IDEATION
Promoting Student-Driven Science Fair Ideas

New Technology Enhances Science Department
Mississippi School for Mathematics and Science Adds High-Tech Microscopes to Arsenal

2018 Professional Conference
Program
Keynote Speaker
Excursions
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
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.

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.

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.

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.

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 5E Instructional Model. I am pivoting off that model and going with the 5X Inspirational Model.

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.
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.

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.

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.

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.

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.

NCSSS INNOVATION AWARDS PROGRAM
Recognize your school’s most innovative student programming and inventiveness in partnerships between organizations and schools.

Nominations due Sept. 14. Winners will be presented at the 2018 Professional Conference Nov. 7-10 in Houston.
The microscopes have greatly enhanced students’ ability to interact with their specimens and truly see what is going on at a granular level.

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
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.

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.

“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 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.

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NCSSS PROFESSIONAL CONFERENCE

PROGRAM

THURSDAY, NOVEMBER 8

9:00 am - 10:00 am  Keynote Speaker
Medical Case Studies That Cross Science Disciplines

10:00 am - 10:50 am  Academic Retention through STEM Camps and Recitation Courses
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 STEM Enrichment 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.

11:00 am - 11:50 am  Interdisciplinary Activities in Finite 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 life science applications (e.g., Leslie Model), apportionment, and graph theory.

12:00 pm - 1:00 pm  Using Computer Algebra System in Teaching High School Physics
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 that 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.

Interdisciplinary Activities in Finite Mathematics

11:00 am - 11:50 am
Presenters: Tamar Akker

Using Computer Algebra System in Teaching High School Physics

Science

Science

11:00 am - 11:50 am
Presenters: Randy Ray, Michele Stover, Ph.D.

Interdisciplinary Activities in Finite Mathematics

Interdisciplinary Activities in Finite Mathematics

11:00 am - 11:50 am
Presenters: Denise Gregory, Daniel Mosi

Encoding Powers Everything: Using the BBC Micro:bit as a Teaching & Outreach Tool

Humanities

Humanities

11:00 am - 11:50 am
Presenters: Nicole Kuzmick

Top 10 Pitfalls of Science Writing

Mathematics

Mathematics

11:00 am - 11:50 am
Presenters: Michelle Seay, Anne Apple

Teammwork and Collaboration-Skills We Must Teach!

Admissions/Enrollment Management

Admissions/Enrollment Management

11:00 am - 11:50 am
Presenters: Park Barney

Interdisciplinary Education and Development in STEM High Schools

Interdisciplinary Activities in Finite Mathematics

Interdisciplinary Activities in Finite Mathematics

11:00 am - 11:50 am
Presenters: Brian Gier, Laura Dostert

Community Building in the Virtual Classroom

Interdisciplinary Activities in Finite Mathematics

Interdisciplinary Activities in Finite Mathematics

11:00 am - 11:50 am
Presenters: Andrea Stubber, Katie Berger

Leadership Education and Development in STEM High Schools

Admissions/Enrollment Management

Admissions/Enrollment Management

11:00 am - 11:50 am
Presenters: Dr. Krissi Hewitt, Kendall Hageman

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

Academic Retention through STEM Camps and Recitation Courses

Academic Retention through STEM Camps and Recitation Courses

11:00 am - 11:50 am
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Modeling in the Physiology Classroom

Physiology and Disease is a Biology elective at FSA that has been developed to be mostly student-centered. Some examples of student projects include modeling heart structure to reflect function and creating LCD wrist 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: Sonneya Arqui

Interdisciplinary Studies/ Science and Engineering

Statistics: Demos, Experiments and Projects

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 Krueger

Mathematics

Designing an Interdisciplinary Course in Cryptography

NCSSS 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

Interdisciplinary Studies/ Mathematics & Computer Science

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

This presentation will offer a brief historical overview of US Immigration Policy from Angel Island Chinese Exclusion to current debates about the status of undocumented immigrants. We will then examine, discuss, and translate 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 Houlder

Humanities

Bridging Art and Science Using Music

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 plans, and exhibiting the student projects through the use of Google Sites.

Presenter: Brett Persa

Interdisciplinary Studies/ Humanities & Computer Science

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

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 programs as well as the successes and positive feedback we have experienced as administrators and teachers of the program. We will also be discussing the development of the ISGA students used as mentors within the program.

Presenter: Anita White, Julie Dooling

Outreach/ Partnerships/ Pipelines/ Summer Programs

3:00 pm - 3:50 pm

Developing Curriculum for Project-Based Engineering Courses

Looking to add project-based engineering to your school’s offerings? Already teaching engineering but searching for new instructional 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 newer additions to traditional schools, most engineering curricula publicly available online are not suited for all and come 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 Eamhert

Engineering/ Makerspace/ Technology

Interdisciplinary Studies/ Science and Engineering

Engaging High School Girls with Social and Ethical Technologies

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 an understanding of 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

Science

Event Driven Programming in JavaFX

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 use an application that will attract a lot of student interest.

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

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

Presenter: John Morrison

Interdisciplinary Studies/ Entrepreneurship (Humanities) and Computer Science

Exploring Other Worlds: A Project in Planetary Science Class

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 robot’s 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

Implementation Entrepreneurship & The Design Thinking Process Across Disciplines

This interactive workshop focuses on incorporating a problem solving design process across computer science and entrepreneurship curricular. Attendees will learn how to incorporate the design process and entrepreneurial concepts into their computer science classrooms. Attendees will also design a marketable solution to a real world 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 Smit, John Chapin

Disciplines

Introduction to Virtual Reality

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 experiment with creating a simple 3D project and explore editing and adding techniques.

Presenter: Michael Cherry, SGHit Professor of Film and Television

Interdisciplinary Studies/ Technology, Computer Science, Makerspace

Creating Pathways for Interdisciplinary Research in a STEM High School Environment

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 discussions 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 intended interdisciplinary research program that could be implemented at their own schools.

Presenters: Kathryn de Ridder-Vigne, Antoine de Ridder-Vigne, Elaine Parrish

Interdisciplinary Studies/ Science and technology studies, foreign language, communication, sociology, & engineering
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 the use of scientific summaries, plant demonstrations, and inquiry-based learning. By presenting plants in an approachable manner through the use of scientific summaries, plant demonstrations, and inquiry-based learning, I aim to how you incorporate plants in classrooms? How can we improve student understanding and appreciation of plants?

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

Sprouting Interest in the Plant Sciences

Strategies for Teaching Diversity and Inclusion in Pre-Modern Literature

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

Science

Humanities

Interdisciplinary Studies/ Humanities, science, research

Research - It’s Not Just for Scientists

Rosalyn Franklin was a Nobel Prize for Chemistry in 1962. In 2007, she published his first book of poems. We will discuss the pleasures and advantages that result when students pursue uncommon 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

Presentation

Sprouting Interest in the Plant Sciences

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Sprouting Interest in the Plant Sciences

Science

Humanities

Interdisciplinary Studies/ Humanities, science, research

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Presentation

Sprouting Interest in the Plant Sciences

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 the use of scientific summaries, plant demonstrations, and inquiry-based learning. By presenting plants in an approachable manner through the use of scientific summaries, plant demonstrations, and inquiry-based learning, I aim to how you incorporate plants in classrooms? How can we improve student understanding and appreciation of plants?

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

Sprouting Interest in the Plant Sciences

Science

Humanities

Interdisciplinary Studies/ Humanities, science, research

Research - It’s Not Just for Scientists

Rosalyn Franklin was a Nobel Prize for Chemistry in 1962. In 2007, she published his first book of poems. We will discuss the pleasures and advantages that result when students pursue uncommon 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.

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Environmental Impact - Using Digital Media to Focus Student Learning

Environmental issues are global challenges that our students will have to address in the 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 season, 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

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 Gauntlett School of Mathematics, Science, and Technology over the past 10 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: Kent Napoleon, Ph.D., Nicole D’Antonio

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

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 experience opportunities.

Presenters: Joshua T. Witter, Randall W. LaCross

Diversity and Inclusion in the Science Classroom

A Diversity, Epidemiology and social justice unit was incorporated into the Physiology and Disease curriculum in Fall 2018. 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

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 AdvancementED. 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 Donnelly, Paul Winkler

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

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. Faculty/collaborative efforts that can be utilized among stakeholders will be highlighted.

Presenter: Tyson Crowl

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

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 practitioners and market sellers. Students were given the opportunity 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 G. Garcia, Chuckie Fer A. Calabas

Teaching Artificial Intelligence Through Game Programming

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 Qi

Using 21st Century Technology to teach 14th Century Skills

What do castles, dusty gargles, 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

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 Beems

Involving Students in Authentic Conservation Research

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 Savien, Freddy Herrera

IMSA Allies Program: The Power of Near-Pear Teaching

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: Green Seeley-Josee, Megan Scherer

Digital Storytelling: Promotional Videos with Nearly No Budget

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?

In high level course 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 show 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 exams 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

Using Partnerships/Pipelines/Summer Programs

Outreach/Partnerships/Pipelines/Summer Programs

Interdisciplinary Studies/Humanities/Science and Studies/Interdisciplinary Partnerships/Outreach/Partnerhips/Pipelines/Summer Programs

Outreach/Partnerships/Pipelines/Summer Programs

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

Interdisciplinary Studies/ Across the academic curriculum & Career Counseling & Wellness
Tour Rice University’s beautiful campus, as well as the under-graduate maker-space, the Oshman Engineering Design Kitchen (http://oedk.rice.edu/), some of the Shared Equipment Author-ity (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 3,983, its setting is urban, and the campus size is 380 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 Dis-trict, 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 Wrenn 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 Archi-tecture 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.

For more than 50 years, NASA’s Lyndon B. Johnson Space Center (JSC) in Houston has led our nation and the world on a contin-uance adventure of human exploration, discovery and achieve-ment. 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, Lyn-don B. Johnson.

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

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 pro-grams.

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 1979-1983. He is currently an adjunct faculty member of Baylor College of Medicine and the University of Houston.

Dr. Tapia has authored or co-au-thored two books and over 80 mathe-matical research papers. He has delivered numerous invited addresses at national and international mathematical conferences and serves on several national advisory boards.
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](http://www.ncsss.com)