

Pre-college STEM programs can inform equitable college admissions

As with all sectors of society, the education world has been upended and we are all searching for ways to make sense of what is, what was and what will be.

The pandemic, the postponement of college board tests and the growing trend of test results becoming optional for college admissions presents a unique opportunity to reevaluate the entire college admissions process.

Members of the [STEM Pathways for Underrepresented Students to Higher Education \(PUSH\) Network](#), a National Science Foundation INCLUDES Alliance, believe this is a critical time to address longstanding and inequitable college admissions practices and processes that have prevented Black and brown students in particular from accessing and thriving in STEM pathways.

We urge institutions of higher education to seriously address these questions:

What defines students' abilities to be successful in college?

What sets of experiences best predict that success?

What are the characteristics of successful college students?

How are issues of race and equity addressed in the admissions process?

As part of the response there must be an emphasis on [Out of School Time](#) programs, including pre-college STEM programs. Pre-college STEM programs have long provided powerful learning experiences for thousands of students across the United States, from researching genomes to building robots to exploring river ecosystems.

Unfortunately, these programs have not been leveraged to support broadening participation of minority students who are underrepresented in STEM fields. The underuse of pre-college STEM programs extends to their untapped potential to contribute to more nuanced and equitable college admissions processes.

The STEM PUSH Network, which is supported by a diverse group of collaborators and thought partners, brings together pre-college STEM programs from across the country to work on strengthening programming for racially and ethnically underrepresented students, and on reinventing the relationship between pre-college STEM programs and higher education admissions toward more equitable pathways into undergraduate STEM fields.

The STEM PUSH Network believes that its findings will demonstrate the power of STEM experiences, like pre-college STEM programs. The network is working with STEM pre-college programs to both strengthen and better evaluate such programs, as well as connect to college admissions practices to better understand the value of such programming and test out ways to systematically communicate students' STEM competencies to admissions. This data will both

strengthen and measure the effect that participation in pre-college STEM programs is having on high school students, while working to give those programs currency in the college admissions process. Pre-college STEM programs across the country have data supporting the positive impact of their work on young people's STEM knowledge, skills and dispositions. We can also listen to the powerful narratives from students who have participated in pre-college STEM programs.

Consider this story: Terrell Galloway of Pittsburgh finished his eighth-grade year unsure of anything other than he wanted to spend his summer with friends and did not want to do more school. However, Galloway relented to his mother's desire for him to enter [INVESTING NOW](#), a pre-college STEM program at the University of Pittsburgh. He then spent his high school summers learning about robotics and computational fluid dynamics, and realizing that there really is such a thing as a "Black engineer."

His high school pre-college STEM experiences helped him land summer internships, including one on a naval submarine. Four years later, he was a year away from graduating with a degree in mechanical engineering and evaluating where he would like to work when he graduates in spring 2021.

He and a group of friends he met in his pre-college STEM program formed a mentoring organization, [Future Kings](#), for other young men of color from his hometown, helping advise them about college and career choices.

Galloway said his experience with his pre-college STEM program changed the trajectory of his entire life and opened up options he never knew existed. "As a ninth-grader in high school, I had never seen a Black engineer. I did not even know they existed, but it was really hard for me to think that was obtainable for myself since I had never seen it."

Galloway is not alone. There are thousands of minority students across the country who have had meaningful pre-college STEM program experiences, and yet the knowledge and skills they have acquired through their work with pre-college STEM programs and their tangible accomplishments are undervalued in the college admissions process.

It is time to change that.

Wisdom from students

San Antonio Convening of STEM Learning Ecosystems taps ideas from those closest to learning

More than 30 students attended and spoke at the semi-annual convening of the STEM Learning Ecosystems Community of Practice, offering advice and thoughts for STEM leaders throughout the world.

Alicia DeHoyos, a seventh grader from San Antonio:

- “We now have flying cars and cell phones, but our education system has stayed the same for over 100 years.”
- “Our education system needs to change. We need to do more than just memorize facts and prepare for tests and many schools do not have the resources or the curriculum to support the needs of students today.”

Emmet Decker, a ninth grader from Northeast San Antonio:

- “Students are mostly expected to give administration an easier time.”
- He emphasized the need for higher expectations and shares that when he is the CEO of a billion-dollar industry, he will give back to students, so they have the resources and support to create.
- He said it is critical for educators and others to “inspire wonder” and advocate for a school-wide Project Based Learning approach in order to increase access to innovation, invention and entrepreneurship.

Shreya Chaudhary, a tenth grader from San Antonio:

- “In order to best support student’s momentum in innovation and STEM leadership, one of the most important demonstration of student support is for adults and educators to listen to children.”

Leslie Goodman, an 11th grader from San Antonio:

- “If you know anything about coders, you know we never ever give up.”
- Teachers need to realize that students need to be able to pursue various channels for learning and be able to display their learning in different forms.

Rey Vela and Nathanael De León, seventh graders from Donna, TX:

- Rey and Nathanael with support from their teacher, Daniel Gonzalez, designed and produced a robotic hand for Nathanael, who was born without his hand.
- The students said that collaboration and empathy, when combined with support from teachers, can lead to life-changing advancements.

Conrad Fellows, Olivia Bangs, Roberto Martelli, Divyesh Khatri, 12th graders from Houston TX:

- The inventors of VoxLion, a platform that uses AI to help students improve their presentation skills, advise educators to teach more than what is in curriculum. “Soft skills including teamwork, and collaboration, are things we will use every day in business, but they are not being taught in school.” They stress the importance of “supporting students by providing coaching while allowing them to maintain their

independence, including their independent ideas.”

- “Local companies can play an important role by providing internship opportunities while major, national organizations can provide access and exposure to their businesses and facilities, to really learn the inner workings.

Science dictates policy in San Antonio, Texas

Global convening leads with curiosity and collaboration based models of education and community engagement

SAN ANTONIO – San Antonio Mayor Ron Nirenberg Tuesday told more than 500 members of the STEM Learning Ecosystems Community of Practice that “Here in San Antonio, Science dictates policy.”

His comments came a day after he declared that the city was in a state of emergency due to what he called missteps by the Centers for Disease Control for releasing a patient into the general public who had tested positive for the COVID-19 illness.

“When it comes to matters of public health, we will always be guided by medicine and science,” he said.

Nirenberg’s comments were one of more than a dozen mainstage presentations Tuesday, the second day of the bi-annual convening, “The Future is Here: Embracing it Together.”

Dominant themes of Tuesday included reminders about educating children to tackle the grand challenges facing the world, including epidemics.

The Power of Collaboration

Speakers stressed the importance of collaboration to meet learning needs for future economic growth and of not underestimating students’ abilities. Leaders also recognized that families sometimes don’t have any idea how to support their children’s educations.

San Antonio Superintendent Pedro Martinez explained that more than 90 percent of the students who attend his school live in poverty and come from families that have no idea how to support their children’s educations.

“It’s not that my parents don’t care about their child’s learning. They just don’t know what they don’t know,” he said.

This, he said, is where ecosystems must step in and work to support families with meaningful and practical strategies to better support their students. He emphasized the power of cross-sector collaboration, a pillar of the global STEM Learning Ecosystems initiative. Such collaboration includes cross-sector partners from a wide variety of industries and sectors all working for shared

common goals around improving students' experiences.

"We have an open door to industry partners and higher education partners. To put all of this on our teachers is not fair. It has to be a community partnership," he explained, noting that his school district was once failing and is now considered a leading system in Texas.

Martinez participated in a mainstage discussion with Donna DeSiato, superintendent of the Syracuse Minoa School District. Moderated by John Fitzpatrick, president of Educate Texas, the two superintendents touched on issues of equity and access in STEM education.

DeSiato said the ecosystem operating in her community has helped lead a wholesale transformation of the entire district into one that is focused on STEM and principles guiding it.

"We have had an entire paradigm shift," she said, explaining that all schools in her district have become STEM schools.

Citing how there are no bells to signal students to move from class to class in middle school, she explained that students need to understand how to manage their own time and be in charge of their own learning.

The model of education that DeSiato is offering in East Syracuse Minoa is far more in line with what morning keynote speaker and inventor Radia Perlman explained is needed in order to foster invention and imagination.

"My superpower is having no memory at all," Radia Perlman told the group. "I had to deeply understand everything instead of memorizing."

Perlman, who invented key protocols that shaped and advanced the Internet, was inducted into the National Inventors Hall of Fame which sponsored her remarks to the group.

Perlman explained that stereotypes can negatively affect the numbers of women and people of color who enter STEM disciplines.

"Everyone has this notion that an engineer is someone who took stuff apart when they were little," she said. "I never took stuff apart. I went to college not knowing how to change a light bulb."

Perlman said teachers must be recognized and appreciated but also retrained with better strategies for supporting creativity.

The San Antonio Convening also featured news from global convening co-host, Movimiento STEM. In Mexico, Movimiento STEM will be recognizing the country's leading teacher with a prize of \$1 million pesos. The prize, sponsored by the Varkey Foundation, will be awarded later in 2020. Find out more about the National Teacher Prize Mexico [click here](#).

'You don't take a white boy and put him on your brochure'

More than 500 STEM Leaders Explore Issues of Equity in STEM Education

SAN ANTONIO – Kamau Bobb, a nationally recognized expert in STEM education and equity, said he wound up on the cover of brochures for almost every college he attended.

"At first, I thought it was because I was cute," Bobb told a group of 500 STEM leaders attending the STEM Learning Ecosystems Community of Practice, SLECoP, convening in San Antonio. Later, he realized that it was because of the color of his skin.

"You don't take a white boy and put him on a brochure because schools want to show that they are diverse," Bobb said.

"The expectation is that black kids can't do it [achieve], If they do, they're like superheroes," Bobb said. "I am always asked what I did to get where I am, but the reality is that I did my homework and turned it in just like everyone else."

Bobb warned the audience of the danger of such low expectations for children of color, in particular, black boys.

Bobb was one of three speakers on a keynote panel, "Inventing Tomorrow: Cultivating a New Generation of Problem Solvers," sponsored by the Lemelson Foundation with support from Qualcomm Foundation. Bobb and other panelists are interested in creating conditions that will eliminate barriers for marginalized students and foster students' ability to invent.

"We must remember that marginalization is not a passive thing – it's active," said Bobb. "Someone is culpable."

Other panelists echoed that it is critical to address the factors that cause students to be kept on the outside.

Katelyn Sweeny, an engineer, and Kristin Moon, a teacher with the Portland Public Schools, both agreed that teachers need to get out of the way of their students and act as allies for them.

Moon said it is important for educators to "be able to take small risks within their classrooms. Those risks enable students to aim higher and achieve more."

The Lemelson Foundation has created an invention education framework intended to provide educators and others with a common understanding of invention education. That framework and numerous other resources to further invention education are being shared at the SLECoP convening.

Other speakers at the convening included Nathanael De Leon, a San Antonio 7th grader, who was born without his right hand. His classmates designed and printed a robotic hand for him that now enables him almost total mobility.

Nathanael was one of six students on a panel, “Student Perspectives: A Panel of Future Inventors, Innovators and Entrepreneurs.”

Another student on the panel, Alicia Amber De Hoyos, urged leaders to reform the educational system.

“The school system is still the same way it has been for more than 100 years. Our school system needs to advance too,” Amber said.

Monday concluded with San Antonio students participating in an “Invention Convention,” sponsored by the Henry Ford Museum, with support from the Lemelson Foundation and others. Students showed off their inventions to leaders of the STEM Learning Ecosystems, with the hope of winning prizes and the right to advance to a national competition.

STEM According to Mr. Rogers

By Jeremy Shorr, Director of Digital Innovation and Early Learning for TIES

“The most important learning is the ability to accept and expect mistakes, and deal with the disappointments that they bring” – Fred Rogers

The only time I ever made my mother cry was because of Mr. Rogers.

Overall, I was a pretty well-behaved kid. Like anyone, however, I had my moments. When I was five, I got in trouble for not listening and, defiantly told my mom, “Yeah, well MR. ROGERS likes me JUST THE WAY I AM!”.

That unwavering support in the face of failure was a cornerstone of Fred Rogers’ belief system. It is a big part of why I am willing to take risks in my adult life. My loving parents were the biggest influences in my young life, but Mr. Rogers continues to impact my thinking 35 years later.

Fred Rogers has been in the news a lot in the past couple of years. Between last year’s documentary and this year’s feature film (starring Tom Hanks), I seem to hear those familiar piano riffs tugging at my memories regularly. For me, however, his presence has never left. I think it is very possible that Mr. Rogers is one of the best humans to have ever lived and his heart and words have guided my entire life.

Life lessons can be learned from Fred, but the STEM community has a lot to gain from The Neighborhood, too. Here are five of my favorites.

“Often when you think you’re at the end of something, you’re at the beginning of something else”

We talk a lot in the STEM world about both the discrete skills of STEM and the transferable skills that help everyone, regardless of vocation or avocation. The end of a project not only opens up the opportunity to engage in a new project, but it brings with it lessons that carry forth to future work.

“What do you do with the mad that you feel?”

When something we’re working on doesn’t work, it is okay to get angry. But then we take that anger and funnel it into finding a solution or finding the next iteration. Don’t let frustration and anger sink you, let it give you the drive and energy to make things even better.

“Someday you’ll be a grown-up too.”

Our job is to make sure that our children are prepared to be positive and productive members of our communities. However, the inverse is true too. Adults were once children and would benefit from remembering the wonder, creativity, and problem solving inherent in the youngest members of our society.

“Did you know that when you wonder, you’re learning?”

Do you have children? Grandchildren? Young neighbors or friends? Watch them as they move through the world. I remember watching my daughter spend nearly an hour exploring a single leaf when she was a toddler. When I remember that lesson and make sure that I allow myself the time to think and explore. When I take time to wonder, I am filled with solutions to new (and often unrelated) problems and fresh ideas for my personal, volunteer, and professional lives.

“We live in a world in which we need to share responsibility. It’s easy to say, ‘It’s not my child, not my community, not my world, not my problem.’ Then there are those who see the need and respond.”

The STEM Learning Ecosystems Community of Practice is filled with responders. Twice a year I am blown away by the ways that this community comes together to meet the needs of young people around the world. This isn’t something that any of us can do alone, but together we can make a difference that will ripple through our communities and beyond.

Gearing up for San Antonio - Tips from Locals

When you come to San Antonio in March for the Spring 2020 Convening of the STEM Learning Ecosystems Community of Practice, you can expect to experience a city that is truly multi-cultural, vibrant and overflowing with entrepreneurial energy and ideas.

We are in the final stages of planning the agenda for the three-day convening which officially opens at the [Marriott River Center](#) on Monday, March 2 and concludes at noon on Wednesday, March 4. While we are planning for rich and meaningful experiences for you, we also have heard your requests for more unstructured time to meet with others and to explore the city.

Many of you will be arriving Sunday and there are some dining options outlined below.

After a half-day of workshops and discussions on Monday, we will spend Monday evening at the [San Antonio Museum of Science and Technology](#) enjoying some great food from [Chef Johnny Hernandez' kitchen](#). We have some other surprises in store for you there, but we will save that for later.

We will spend most of the day together Tuesday at the [Marriott River Center](#), but you will be free to explore the city or meet with colleagues Tuesday evening.

The San Antonio host committee, along with our event planners, have developed the following list of dining options and some fun tips for you to think about as you plan your time in this beautiful city.

From Rudy Reyna, who grew up in San Antonio, the number one must-do is the [River Walk](#) and [Market Square](#) and for dinner on Tuesday night, he strongly urges you to think about [Mi Tierra at the Market Square](#)

And another member of the San Antonio Planning Committee, Tyler Schroeder, suggests the [Pearl San Antonio](#) (just north of downtown San Antonio), which has some great shopping and restaurants, including [La Gloria](#), which is right on the San Antonio river. A must see is the [Emma Hotel](#) which includes an amazing bar!

And as you begin to think about what to pack, we wanted to remind you that temperatures in San Antonio fluctuate between the mid-50s at night to the mid-70s during the days.

Also, we will load all of this information on the Attendify App in the coming weeks.

Women Living STEM

Advice from trailblazers and strategies to elevate the role of women in science.

Astronaut Kathryn Sullivan, the first woman to walk in space, shared that in college she was “forced” to take two science courses. This revelation shocked the more than 400 attendees of the Fall convening of the STEM Learning Ecosystems Community of Practice, held in Cleveland, OH in October 2019.

Within just a few weeks, Sullivan’s dread transformed into a love and passion for science, when she realized that science is a meaningful and fascinating journey of “inquiry and personal discovery.”

Sullivan was one of several women recognized for their contributions to the field, a testament to [“Women Living STEM”](#) at the Fall convening. Others notable women honored included:

- Ruth Begun, Former NASA Physicist

- Dr. Jeanette Grasselli Brown, Retired Director of Corporate Research in Analytical and Environmental Sciences at BP America, Inc.
- Frances Seiberling Buchholzer, Retired Geomorphologist and Current Biomimicry Advocate
- Margot James Copeland, Retired Chair and CEO at KeyBank Foundation
- Clara Rankin, Philanthropist
- Helen Williams, PhD, Program Director, Education at Cleveland Foundation

[Watch highlights from the evening here.](#)

Sullivan and others were recognized to demonstrate the important contributions of women to the field, with a particular emphasis on the Northeast Ohio region. The event was a nod to the great accomplishments of women in STEM overall and served as an important reminder for the need to create and encourage pathways for more girls and women to enter STEM professions.

Statistics from the National Science Foundation (2018) about girls and women in STEM amplify this need:

- Women make up half of the total U.S. college-educated workforce, but only 28% of the science and engineering workforce.
- Female scientists and engineers are concentrated in different occupations than are men, with relatively high shares of women in the social sciences (60%) and biological, agricultural, and environmental life sciences (48%) and relatively low shares in engineering (15%) and computer and mathematical sciences (26%).

In addition to recognizing Women Living STEM, the Cleveland convening also saluted Girls Living STEM, highlighting the tremendous accomplishments of young women across the nation.

The STEM Learning Ecosystems Community of Practice continues to provide tools for communities and spotlight best practices to encourage more girls to pursue math and science.

In the words of Kathleen Sullivan, “We need to begin providing them (young women) those first muscle-flexing experiences of inquiry and discover in classrooms and school rooms where they spend so much of their lives so that they can begin to accelerate through the pathway of life faster than I did.”

Questions to Form Our Identity

“The marvelous thing about a good question is that it shapes our identity as much by asking it as it does by the answering.” – David Whyte

For those who know me, you’re about to laugh when I say this – I’m all about the answers sometimes. And I usually want those answers quickly.

I live in NYC and fast-paced anything is a part of my spirit.

However, I read this quotation, and it made me pause. Then it kept creeping back to me throughout the day. I couldn't help but think about the transformational work of the STEM Learning Ecosystems and the power of questions in the formation of 'their' identities of ecosystems.

Design Studios are common practice for early forming Ecosystems. A facilitated session that forces leaders from different backgrounds and areas of expertise to ponder things like:

What are the most pressing challenges of our community?

How might this community look different if we had a chance to rebuild structures and pathways?

Who do the systems in place work for? Who might they be excluding / hurting?

How do we change things? What relationships must exist to do this?

Those are big questions right? In a room full of community leaders, even ASKING them can be a transformational act.

Inquiry like this can inevitably change our identity. It causes us to pause and think about how the auto-pilot type rush of our daily work and routines might be contributing to the very problems we say we want to solve.

For example, if a community is facing a talent pipeline issue, asking 'why does this challenge exist' could lead to a much larger discussion that shifts systems of education, training and recruitment.

That question might lead to new partnership development between post-secondary and K-12 schools.

It could lead to more business involvement in learning environments to expose young people and their families to opportunities they never knew existed.

It could open opportunities for historically marginalized populations.

It might even inspire legislators to amend credentialing requirements and provide state funding to tackle the issue.

The very act of gathering different leaders in a community in one room for a two-hour meeting is transformational. Getting very busy and very important people together to ask what they envision for their community's future is an identity changing act.

So pausing from hustle and bustle of my own routine, I say thank you to the 84 communities that make up the STEM Learning Ecosystems Community of Practice. I recognize every hour of extra time you commit that you absolutely don't have in your day.

I am humbled to be a part of work that causes us to question ourselves and inspire greater futures.

With so much gratitude,

Veronica Gonzales
Deputy Director

Partnering to Change the GAME ~ Infusing STEM into Football Camps

By Kathleen Schofield, Executive Director, Northeast Florida's STEM2 Hub

On a sunny Saturday morning, the last place you would expect to find our STEM team would be at a football field nestled beside the Police Athletic League in Jacksonville, but that is exactly where we were - The Calais Campbell - Jax PAL -STEM Football Camp.

At the camp, sponsored by Calais Campbell, Defensive End, Jacksonville Jaguars, almost 500 kids came out to drill and learn new moves under the coaching of Campbell and half a dozen other players on the Jaguars football team.

But football was not the only game being played that day! Inside the building, students rotated through multiple centers giving students introductory exposure to STEM programs and skills. Partners, including LEGO Education and Microsoft participated by bringing their equipment - computers, robots, drones, and the latest in HoloLens and mixed reality, so that these athletes could engage with and pick up new skills and learn how to continue their learning in these areas after the camps.

One of the highlights of the day was a visit to the Hacking STEM Brain Gong Concussion Simulator experience, developed by the Hacking STEM Team at Microsoft. Students learned about the regions of the brain and their functions from a local orthopedic surgeon and a neuroscientist from the local university. Then, they experimented with a model that had been built to visualize, in real-time, what happens when the brain collides with the skull. This helped students understand the science behind the concussions, and the reason why helmet safety is so important, all while being exposed to live data collection, and how technology can empower them to learn and explore!

Another highlight was the drone flying competition. After everyone got a chance to fly a drone, teams formed to compete by flying through an obstacle course. And the Jaguars joined right in, learning a new skill right alongside these young athletes! Each session was tied to career awareness in the tech sector and the jobs of the future! Athletes learned how gaining these new skills could jumpstart their learning about emerging careers in the context of sports! Due to the great number of volunteers and community partners who came out to help, students were able to work in small groups, deepening their engagement in each of the activities. In our ecosystem, when we work as a team, we ALL win!

Highway to STEM Begins with a Good On Ramp

By **Xan Black**, Executive Director of the **Tulsa Regional STEM Alliance**

The Journey

Thanks to the Charles and Lynn Schusterman Family Foundation, the Overdeck Foundation and the Harvard PEAR Institute, the Tulsa Regional STEM Alliance (TRSA) had a chance to take a long look at our STEM journey. We had the chance to invite outside experts into our living room and not only tell the stories of our journey as an ecosystem, but listen for and learn from each other's memories of our STEM expedition.

Onramps = Access

One way that we classify STEM programming in TRSA is to think about whether the event is meant primarily to engage, equip, or empower students. We imagine equip programming as a variety of onramps that students use to access the STEM highway system. Onramps are short, you have to go slow, and you need a lot of them. It's easy to take an Interstate point of view and dismiss the value of an on ramp in STEM education.

For most students, however, the beginning of a STEM career is a STEM onramp.

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- Before going to college, a teacher or class got them interested in STEM. This is especially true of female students (68% vs. 51% males), who give “a teacher or class” as the top factor that sparked their interest.

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Microsoft: STEM Perceptions Study

Infrastructure

The Harvard PEAR study provided TRSA with a complex infrastructure map of the STEM ecosystem we are building together. TRSA has about one third each of engage, equip, and empower programming events.

We need more skill building experiences for students which are the expressways in this STEM mixmaster. We are working to increase the number and quality of interstate lanes that will provide STEM pathways for **ALL STUDENTS** to arrive at high-quality careers.

But it may just be that our greatest achievement and paradoxically our greatest need in achieving our vision of **All Students STEM Ready** is a robust system of well placed, clearly marked,

recently resurfaced on ramps.