium, I do promise you will meet like-minded individuals that have an affinity for you and your school.

"In addition to expanding our connections globally we have started meeting regionally."

I often tell people NCSSS is my second family. We celebrate each other's successes and share in each other's challenges. In May I was fortunate to attend the International Science and Engineering Fair (ISEF) in Pittsburg with 10 students from my school. I was excited to see students from other NCSSS member schools showcasing their talents in STEM. While at ISEF I was able to visit with representatives of colleges and universities. I look forward to working with the institutions that expressed an interest in developing further connections with the Consortium.

In keeping with the NCSSS mission to advance STEM education by providing professional development and networking opportunities, we are piloting an international cohort of schools. At this time the cohort includes eight U.S. schools and nine international schools, all of which are excited to explore connections and commonalities. In addition to expanding our connections globally we have started meeting regionally. Expect to hear more about these regional opportunities in the near future.

I encourage everyone to attend our fall Professional Conference. The renewed connection to old friends and the opportunity to make new ones is readily available. This year's Professional Conference is being held Nov. 7-10 in Houston.

Our Keynote Speaker, Dr. Richard Tapia, is a professor in the Department of Computational and Applied Mathematics at Rice University. He has delivered numerous invited addresses to national and international conferences. I look forward to hearing from Dr. Tapia.

The Professional Conference Agenda is now available online and includes session strands in Administration, Admissions, Diversity, Outreach, Research and Wellness. Curricular strands in Science, Engineering, Math, Computer Science, Humanities and Interdisciplinary Studies round out the offerings. Excursions to Rice University and Johnson Space Center are enjoyable ways to interact with conference participants and learn about the Houston area.

On a personal note, my staff always seems to return from the NCSSS Professional Conference with new understandings that lead to school improvements that would not otherwise be implemented. I hope to see you all in Houston!

— BOB GREGORY

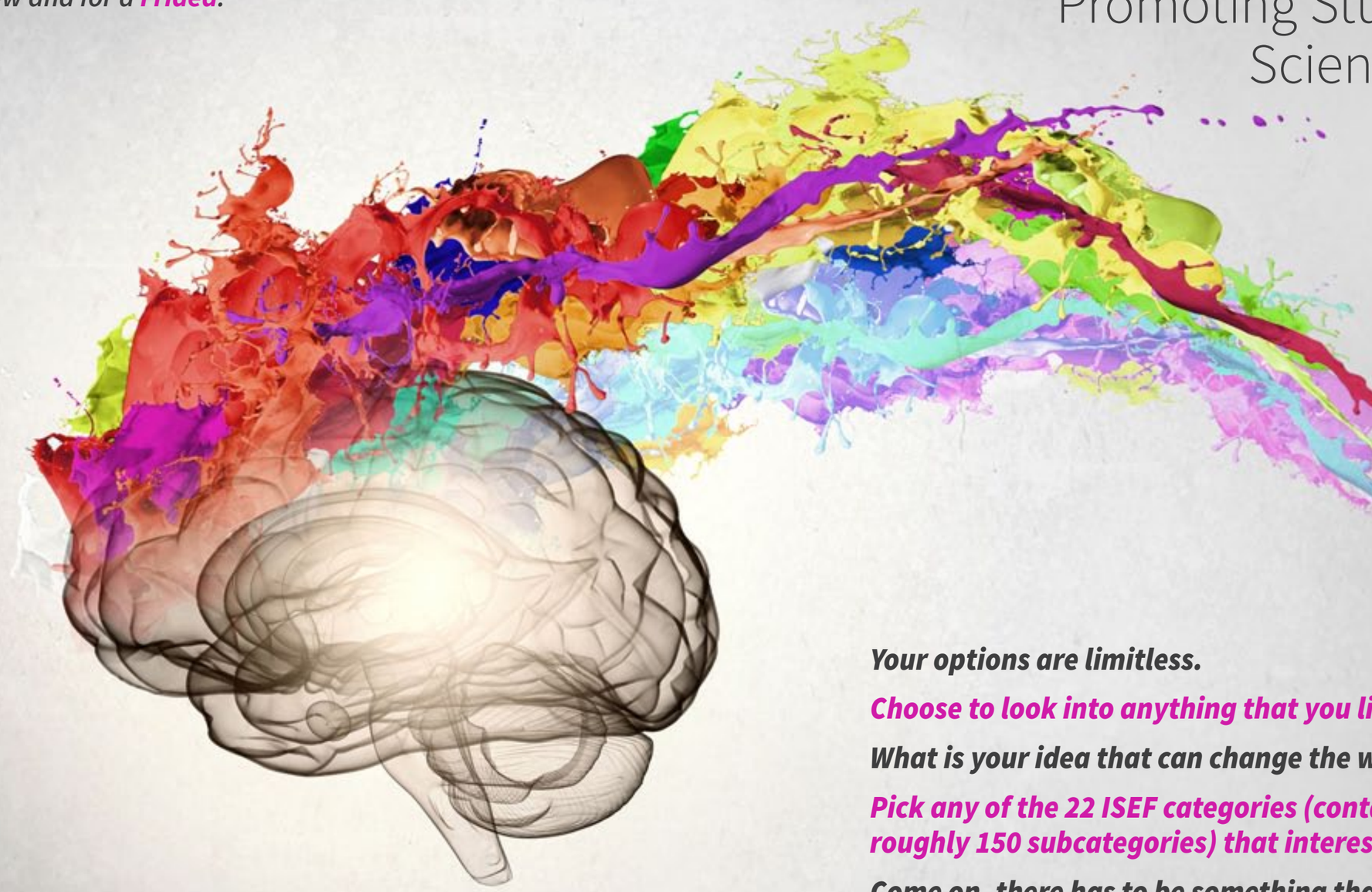
Dean of Academic Affairs
Arkansas School for Mathematics, Sciences and the Arts
President of the NCSSS Board of Directors

*"As the rest of the week balances out class time, Fridays become an anomaly in the schedule. So, I use that day for a recap, a preview and for a **Fridea**."*

IDEATION

Promoting Student-Driven Science Fair Ideas

by Scott Robinson



Your options are limitless.

Choose to look into anything that you like.

What is your idea that can change the world?

Pick any of the 22 ISEF categories (containing roughly 150 subcategories) that interest you.

Come on, there has to be something that you want to do!

The "world is your oyster" take on finding a science fair idea can be both inspiring and intimidating for a student. So, how can you move from every option possible to just one idea to explore deeply?

The answer can take one of these forms:

- The student already has a great idea of their own
- The teacher gives the student a great idea
- The student explores science to come up with their own idea.

This article will explore the instruction of ideation. The goal is the creation of a science fair project that the student can embrace as their own. I will examine the exploration process with an emphasis on finding something that excites the student.

What Does Ideation Look Like?

Ideation looks different in every classroom at our school, as I expect it would look different at every school. Each school and classroom are unique in physical resources, knowledge base, schedule and time restrictions. For example, my school has a dedicated research path and curriculum. The students are enrolled in a research class that provides class time to work on their science fair projects.

The students form their idea at the end of the school year and carry it out the next year. Our school provides the research lab space and we obtain materials necessary to complete the students' work. When working well, the process is more of a "push" than a "pull." The students are not "pulled" along through a topic or idea that the instructor is working on. The instructor is "pushing" and encouraging the student to complete independent work.

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Throughout this process there is advisement, facilitation and hands-on help (as much as one teacher can help with 60 or more different and independent projects). There are times that the student's research process may require guidance beyond their instructor. These few may seek outside mentors to help. Overall, 99% of all work is done within the walls of our school. This situation may be unique and may not match the challenges and or have the advantages of every research landscape.

My class schedule is unique; every Friday I see one-half of my classes. This alternates on Fridays. As the rest of the week balances out class time, Fridays become an anomaly in the schedule. So, I use that day for a recap, a preview and for a *Fridea*. A *Fridea* is a Friday Idea. A *Fridea* is where a predetermined topic is set. The students have to come into class with a cool article, video or a reference to something that they saw on a TV show or in a movie. It is like a current event without being restricted to news. It is only restricted to ideas. With the *Fridea*, the students are asked to point out the purpose and potential impact, identify variables, and talk about how this idea could be taken further or move in a different direction.

EXPOSE

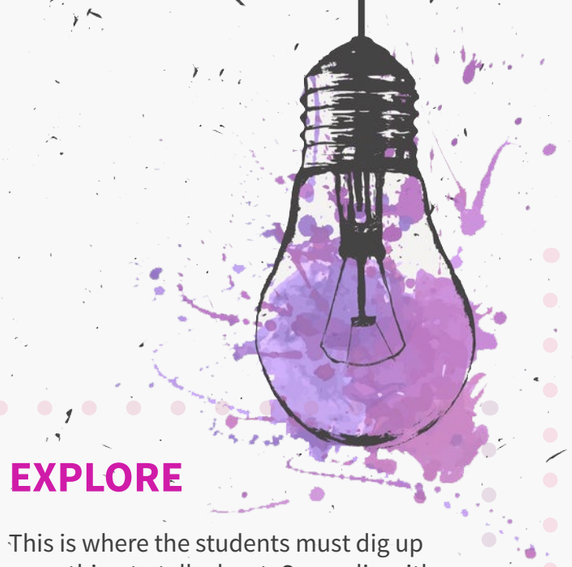
My goal is to expose the students the most common ISEF categories. Not being able to hit them all, I select six that will spread over 12 weeks. They are Animal Sciences, Plant Sciences, Earth and Environmental Sciences, Engineering Mechanics, Cellular and Molecular Biology, and Microbiology. Over this 12-week period, students will become exposed to ideas and the work that is being done in this survey of ISEF categories. Each Friday, every student shares their *Fridea* as I share one of my own. Much of finding an idea of your own is just the exposure to ideas of others.

The 5X Inspirational Model

I have found some concepts and framework that have enhanced the ideation process. We will explore going from having no idea at all to finding a workable idea that the student can be excited about.

You may be familiar with the 5*E* Instructional Model. I am pivoting off that model and going with the 5*X* Inspirational Model.

Stages of the 5X Inspirational Model



EXPLORE

This is where the students must dig up something to talk about. Some dig with a shovel while others use a backhoe. You can expect repetition from those that didn't dig past the first page of a Google search. The purpose here is for students to explore a topic that they may not have previously thought much about. With the end goal to find an idea that the student can run with to the science fair, I try not to judge the effort in the search. If topic is not appealing, it is probably not going to carry their interest to the science fair finish line.

EXPAND

This is where the fun stops if the student is not excited. This is where it begins to feel a grind if the students didn't find authentic excitement. Here, they take their favorite idea and expand on it. It may be from a *Fridea* or it may be something they walked into the first class with. They must look at what others have done, search primary research literature to review, and look at what they could do to contribute to the study of their idea. Students must find something original or a different take on something that has already been done. As an instructor, you will often find yourself saying, "We can't do that here!" Your role is to keep the excitement while guiding the way to stay with their idea in a way that you are comfortable with and is safe for the student to pursue.

EXCITE

This is the big one for me. If you can get this, the rest happens much more easily. I do my best to allow students to find something that they like. The reality is that some may have no interest in a particular ISEF category. So, that week will not excite them. What most often happens is that they find one topic that really gets them excited to share and explore. Sometimes, the excitement comes from hearing another student share. I get a lot of "I've never heard of that" moments when the class share their *Fridea*. Total success is when exposure and exploration yield excitement.

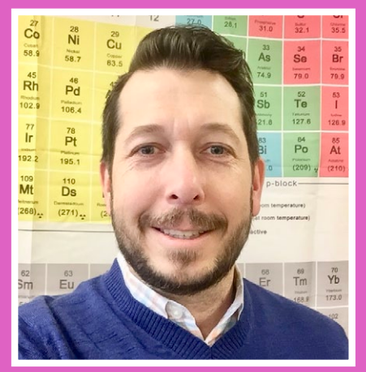
EXPLAIN

Many great ideas or inventions have gone unrealized due the inability of the creator to explain how this all works. This phase requires more work. The student must come to a full understanding of the topic to successfully explain how the idea will be realized into a science fair project. This may take more background research and more digging. Ultimately, their science fair idea can be explained during a poster session review, an elevator speech, a PowerPoint or a "Shark Tank" style pitch.

Conclusion

If the ping-pong balls of ideas finally land on a solid platform, we will accomplish the task of setting our students up with a complete, unique, purposeful and independent idea. This results in personal ownership of students' projects. If you haven't expanded and explained away all of the excitement, you can trust that the science fair process will find success despite all of the fruit flies escaping the lab. This success will come from the process of exploring as well as the excitement of ideas that are at the heart of the science fair. ■

SCOTT ROBINSON



Scott Robinson currently teaches research at the Rockdale Magnet School for Science and Technology. He has been a high school science educator for over ten years and has spent ten years in the business technology world. Mr. Robinson strives to leverage his experience by connecting the practical world to the classroom.

Along with photographing capabilities, the new microscopes also allow for video recording of morphology processes.

NEW TECHNOLOGY ENHANCES SCIENCE DEPARTMENT

Mississippi School for Mathematics and Science Adds High-Tech Microscopes to Arsenal

BY JULIA MORRISON

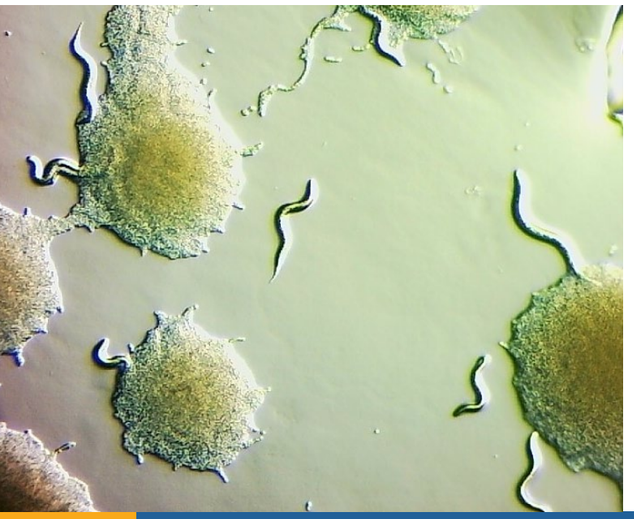
The microscopes have greatly enhanced students' ability to interact with their specimens and truly see what is going on at a granular level.

Dr. Tina Gibson, biology and chemistry instructor at the Mississippi School for Mathematics and Science (MSMS), recently acquired two modern, high-technology microscopes to enhance her classroom instruction and heighten students' engagement during lab experiments.

As part of the rigorous, STEM immersive curriculum offered by the Mississippi School for Mathematics and Science, students conduct in-depth laboratory-based research projects and experiments twice a week. The new microscopes Dr. Gibson secured will greatly enrich students' experience in the lab because they allow for greater specimen visibility in a variety of lighting conditions and degrees of contrast. Students are now able to see firsthand the scientific principles they are discussing in the classroom come to life.

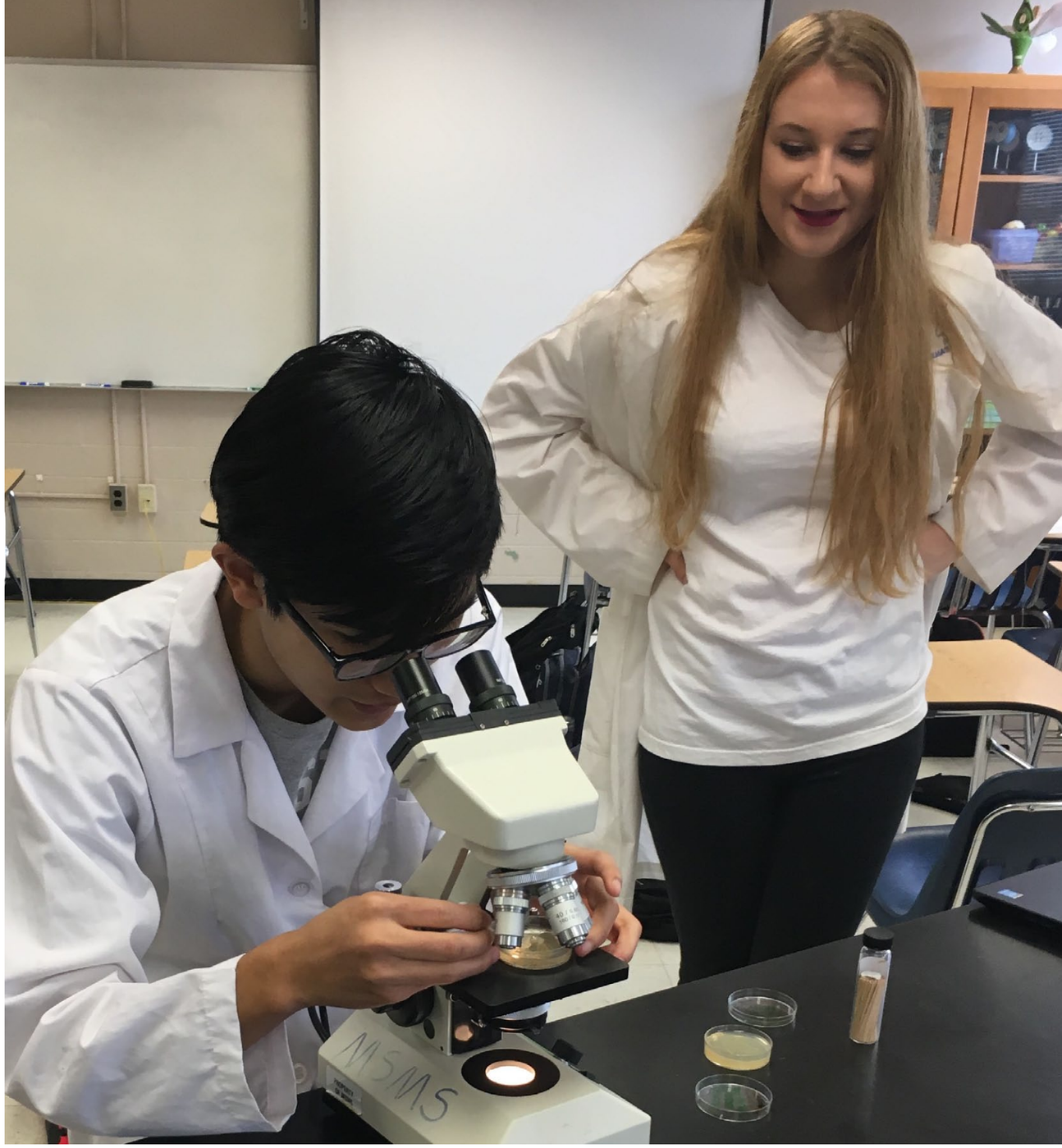
"During research, take for example the c.elegans study we did, students would take photographs of the specimen and could document different things we did with RNAi that interfered with RNA. Students were able to go through and look at their changes in morphology, look at their changes in the epidermis, photograph them, and then incorporate these photographs into their formal lab report and research paper," Gibson said.

> **Because of their image capturing and Bluetooth capabilities, the new microscopes allow for students to insert pictures into their lab reports, and I think visual supplements is often times more helpful than text when explaining an idea.**

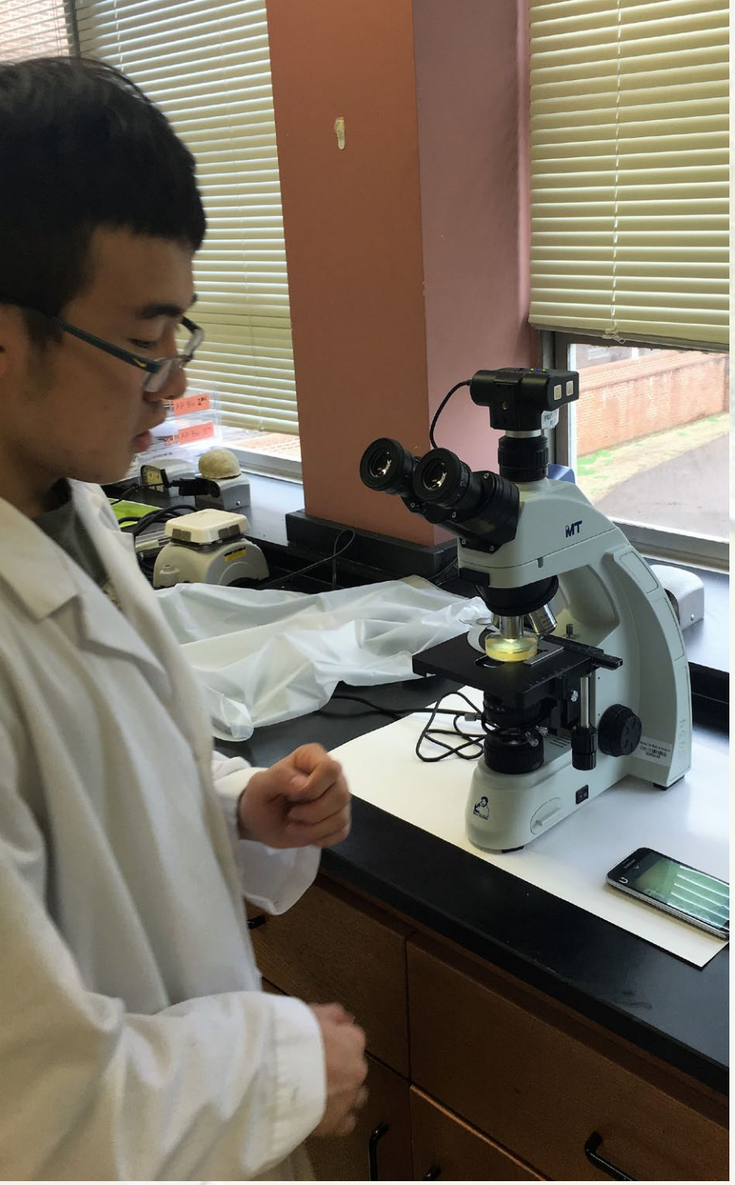


The microscopes have greatly enhanced students' ability to interact with their specimens and truly see what is going on at a granular level. Additionally, the evidence the microscopes able about to capture has elevated students' understanding of scientific research papers and the need for supporting documentation to illustrate their findings.

Senior Gary Nguyen is a member of Dr. Gibson's AP Biology class and has interacted with the new microscopes as part of his scientific observations.



"The level of sophistication in the new microscopes makes for a huge difference in the level of image quality. Because of their image capturing and Bluetooth capabilities, the new microscopes allow for students to insert pictures into their lab reports, and I think visual supplements is often times more helpful than text when explaining an idea. The equipment is a relatively new addition to the classroom, but in time, I see the image capturing feature of the microscopes being used in a number of ways, including specimen analysis, science fair projects, and independent student research," Nguyen said.



Along with photographing capabilities, the new microscopes also allow for video recording of morphology processes. Currently, students are planning to grow pollen tubes underneath the microscopes after collecting flowers. They will be able to observe growth within 15-30 minutes. The ability to record the growth process enables future study on how pollen tubes grow in real time.

Dr. Gibson recently applied for a technology grant in hopes of obtaining two more microscopes for the Science Department at the Mississippi School for Mathematics and Science. ■

JULIA MORRISON
Coordinator for Public Relations
The Mississippi School for Mathematics and Science

The Mississippi School for Mathematics and Science is Mississippi's only public, residential high school focused on STEM education and specifically designed to meet the needs of the state's most academically gifted and talented students. For more information, please visit themsms.org.

NCSSS 2018 Professional Conference

NOV. 7-10, 2018 | HOUSTON, TX

AGENDA AT A GLANCE

WEDNESDAY, NOVEMBER 7	
12:00 pm -6 pm	Registration Open
1:00 pm - 4:00 pm	Excursion to Rice University
Afternoon	Optional NCSSS Community Service Volunteer Project
Afternoon	Pre-Conference Session
5:30 pm	New Attendee/First-Time Presenter Session
6:00 pm - 7:30 pm	Welcome Reception
THURSDAY, NOVEMBER 8	
7:00 am - 4:00 pm	Registration Open
7:45 am - 8:45	Breakfast
9:00 am - 10:00 am	Keynote Speaker Dr. Richard Tapia
10:00 am - 10:50 am	Concurrent Sessions
11:00 am - 11:50 am	Concurrent Sessions
12:00 pm - 1:00 pm	Lunch
1:00 pm - 2:00 pm	College Fair
2:00 pm - 2:50 pm	Concurrent Sessions
3:00 pm - 3:50 pm	Concurrent Sessions
6:00 pm - 8:00 pm	Reception
FRIDAY, NOVEMBER 9	
7:30 am - 12:00 pm	Registration Open
8:00 am - 9:00 am	Breakfast and Business Meeting
9:00 am - 9:50 am	Concurrent Sessions
10:00 am - 10:50 am	Concurrent Sessions
11:00 am - 11:50 am	Concurrent Sessions
12:00 pm - 1:00 pm	Lunch
1:30 pm - 2:20 pm	Concurrent Sessions
8:00 pm - 10:00 pm	Evening Event
SATURDAY, NOVEMBER 10	
8:00 am - 1:30 pm	Excursion to Johnson Space Center

PROGRAM

THURSDAY, NOVEMBER 8

9:00 am - 10:00 am — **Keynote Speaker**

10:00 am - 10:50 am

Medical Case Studies That Cross Science Disciplines

Science

Medicine is a vast endeavor drawing from all areas of science. Its intrinsic appeal and importance to everyday life provide effective avenues for teaching most science subjects with connections to history, ethics, and the humanities. Case studies — the cornerstone of medical education — can be used in the secondary classroom to support a variety of instructional goals. Participants will discuss medical cases connecting different areas of science, share methods for using these effectively, and identify source materials for creating cases of their own.

Presenter: Philip Jeffery

Academic Retention through STEM Camps and Recitation Courses

Interdisciplinary Studies/ Chemistry, Math, Summer Programs

The Louisiana School for Math, Science, and the Arts has identified data points in student applications that may indicate first year academic struggles, particularly in the discipline of Chemistry. In response and through faculty initiative, LSMSA created a STEMrichment camp and Chemistry Recitation course. Through a week long summer camp and an additional Chemistry course throughout the academic year, students are strengthening their STEM skills while creating cohorts and study habits. This session discusses the data analysis, the STEM camp, and the recitation course. We will share our discoveries and methods for continued improvement.

Presenters: Randy Key, Michele Stover, Ph.D.

Ethics, Protest, and Racial Justice

Humanities

In this session, we will discuss ways to integrate ethics into a high school humanities course. We will explore key tenets of 7 to 10 ethical theories and view examples of assignments in which students are asked to apply the theories to relevant historical and contemporary cases. We will also examine different forms of protests for racial justice and analyze their ethical implications. Additionally, we will brainstorm useful classroom strategies for discussing ethics and race in humanities courses.

Presenter: Jamie Lathan

Expanding Access to Computer Science At NCSSM and Across NC: Lessons Learned from a New STEM Scholars Program with Rural Schools

Computer Science

The North Carolina School of Science and Mathematics (NCSSM) has implemented a new computer science program for 9th and 10th graders with rural school districts, and has built on momentum from the national CS4All movement to drive innovative thinking for improving computer science education on campus and with our partners. In this session, participants will learn about NCSSM's new STEM Scholars Program in computer science as well as hear about lessons learned from our first year of implementation. Participants will also be provided with evidence-based practices in assessing computer science/computational thinking programs and courses.

Presenters: Dr. Krissi Hewitt, Kendall Hageman

It Takes a Village: A Tiered Approach to Supporting Mental Wellness of STEM Students

Wellness/School Climate/Academic Integrity/Mindset

This cross-discipline presentation will discuss ways to support students' mental wellness so they can be successful both in the classroom and in life. The unique portrait of a STEM secondary student and their corresponding needs will guide our discussion of creating a tiered intervention approach, beginning in the classroom and including group interventions and individual clinical interventions. Ethical responsibilities and limitations of the school and various school roles will be discussed. Whatever the school's resources or school role, everyone can take away strategies to implement in their school.

Presenters: Danielle Armstrong, Caitlin Palmer

Community Building in the Virtual Classroom

Outreach/ Partnerships/ Pipelines/Summer Programs

Virtual academic programs provide unique opportunities for students who are qualified for residential secondary schools yet for whom a residential program is not the best fit. Many virtual programs lack opportunities that are available in residential programs. Therefore, the South Carolina Governor's School for Science and Mathematics (SCGSSM) Accelerate Academic Experiences leverage qualities of both the virtual and residential academic environments, to provide hands on experiences and community and team building. These experiences afford students the opportunity to engage with some of the best aspects that both residential and virtual programs provide.

Presenters: Brian Gloor, Laura Dostert

Interdisciplinary Activities in Finite Mathematics

Mathematics

Finite Mathematics is a course that offers students rich opportunities to study mathematics in multiple interdisciplinary contexts that are relevant and engaging. In this session, we will discuss problems and activities included in Finite Mathematics courses based in both social science and biological contexts offered at the North Carolina School of Science and Mathematics. Lesson materials, class activities, and assessments will be shared, and mathematical topics may include matrix applications (e.g., Leslie Model), apportionment, and graph theory.

Presenter: Tamar Avineri

11:00 am - 11:50 am

Using Computer Algebra System in Teaching High School Physics

Science

As computation has become vital in Physics research in the past years, we incorporated a Computer Algebra System (CAS) in teaching Physics to Grade 12 students. The advantage of using CAS is that it eliminates tedious mathematical work, allowing students to focus on the physics concept. With the ease provided by the computation, students can now handle problems that go beyond ideal cases. It also provides a variety of visualization tools. More importantly, it can be used to do numerical analysis of experimental data. The presentation will include actual implementation of the curriculum and responses of both teachers and students.

Presenter: Maria Veronica S. Torralba

Let's Talk: Selective Admission and Committee-Based Evaluation

Admissions/ Enrollment Management

Committee-based evaluation (CBE), a holistic approach to reviewing college admission applications, pairs admissions officers to discuss and analyze applicants' qualifications. Representatives from universities which have recently implemented CBE will share how this new approach helps their staff glean the context, achievement and aspirations of the applicants, and the importance of student essays and recommendation letters.

CBE has been featured in the Chronicle of Higher Education and Inside HigherEd as a new and innovative approach in college admissions.

Presenters: Dr. Yvonne Romero da Silva, James Atkins, Wes Wagonner

Coding Powers Everything: Using the BBC Micro:Bit as a Teaching & Outreach Tool

Computer Science

This session will demonstrate how to use the BBC Micro:bit (a pocket-sized computer) to introduce students to the world of coding and as a tool to connect with potential students in outreach events. Participants will engage in hands-on activities using Micro:bits. One lucky participant will take home a Micro:bit Go kit. Participants should bring a laptop or bluetooth enabled device to the session.

Presenters: Denise Gregory, Daniel Moix

Minute Mathematics: Sharing the Beauty of Mathematics

Mathematics

In this talk, we will discuss several mathematical topics that can be explained to anyone in 8 minutes or less, but show the beauty and depth of mathematics. I will start by demonstrating the activities and then talk about how the activities can be used in the classroom, in math clubs, and for outreach. Some of the topics we will discuss are hexaflexagons, polyominoes (not polynomials!), Mobius bands, mathematical card tricks, and more.

Presenter: Nicole Kroeger

Top 10 Pitfalls of Science Writing

Humanities

Come discuss with us the most common pitfalls your students may encounter when they pursue a science topic through the review of cutting-edge science literature and communication with author-scientists, with the goal of writing a compelling science essay for a general audience. We will share our Top 10 with you along with some illustrative student examples, some humorous, some surprising. Our goal is for you to leave with a better understanding of what will help your students navigate, understand, and communicate primary and secondary literature for use in crafting science essay narratives.

Presenters: Jennifer Seavey, Anne Applin

Teamwork and Collaboration-Skills We Must Teach!

Interdisciplinary Studies/ All Curricular Areas

This immersive 50 minute lesson will explore stages of group development, personality types, team dynamics and conflict resolution. The workshop will provide a template that can be used to teach the lesson immediately after experiencing it. It is an excellent introductory topic in advance of any group project no matter what the curricular area.

Presenter: Michael Barney

Leadership Education and Development in STEM High Schools

Interdiciplinary Studies/ Leadership

Leadership. Education. Development. How are we inspiring young adults to grow as good and ethical leaders? Leadership should not be defined by a title or label. It's about developing the perspective, skills and personal style of the whole individual. Through the LEAD program at IMSA, we believe that leadership can be learned through discussion and application. Thus, we have designed a year long course that takes an intricate look at various definitions, theories, models, and conceptualizations of leadership. Students are challenged to think critically about leadership during peer-to-peer facilitated class discussions, hands-on exercises, and group work.

Presenters: Andrea Stuiber, Katie Berger

2:00 pm - 2:50 pm

Modeling in the Physiology Classroom

Interdisciplinary Studies/ Science and Engineering

Physiology and Disease is a Biology elective at IMSA that has been developed to be mostly student-centered. Some examples of student projects include modeling heart structure to reflect function and creating LED arduino monitors to measure heart rate. Students also measure their lung capacity and blood pressure to demonstrate correlation of these values with heart rate, and trace the correlation back to neuronal controls. Projects such as these integrate other disciplines such as engineering and conform to NGSS Science and Engineering standards and NGSS Cross cutting Concepts standards. Students take responsibility for their own learning and articulate better on tests.

Presenter: Sowmya Anjur

Statistics: Demos, Experiments and Projects

Mathematics

In this roundtable discussion, we will share ideas about experiments, journal articles, project topics, and teaching demos that are used in Statistics classes. We will also spend time discussing the American Statistical Association's Guidelines for Assessment and Instruction in Statistics Education (GAISE) Guidelines which provide recommendations for teaching Statistics. Come with your favorite teaching ideas to share. This discussion is open to anyone who has an interest in teaching Statistics even if you have not yet taught the course.

Presenter: Nicole Kroeger

Designing an Interdisciplinary Course in Cryptography

Interdisciplinary Studies/ Mathematics & Computer Science

NCSSM is currently designing a interdisciplinary cryptography course to teach applications in number theory and an introduction to programming in Python. Come hear about the design process and details of the course! We plan to offer this course as both a math elective and a computer science graduation requirement in the 2018-2019 academic year. Content standards and sample assessments will be shared with participants.

Presenter: Taylor Gibson

Writing on the Wall: The immigrant experience through poetry, from Angel Island to DACA

Humanities

This presentation will offer a brief historical overview of US Immigration Policy from Angel Island and Chinese Exclusion to current debates about the status of undocumented immigrants. We will then examine, discuss, and analyze poems taken and translated from the walls of Angel Island. Finally, we will draw parallels and distinctions between those works and the works of the contemporary poets Sandra Cisneros, Zilka Joseph, and Javier Zamora, who write about the immigrant experience today. Poetry can be a particularly effective method of encouraging students to connect to historical ideas and current controversies on a personal level.

Presenter: Katie Moulder

Bridging Art and Science Using Music

Interdisciplinary Studies/ Humanities & Computer Science

This session will examine the connection between art & science by using music technology. Highlights will include developing the program curriculum through a selection of free software tools, implementing a variety of lesson plan ideas and exhibiting the student projects through the use of Google Sites.

Presenter: Brett Penza

The creation and evolution of the PROMISE and EXCEL programs at the Illinois Mathematics and Science Academy

Outreach/ Partnerships/ Pipelines/Summer Programs

The PROMISE and Excel programs are for students in 7th-9th grade focusing on students interested in STEM from culturally, linguistically, and economically diverse backgrounds. The PROMISE and Excel programs run both during the school year and summer for a variety of enrichment opportunities. We will be discussing the history, current focus, and future of the program as well as the successes and positive failures we have experienced as administrators and teachers of the program. We will also be discussing the development of the IMSA students used as mentors within the program.

Presenters: Anita White, Julie Dowling

3:00 pm - 3:50 pm

Developing Curriculum for Project-Based Engineering Courses

Engineering/ Makerspace/ Technology

Looking to add project-based engineering to your school's offerings? Already teaching engineering but searching for new and creative projects? While many schools are finally focusing on the "E" in STEM, many teachers and administrators are at a loss on how to begin. As a newer addition to traditional schools, most engineering curricula publicly available is "one size fits all" and comes with little background preparation. This presentation and interactive workshop will focus on the core academic values of teaching hands-on, project-based engineering and how to develop fun and collaborative projects that are tailored to your school's unique needs.

Presenter: Alison Earnhart

Engaging High School Girls with Social and Ethical Technologies

Interdisciplinary Studies/ Computer Science, Science, Technology, Diversity, Outreach/ Pipelines

Educators will use sensors and portable computers with custom coding to experience unique wearable technologies. The projects emphasize solving societal problems with computer science, including health and wellness applications and interactive animal perception experiences that increase awareness of conservation issues and empathy for global management of environmental resources. Attendees will be able to discuss unique requirements of engagement for many female students and will gain see how in creating projects using circuits, building wearable devices, and applying design processes, using computational thinking strategies, and coding, girls can flourish in STEM classes and consider STEM careers beyond high school.

Presenter: Charlotte Dungan

Event Driven Programmming in JavaFX

Computer Science

This will be a "dirty hands" introduction to the JavaFX GUI framework. It will be of special interest to teachers who are teaching the principles of object-oriented programming and who would like to see an application of it that will attract a lot of student interest.

Also, there will be a brief introduction to Java9's JShell, which turns out to be a very nice teaching tool. So, install Java9 on your PC, update your path, and get ready for some hands-on fun.

This framework runs on Mac, PC and Linux. You will definitely want to have your PC!

Presenter: John Morrison

Exploring Other Worlds: a Project in Planetary Science Class

Science

Planetary science is a highly interdisciplinary field, it often requires knowledge of physics, chemistry, geology, biology, and atmospheric science. In addition much of what we know of planets and moons come from missions that are exemplars of good engineering practices. In order to give my students a very basic understanding of what a planetary scientist does, they do a project that simulates the process of designing, proposing, operating, and analyzing the data from a robotic mission to a planet or moon. In this workshop, participants will work in groups to go through the steps of this project.

Presenter: Eric Hawker

Implementing Entrepreneurship & The Design Thinking Process Across Disciplines

Interdisciplinary Studies/ Entrepreneurship (Humanities) and Computer Science

This interactive workshop focuses on incorporating a problem solving design process across computer science and entrepreneurship curriculums. Attendees will learn how to incorporate the design process and entrepreneurial concepts into their computer science classrooms. Attendees will be design a marketable solution to a real market problem using rapid development CS tools to develop their testable prototype. Attendees will take away a clear vision of how to use the design thinking process in their classrooms and how to add entrepreneurial concepts to the computer science curriculum.

Presenters: Laura Boyd Smidt, John Chapin

Introduction to Virtual Reality

Interdisciplinary Studies/ Technology, Computer Science, Makerspace

Join us for an introduction to Virtual Reality and the impact this technology is having on a wide range of industries. Participants will have an opportunity to experience VR with Oculus platforms and explore some of the exciting creative applications that are available. Participants will also will also experiment with creating a simple 360 project and explore stitching and editing techniques.

Presenter: Michael Chaney, SCAD Professor of Film and Television

Creating Pathways for Interdisciplinary Research in a STEM High School Environment

Interdisciplinary Studies/ humanities (science and technology studies, cultural studies, foreign language, communication, sociology) & engineering

In this workshop, participants will hear about efforts to create interdisciplinary research opportunities at the South Carolina Governor's School for Science & Mathematics. Leaders will summarize the research program conducted in 2017, lessons learned from that pilot, and work with their 2018 program. Subsequent small-group discussion of research experiences that participants would like to organize at their own institutions will focus on choosing relevant societal problems to solve, organizing teaching teams, networking with experts, and navigating bureaucracy. Participants can expect to leave the session with an outline of an interdisciplinary research program that could be implemented at their own schools.

Presenters: Kathryn de Ridder-Vignone, Antonio de Ridder-Vignone, Elaine Parshall

FRIDAY, NOVEMBER 9

9:00 am - 9:50 am

Academic Transition: a course designed to ease students' adjustment to the rigors of a STEM school & reduce attrition

Administration

The SCGSSM student body, like many STEM schools, is typically populated with students who've rarely had to study hard or organize their time prior to enrolling with us. Our challenge: increase our students' skills in these areas, knowing they doubted they needed help with either one. Our solution: create a course focused primarily on the scientific theories behind effective studying and time management.
We will discuss the decisions leading up to this course, its design and implementation, the successes, challenges and feedback received and adaptations for Fall 2018. Ample sample material will be available.

Presenters: Kyle Anne Barnett, Danny Dorsel

Culturally Responsive STEM

Diversity

In today's diverse classrooms, educators must embrace the cultural identities of the students they teach. In this roundtable discussion, we will open a useful dialogue that seeks to inform culturally responsive teaching practices in STEM classrooms. Let's discuss the best way to impact ALL students!

Presenters: Allen Antoine, Dr. Kristen Antoine-Morse

Exporting Excellence: How ASMSA's Teacher Outreach Program Increases Teacher Capacity in Arkansas

Outreach/ Partnerships/ Pipelines/Summer Programs

This session will introduce ASMSA's blended approach to Computer Science, AP Biology and Entrepreneurship teacher mentorship and share the successes from the design, recruiting and deployment perspectives of this innovative outreach program. The technology infrastructure, the professional development model, the student experiences, and the lessons learned will be shared.

Presenters: Whitney Holden, Ph.D., Patrycja Krakowiak, Daniel Moix, Steven Rice

Highlight Your History to Reach Alumni, Funders, Researchers and the Merely Curious

Outreach/ Partnerships/ Pipelines/Summer Programs

Digitizing your archive and making it publicly available can help you reach alumni, funders, researchers and others curious about your school, and help widen your digital footprint. By doing so you leverage your history, highlights and strengths. Alumni get an opportunity to relive their time at your school, potentially making them more likely to donate. Potential funders can mine the site and assure themselves that their money will be well-spent. Researchers and other curious souls have access to records without physically visiting your campus.

Presenter: Robin Boltz

Sprouting Interest in the Plant Sciences

Science

Plants are a necessary, but often overlooked, component of our everyday lives. As a botanical educator at the South Carolina Governor's School for Science and Mathematics, my goal is to foster student interest in the plants through both my Advanced Placement Biology course and my advanced Botany elective. By presenting plants in an approachable manner through the use of scientific summaries, plant demonstrations, and inquiry-based learning, I aim to encourage students to recognize this important field of biology. How do you incorporate plants in classroom? How can we improve student understanding and appreciation of plants?

Presenter: Jennifer Brown

Strategies for Teaching Diversity and Inclusion in Pre-Modern Literature

Humanities

Pre-modern literature is rarely the first place instructors turn when we want to engage students in questions about diversity and inclusion. Yet, the pre-modern world was not homogenous—people of color existed, as did intersectional identities—and, as a whole, the pre-modern world was multicultural, multiracial, and multi-faith. This session will discuss the methods and resources for teaching pre-modern literature as global and diverse, as well as the value of using these texts to examine our own cultural assumptions about diversity and inclusion.

Presenter: Justin Barker

Research - It's Not Just for Scientists

Interdisciplinary Studies/ Humanities, science, research

Roald Hoffman won a Nobel Prize for Chemistry in 1981. In 1987, he published his first book of poems. We will discuss the pleasures and advantages that result when students pursue are offered opportunities to challenge themselves in scientific and artistic thought. We will present methods we have used to encourage students to take risks in areas they may be curious about in a wide array of disciplines.

Presenters: Richard Weems, Todd Crane

10:00 am - 10:50 am

Designing a College Transition Curriculum

College and/or Career Counseling

The session reviews the curriculum of a 10-week residential education course for high school juniors designed to guide students through the college application process. We will discuss the student and staff concerns that resulted in the creation of the course, how the course addresses these concerns, and how the course impacts students' college application process as they transition into senior year. There will also be opportunities to explore how the course could be applied to different environments, how it impacts students' stress levels and perception of success, and how it affects counseling staff and their interactions with students.

Presenter: Ian Oliver

Thoughtful Scheduling: A Surprising Avenue for Student Support

Admissions/ Enrollment Management

Motivated, intelligent students often seek out challenge and involvement at a level that can leave them overwhelmed and have a detrimental impact to their well being. We will explore how schools use graduation requirements, scheduling, course choice, and course offerings to encourage healthy student boundaries and behaviors. We will grapple with ways to encourage students to choose courses that support their well-being, rather than focusing on courses they believe will look good on their transcripts. Let's learn from one another the current practices and innovative ideas schools use, and leave with different perspectives to improve scheduling and curriculum management practices.

Presenters: Linsey Morrison, Jennifer Betz, Phillip Riggs

The "SPARK" that Ignites Corporate Partnerships

Outreach/ Partnerships/ Pipelines/Summer Programs

SPARK Conferences (Symposium Promoting Advancement of Real-World Knowledge) expose students to STEM careers and relevant topics related to science and technology. The Academy for Science and Design, New Hampshire's top-performing STEM-focused public charter school and National Blue Ribbon recipient, has created and implemented SPARK, which serves as the most successful vehicle for corporate engagement and relationship development. Participants will understand the value of implementing a SPARK Conference Series as well a "nuts and bolts" perspective on how to organize their own SPARK Conference, including useful materials/strategies for publicity and corporate partnership development.

Presenter: Jennifer Cava

Sustainable Pollinator Gardens with Research Applications

Research

Elk Grove High School, a comprehensive school located adjacent to Chicago's O'Hare Airport, set out to create a Native Plantings/Pollinator space. Over 100 students, in design teams, conducted research on native plantings, costs, create labor schedules and then presenting findings to a panel of judges. Now after removing the current grass that occupied the space, native plants, seeds, and plugs were laid out under consultation and guidance of the Cook County Forest Preserve District & University of Illinois Extension Program. Future plans call for students to do active research with the space in AP Environmental and AP Biology classes, and we are actively seeking more ways to integrate this into the courses with a focus on real world applications.

Presenters: Kyle Burritt, Quinn Loch

Our Stories: Beyond the Classroom

Interdisciplinary Studies/ Humanities, Diversity, School Climate

My students are a diverse lot hailing from India, China, Russia, Japan, Africa, West Indies, and even Iowa and Michigan. After completing Willa Cather's "My Antonia," a story of immigrants in America, My students respond by writing their own accounts of family. These memoirs are often mesmerizing tales of sacrifice and struggle, but with doses of humor and a fairy-tale quality. I do not know why it took so long, but I now realize that these stories needed to be shared beyond my classroom. For in my students' diversity lies their commonality. Hence, the theater piece of my devising.

Presenter: William Hathaway

Utilizing Website Evaluation Criteria in Selecting Online Resources

Interdisciplinary Studies/ Media and Information Literacy

In this workshop, the authors guide the reader through 5 evaluation criteria, to search, identify and select good educational resources. At the end of the session, participants will also be able to reflect the importance of evaluating websites before using it.

Presenter: Jayson Bingcang

Overworked by Homework- How to Make Independent Assignments More Meaningful

Interdisciplinary Studies/ All classes

The perception of homework is often drastically different for teachers and students. Teachers are challenged to design assignments that engage students in a meaningful, authentic, and lasting way. Our current students are a generation that have access to unlimited information and share (and sometimes overshare) everything- including their latest homework assignment. Although social media and the internet can have many benefits, it can involve hours of distraction- resulting in hours of attempting homework. This session is designed to gather teachers to discuss how to engage Gen Z students outside of the classrooms by making homework assignments effective and less tedious.

Presenters: Cailin Daly, Rachel Wax

11:00 am - 11:50 am

Environmental Impact- Using Digital Media to Focus Student Learning

Science

Environmental issues are global challenges that our students will have to address in their future. Addressing these issues through curriculum helps bring purpose to students' learning. We have developed a capstone project in our introductory biology class that allows students to engage in these issues in a creative and personalized manner, and which asks students to not only address the biology at the core of these issues but also suggest possible solutions to the problem. In this session, we will share how we scaffold our curriculum to prepare students for this experience, as well as show examples of student work.

Presenters: Sarah O'Leary-Driscoll, Crystal Randall

Community Outreach: Strategies for Forging Successful School-to-Business Partnerships

Outreach/ Partnerships/ Pipelines/Summer Programs

In STEM education, there exists little debate regarding the value of partnerships between professionals in the community and the school. However, creating and maintaining those partnerships are difficult tasks. Where do you even begin?

This session will answer this question and more by providing methods for partnership development that have proved successful at the Gwinnett School of Mathematics, Science, and Technology over the past 11 years of its Partnership Program. Learn from experienced Partnership Coordinators who collectively manage over 150 partnerships and 400 internship placements per year. Their techniques provide concrete strategies to engage community members in sustainable partnerships.

Presenters: Kerri Napoleon, Ph.D., Nicole D'Antonio

Defining Educational Goals & Assessments for Student Research Experiences: Challenges, Tradition, and Variety

Research

Student research experiences have received increased emphasis as high-value educational opportunities, particularly for STEM students. The objectives that are appropriate for an individual student research experience program depend on the unique features of each program. Discussion will include participants sharing thoughts on the educational objectives of research experiences. The discussion will also focus on identifying assessments for these objectives. The results of this discussion should be a step toward a framework of shared best practices for effective student research experiences, collaboration on evaluation, and leadership to other secondary schools interested in developing student research experiences opportunities.

Presenters: Joshua T. Witten, Randall M. LaCross

Diversity and Inclusion in the Science Classroom

Interdisciplinary Studies/ Science and Humanities

A Diversity, Epidemiology and social justice unit was incorporated into the Physiology and Disease curriculum in Fall 2016. Students discussed topics such as social and cultural influences on diversity thinking, and selective treatment in hospitals based on race. It was very noteworthy that students were united in their thinking regarding diversity and inclusion, despite the fact that they were from different backgrounds and diverse cultures. In 2017, additional discussions were held on equity in education. Students who were otherwise reserved were encouraged enough to express their views, and everyone appreciated the fact that they had been included.

Presenter: Sowmya Anjur

From Traditional School to STEM Certified in 2 years

Administration

In the Fall of 2015, Rockhurst High School began its STEAM initiative. One of its first steps was to attend the NCSSS Conference in New York City. In the Spring of 2017, Rockhurst became STEM Certified by AdvancED. Learn how Rockhurst learned how to apply beliefs, principles and practices of NCSSS schools to its context in order to enhance the educational experience of Rockhurst students.

Presenters: Greg Owsley, Paul Winkeler

Fostering Success Among African American Students From Low SES Backgrounds in the STEM Fields; Strategies for Professional School Counselors and Educators

Diversity

This presentation will focus on recruiting, preparing, and supporting African American students from low SES backgrounds into STEM careers. Strategies and techniques from an academic, personal/social, and career development perspective for this population will be explored. Finally, collaborative efforts that can be utilized among stakeholders will be highlighted.

Presenter: Tylon Crook

Agri or Agree? : Impact of Agriculture Elective on Special Science High School Students in the Philippines

Science

The education session will focus on presenting the impact of having an agriculture elective class in a science high school with most students growing up in an urban setting.The elective allowed students to understand the importance of knowing the processes and struggles of producing goods from farm to table. It also informed students on the plight of the Philippine Agriculture, farmers, aquaculture practioners and market sellers. Students were given the opportunities to engage in hands on activities like farming, livestock raising and aquaculture. Supplemental educational trips were also offered to strengthen the understanding of students on agriculture.

Presenters: Justin Ray M. Guce, Chuckie Fer A. Calsado

1:30 pm - 2:20 pm

Teaching Artificial Intelligence Through Game Programming

Computer Science

At the Bronx High School of Science, in the post - AP Computer Science Game Programming classes, our students are engaged in the learning of AI (artificial intelligence) algorithms through the design and implementation of computer games including board games with human players playing against computer programs, video games with game controlled characters making intelligent moves, and natural language processing games with chatbots who has "learning" capabilities.

Presenter: Wendy Qiu

Using 21st Century Technology to teach 14th Century Skills

Interdisciplinary Studies/ Humanities, Computer Science, Engineering/ Makerspace/ Technology

What do castles, hurdy-gurdies, 3D Printers, and coding have in common? Come with me to 14th Century England and find out how student-led interdisciplinary projects in history and literature can be fueled and augmented by STEM technologies and student interests.

Presenter: Michael McCartney

Productivity and Life-Long Learning Best Practices for Educators

Interdisciplinary Studies/ Across the academic curriculum & Career Counseling & Wellness

Modern workplaces and digital schools were supposed to be paragons of productivity yet the expectations placed on our professional and personal time seem to be at an all-time high. How did our lives get so crazy and what can we do about it? This session will provide real-world advice on how to reconsider your workflow both as a professional educator and a lifelong learner to help you more effectively address what is important and learn to ignore the rest.

Presenters: Todd Crane, Richard Weems

Involving Students in Authentic Conservation Research

Outreach/Partnerships/Pipelines/ Summer Programs

Discover the empowerment, independence, and learning that comes with cutting edge biodiversity field research. As scientists, we recognize the importance of credible field work. Field trips are great, but imagine your students working alongside research scientists, developing protocols, collecting information and contributing to the published body of original research.

Presenters: Lisa Wu, Scott Sveiven, Freddy Herrera

IMSA Allies Program: The Power of Near-Pear Teaching

Outreach/Partnerships/Pipelines/ Summer Programs

IMSA ALLIES is a STEM leadership development program that trains high school students as teachers and group leaders to deliver inquiry based hands on science, technology, engineering and mathematics activities (STEM) in the community. In this session you will learn about the benefits of this type of program and how to implement one at your school.

Presenters: Gwen Seeley-Joosse, Megan Scherer

Digital Storytelling: Promotional Videos with Nearly No Budget

Admissions/ Enrollment Management

How to create high-quality branded videos to promote the school with nearly no budget. Using only a smartphone and knowing some basic skills of lighting, video, and interviewing will allow professional videos at a fraction of the cost.

Presenter: Ryan McDonald

How do we balance Depth vs Breadth?

Science

In many high-level courses such as Advanced Placement (AP), IB, or dual-enrollment, students are expected to learn a large number of topics. This expectation suggests teaching topics at a rapid pace. However, research and experience shown that active learning through discussion, projects, and problem-solving improve long-term learning. How do we achieve the best learning outcomes for our students in the time available? How do we cover the breadth of topics expected for an end of course exam while fostering in-depth understanding of the information covered? We will discuss the benefits and challenges of including in-depth lessons in the curriculum.

Presenter: Jennifer Taylor

EXCURSIONS

Wednesday, Nov. 7 | 1:00 pm - 4:00 pm
Rice University

Tour Rice University's beautiful campus, as well as the undergraduate maker-space, the Oshman Engineering Design Kitchen (http://oedk.rice.edu/), some of the Shared Equipment Authority (https://sea.rice.edu/) research facilities, and some science or engineering research laboratories.

Rice University is a private institution that was founded in 1912. It has a total undergraduate enrollment of 3,893, its setting is urban, and the campus size is 300 acres. It utilizes a semester-based academic calendar. Rice University's ranking in the 2018 edition of Best Colleges is National Universities, 14. Its tuition and fees are $45,608 (2017-18).

Rice University, located in the heart of Houston's Museum District, offers a dynamic student life in the nation's fourth-largest city. The Rice Coffeehouse, Valhalla Pub and Willy's Pub are all student-run institutions offering on-campus food and drink. Before stepping foot on campus, all students are assigned to one of 11 residential colleges, of which they remain members even if they decide to move off campus. The residential colleges provide housing, dining, and academic and social events. The Rice Owls boast 14 varsity NCAA Division I athletic teams and are well known for their strong baseball program. Students receive free tickets to all varsity athletic events.

Rice is comprised of eight schools, including the School of Social Sciences, School of Humanities and Wiess School of Natural Sciences. Its graduate schools include the highly ranked Jesse H. Jones Graduate School of Business and George R. Brown School of Engineering. Rice also has a well-regarded School of Architecture and the Shepherd School of Music. Rice is home to the James A. Baker III Institute for Public Policy, a nonpartisan think tank, which offers coursework, internships and lectures.

RICE
Unconventional Wisdom

Saturday, Nov. 10 | 8:00 am - 1:30 pm
Johnson Space Center

For more than 50 years, NASA's Lyndon B. Johnson Space Center (JSC) in Houston has led our nation and the world on a continuing adventure of human exploration, discovery and achievement. The center has played a vital role in powering our country into the 21st century through technological innovations and scientific discoveries.

The dedicated professionals who work at JSC have made advances in science, technology, engineering and medicine that enable us to explore our world and universe as never before, and to derive unparalleled benefits from that exploration.

The Johnson Space Center was established in 1961 as the Manned Spaceflight Center, the home and Mission Control Center for the U.S. human space flight program. In 1973, it was renamed in honor of the late President, and Texas native, Lyndon B. Johnson.

The Johnson Center's $1.5 billion complex occupies 1,620 acres southeast of downtown Houston, in the Clear Lake area.

*More details about this excursion will be coming shortly.

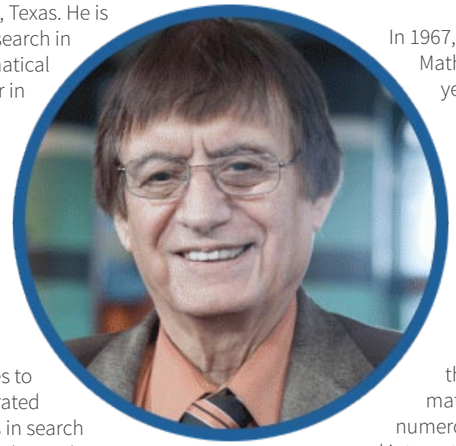
In a lab at NASA's Johnson Space Center in Houston, engineers simulated conditions that astronauts in space suits would experience when the Orion spacecraft is vibrating during launch atop the agency's powerful Space Launch System rocket on its way to deep space destinations. *Photo courtesy of NASA*

Rocket Park at Night. *Photo courtesy of NASA*

KEYNOTE SPEAKER

Dr. Richard Tapia

Dr. Richard Tapia is a mathematician and professor in the Department of Computational and Applied Mathematics at Rice University in Houston, Texas. He is internationally known for his research in the computational and mathematical sciences and is a national leader in education and outreach programs.



Dr. Tapia's current positions at Rice are University Professor; Maxfield-Oshman Professor in Engineering; and Director of the Center for Excellence and Equity in Education.

Dr. Tapia was born in Los Angeles to parents who, separately, immigrated from Mexico as young teenagers in search of educational opportunities for themselves and for future generations. He was the first in his family to attend college. He received B.A., M.A. and Ph.D. degrees in mathematics from the University of California-Los Angeles.

In 1967, Dr. Tapia joined the Department of Mathematics at UCLA and then spent two years on the faculty at the University of Wisconsin. In 1970, he moved to Rice University where he was promoted to associate professor in 1972 and full professor in 1976. He chaired the department from 1978-1983. He is currently an adjunct faculty member of Baylor College of Medicine and the University of Houston.

Dr. Tapia has authored or co-authored two books and over 80 mathematical research papers. He has delivered numerous invited addresses at national and international mathematical conferences and serves on several national advisory boards.

REGISTRATION

Registration is now open!

ncsss.org/2018-registration

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.com