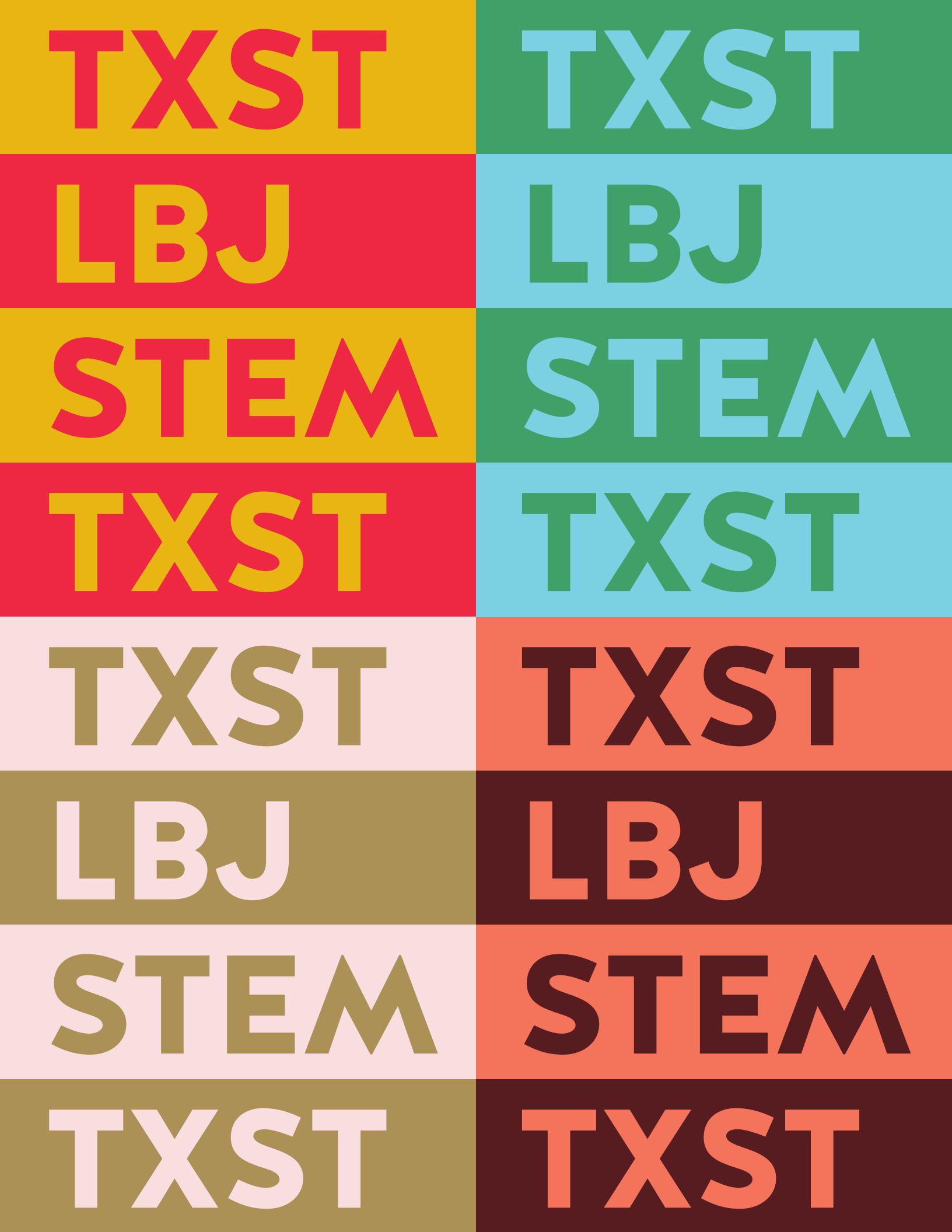




TEXAS STATE UNIVERSITY

**LBJ INSTITUTE**

FOR STEM EDUCATION AND RESEARCH



<b>LBJ Institute for STEM Education and Research</b>	<b>4</b>
<i>Rising Stars</i>	6
<i>Latina STEM Professors</i>	15
<i>Stem-for-all Partnership</i>	18
<b>Reaching Teachers</b>	<b>20</b>
<i>EPDC Specialists</i>	26
<i>Quick Bits &amp; STEM In Action</i>	30
<b>Reaching Students</b>	<b>32</b>
<i>Culturally Responsive Teaching (CRT)</i>	39
<i>PEACE GEMS Camp</i>	40

## THE INITIALS LBJ CONVEY A CERTAIN GRAVITAS ON THE TEXAS STATE CAMPUS.

Named after Lyndon Baines Johnson, the 36th president of the United States and class of 1930 graduate, the LBJ Institute already had a three-decade history of education-related grants at Texas State. By 2012, though, the Institute was inactive. The arrival of former director Dr. Araceli Martinez Ortiz, then a newly hired engineering education specialist, and her pairing with Dr. Leslie Huling, a leader in the original LBJ Institute, provided the spark to relaunch and rebrand it as the LBJ Institute for STEM Education and Research.

---

**Make no mistake – research is at the heart of everything the LBJ Institute does.**

---

The Institute's research mission is to transform STEM education in order to increase the participation and success of diverse communities of educators and students, particularly students from populations traditionally underrepresented in the STEM fields such as LatinX, African-Americans, Native Americans and women.

"The U.S. is not producing as many STEM professionals as we need," Huling said. "There is a real need to broaden the pipeline. STEM, like almost any field, hasn't been as diverse as it needs to be. It's been male-dominated. Minorities, particularly those who are economically disadvantaged, haven't been able to enter, persist and be successful in STEM."

THE U.S. IS NOT  
PRODUCING  
AS MANY STEM  
PROFESSIONALS  
AS WE NEED.

THERE IS A  
REAL NEED TO  
BROADEN THE  
PIPELINE.

The STEM Rising Stars program studies retention rates of Hispanic, African-American and female STEM majors at Texas State.

The initial purpose in 2013 was to bring together Texas State faculty who would be interested in moving forward on projects in STEM education. The goal was to shape the Institute into a mission-driven center within the University to conduct research and supported initiatives that would be of interest to other outside organizations.

While Texas State allowed the usage of LBJ's name for the Institute, its research projects would be funded externally. That meant the Institute team needed to find collaborators in the exact opposite way a center like this is normally formed. Without a budget to hire anyone, the Institute instead had to locate faculty members who were already doing their own research projects in this arena.

After nearly a year of developing a proposal for the Institute's first research project, the strategy paid off with a \$1.5 million grant from the National Science Foundation. It created the Institute's STEM Rising Stars program, which became a five-year study of retention rates of Hispanic, African-American and female STEM majors at Texas State.



**STEM  
RISING  
STARS**

**STEM  
RISING  
STARS**

**STEM  
RISING  
STARS**

**STEM  
RISING  
STARS**

**STEM  
RISING  
STARS**

**STEM  
RISING  
STARS**

# A PASSIONATE TEAM OF RESEARCHERS

In order for The LBJ Institute's STEM Rising Stars program to study retention rates of STEM majors from underrepresented populations – Hispanic, African American and female students – Martinez Ortiz needed a varied team of researchers with a deep passion for this particular matter. She was joined by Drs. Debra Feakes (chemistry), Eleanor Close (physics), Clara Novoa (industrial engineering), Vedaraman Sriraman and Kim Talley (engineering technology), Mina Guirguis (computer science), Susan Morey and Alejandra Sorto (math) as co-principal investigators.

Each member of the team worked on subproposals in their respective fields to keep students engaged in the different majors. For example, the project helped launch an early internship program for engineering technology majors as part of the degree requirement – a three-credit, 400-hour internship in their sophomore year still in place today.

"The thought was sending them out to practice early on would develop greater interest, a greater connection for the discipline and help with retention and graduation," Sriraman said.

Novoa created a course to train students on spatial visualization skills that are needed in

industrial engineering. The project also led to the faculty members meeting incoming freshmen as part of New Student Orientation to discuss underrepresentation in STEM and the need for new voices in the field. Engineering freshmen were also grouped together in their own section of US1100, which is the University Seminar course on how to be an effective college student, allowing them to find their way early in their educational careers.

"Males seem to be more clear about the applications of engineering, while females really need more support in the first years to learn what they will do with this degree," Novoa said. "This is something we learned that is common in some Hispanic and underrepresented populations. Through education, we can change that lack of clarity. We can identify what other skills we need to reinforce to make them more confident. If they get more confident, more enthusiastic and more clear, they have the elements to succeed in STEM."

Sorto and the team created real-world situations based on their own research to use in calculus courses, which provided a more relevant and meaningful experience for students than problems presented in textbooks. One of

Sorto's graduate students tested this method in the classroom and found the impact was highest with female students.

*As an Hispanic-serving institution with no majority race or ethnicity on campus and nearly 60% of the student population being female, Sorto believes Texas State is the ideal setting to conduct this type of research.*

"Other institutions wish they had what we have," Sorto said. "It is a perfect place to test out methods and practices because we have the great conditions of being diverse in that way."

One of the main goals of the Rising Stars grant was to increase the percentage of Hispanic and African-American STEM majors (27.7% in 2012) to 34% by 2018. Now in 2020, more than half of STEM majors at Texas State are Hispanic and African-American. The team's research recognized many factors behind this increase, but student surveys showed efforts born out of the Rising Stars program played a major role in their decisions. Another goal of the program was to increase the percentage of female STEM students (22.6% in 2012) to 25% by 2018, a number also achieved in the stated time frame.



>50%

of STEM majors at Texas State are Hispanic and African-American

>25%

of STEM majors at Texas State are female



Future scientists and engineers benefit from hands-on learning opportunities.

## An additional byproduct of the Rising Stars grant was the creation of the LBJ Institute's Faculty Research Fellows.

The first cohort – Drs. Eleanor Close (physics), Clara Novoa (industrial engineering), Vedaraman Sriraman (engineering technology), Mina Guirguis (computer science) and Kim Talley (engineering technology) – continued working on research in their respective fields with backing from the Institute. Martinez Ortiz, Talley, Sriraman and Dr. Shaunna Smith, a professor in curriculum and instruction, would go on to receive the Institute's second National Science Foundation grant in 2015, a \$300,000 award to purchase equipment for the Bobcat Made Maker Space. The goal was to provide a free, open-access research and innovation lab for any student at Texas State – no matter their major. The project expanded on Smith's smaller, mobile maker space she would transport in her car to places like the public library and community centers. By 2021, the Bobcat Made Maker Space has impacted

thousands at Texas State – from students just looking to tinker or experiment with cutting-edge technology to Smith's students, who studied how others best learn in these maker environments.

Sriraman, who is now the Associate Vice President for Academic Affairs at Texas State, credits the founding of the LBJ Institute as a systematic beginning of large-scale, collaborative grants for the University from sources like the National Science Foundation.

"These NSF grants are multi-year, multi-million-dollar grants that brought together faculty from education and science and engineering," Sriraman said. "Even now, from liberal arts and fine arts. The LBJ Institute played a pioneering role."

---

**That role included landing the University's largest research grant to date – \$15 million from NASA.**

---

For Huling, news of receiving the NASA grant came as a very pleasant revelation. She knew Texas State had submitted an exceptionally strong proposal, but her prolific career in writing research grants taught her to know NASA would be a completely new funding source for the Texas State College of Education – and she assumed other institutions might have had the inside track in this competition. On the day they learned the good news, Huling was actually tidying up her office and preparing to go on a one-year developmental leave. She was between

grants, and it was the first opportunity she had had to take a developmental leave in the almost 30 years she had been at Texas State.

"Because the call came in over the lunch hour, I missed the original call," Huling recalled. "So when I found out later in the afternoon, it was a wonderful surprise."

fueling a more diverse future workforce of STEM professionals. Prior to the COVID-19 pandemic, specialists spent considerable face-to-face time at the NASA centers with students and educators, in addition to online development like webinars and digital badging – a certified way for teachers to show their development in STEM-related training and practices. During



Her first call after getting the news was to call Faculty Records to delay her upcoming developmental leave for several more years. Funding from NASA transferred operations of the EPDC – the NASA STEM Engagement and Educator Professional Development Collaborative – to the LBJ Institute. This is the only grant of its type in the nation that handles professional development for educators in collaboration with NASA – and it was the exact type of opportunity with an outside organization envisioned at the relaunch of the Institute. The EPDC partners with NASA to provide resources and training on STEM topics for educators and students across the country. The Institute hired 10 education grant specialists, assigned at different NASA space centers across the country, to get NASA content into the hands – and brains – of teachers and students. These specialists are trained on research-driven methods such as culturally responsive teaching, which goes hand-in-hand with NASA's goal of

the pandemic, specialists shifted their efforts entirely online, reaching teachers, students, and informal educators such as parents, grandparents, scout leaders, etc. Now seven and a half years in, educators have earned more than 2,500 digital badges from the EPDC, which represents more than 20,000 hours of professional development credit.

The EPDC also provided an opportunity for other faculty at Texas State to work with NASA. For example, Dr. BJ Spencer, a professor of practice in construction science and management and member of the second cohort of Rising Stars Research Fellows, applied her research interests in virtual and augmented reality (VR/AR) to collaborate with other faculty members on a digital badge in VR for the EPDC. Spencer used that as a springboard for other VR-related research, including a construction safety training project and a VR project about Spring Lake.



“We get so caught up in our own silos that we primarily just work with our own department,” Spencer said. “Seeing the LBJ Institute and how they allow people to collaborate across disciplines, we need to bring that back to our own departments. It really enhances our programs. I don’t know of anything else on campus that harnesses that ability.”

NASA has also provided funding for other research programs at the LBJ Institute, including the Pre-Engineering Academic and Career Exploration Community for Girls in Engineering (PEACE GEMS) Camp, Math and Science – a week- long, overnight summer camp for high school females who show an interest in STEM fields. Students were recruited from communities around the Texas State campus and took part in STEM programming from 7:30 a.m. until 10 p.m. each day, with female professors there to mentor them. The first year, with support from NASA and the Texas State University College of Science and Engineering, featured 16 students and 20 staff members to test the curriculum.

“Eighth grade seems to be a turning point where girls often discontinue their pursuit of STEM, so we targeted girls who were entering ninth grade,” said Dr. Michelle Londa, an assistant professor of practice in engineering and member of the second cohort of Rising Stars Research Fellows. “We want to make sure that we get cohorts that remain enthusiastic about science and engineering throughout their high school years – and then, of course, hopefully come to Texas State. It doesn’t have to be Texas State, though. We’re passionate about getting more females into these professions.”

COVID-19 prevented the second year of the camp from happening, but the Institute is now applying for funding to hold PEACE GEMS camp every summer, with plans for the girls

to come back multiple years for progressively longer periods of time. The goal is for returnees to serve as mentors for the new participants in their second year, to get a job with a local industry partner in year three and then a full-scale internship in year four.

“At Texas State, as a whole, we have more females enrolled than males at the undergraduate level,” said Christine Hailey, Dean of the College of Science and Engineering. My goal is to begin to look like Texas State in terms of number of women who want to be in engineering.”

**Research with the goal of increasing diversity in STEM is a long-term play endeavor. The fruits of these efforts may not be recognized for years. However, as several LBJ Institute researchers pointed out, it only takes one generation for this to transform an entire family’s existence.**

“What you do with a third grader, you’re not going to see in the workplace in a year or two,” Huling said. “But we know that’s where you hook people in, and we have a commitment to do that.”

# A SUPPORTIVE ENVIRONMENT FOR LATINAS IN STEM

Latinas make up only six percent of professional positions in science and engineering, which is a problem Texas State University’s LBJ Institute for STEM Education and Research is tackling through research, mentorship and inspiration - creating a supportive environment where professors can feel comfortable with the nuances and identity that comes with being a Latina in STEM.

**The LBJ Institute team has curated a community of professors who serve as mentors for women and underrepresented students pursuing careers in STEM, which is a community effort.**

Dr. Alejandra Sorto, a mathematics professor who examines how math is taught to English-language learners, knows the value of an encouraging support system and mentorship. Those are what prompted her to pursue a doctorate in mathematics education - even though she initially struggled with the language barrier.

“It took someone that believed in me,” Sorto said. “It takes that kind of mentoring. Someone that you trust and cares for you.”

Despite the difficulties of being a Latina in STEM, especially when they doubt their own abilities or are told they do not belong, Sorto encourages her students to move forward.

“Believe me, there are people who look at you in a different way and give opportunities to show your brilliance, your resilience, your strength and someone will notice,” Sorto said.

Dr. Diana Martinez Dolan, an assistant professor in the St. David’s School of Nursing who specializes in nursing faculty retention, said she struggled during her first year of being a researcher at Texas State. Dolan experienced imposter syndrome, thinking she was not good enough to be a professor. She felt alone, but development opportunities specifically for women through the LBJ Institute and her connection with other females helped motivate her.

“They’re just all these preconceptions and just things like that that you go through as an older graduate, as a female, as a minority,” Dolan said.

After connecting with the community at the LBJ Institute, Dolan realized many of her colleagues had similar feelings of being Latina in the STEM workplace. Dolan understands it can be difficult to be a Latina in STEM, but she wants students to know that they are not alone.



**“This is the time to express yourself, to be what you are here and meant to be without being apologetic about it,” Dolan said. “Own your space. Own where your feet are. Own who you are, and follow your bliss.”**



Biology students have the opportunity to use state-of-the-art equipment in well-furnished labs at the university.

# STEM-FOR-ALL PARTNERSHIP

In July 2021, Representative John Carter (TX-31) and Texas State University announced \$1 million in funding for The LBJ Institute for STEM Education and Research team for the Round Rock campus' STEM-for-All Partnership. These funds were secured in the Labor, Health and Human Services Appropriations bill, which passed through committee in July 2021. The STEM engagement and educator professional development opportunities made possible by this funding, will include summer engineering camps, STEM internship programs, monthly STEM nights, professional development sessions, and more. The STEM-for-All Partnership has immediately kicked off to begin with an immersive two-day drone training initiative with six NASA STEM Engagement & Educator Professional Development Collaborative (EPDC) Specialists and approximately ten EPDC staff members September 10-11 at the Texas State University's Round Rock campus. LBJ Institute Director Dr. Leslie Huling states, "The professional development for our EPDC specialists and LBJ Institute staff is part of our commitment to providing a variety of educational services on emerging topics and to equip our staff to successfully deliver these services." FAA107 training is commonly used by pilots and focused on flight safety, navigation, model operations, virtual mapping, and more. EPDC Specialists who receive FAA107 training can obtain their pilot certification to fly commercial industry drones. This will enable specialists to share extensive drone instructions with instructors and students.

NASA EPDC Specialist Dr. Deepika Sangam was interested in the drone training exercises due to their valuable educational experience. She believes drones can be utilized as tools to introduce young students to STEM concepts and careers. Sangam states, "Drones are becoming more pervasive with the advancement of technology. It is beneficial for educators to use drones in classrooms to intrigue students' curiosity and allow them to learn more about the roles drones play in our everyday lives." Each of the drone training exercises focused on realistic operations that could be replicated for instructional purposes. For example, an indoor drone simulation allowed participants to navigate a drone to designated markers on the floor to emulate how NASA deploys drones to gather data from specified locations on Mars.

Senior Advisor and Distinguished Professor Emeritus Dr. John Beck explains how drone technology can benefit students from grade levels k-12. Beck says, "The training exercise provided examples of classroom simulations teachers can use to teach students about drone capabilities. The instructional exercises serve as an introduction and opportunity for students who are 16 years of age or older to obtain a drone certification."

Sangam looks forward to instructors utilizing drones to continue increasing high-level engagement and STEM identity development in education. Furthermore, she believes these STEM concepts should be accessible to teachers and students throughout the United States. Sangam says, "We are actively

addressing the issue of accessibility to ensure that each of our STEM programs are offered to teachers and students across the nation.

**The LBJ Institute for Education and Research's STEM-For-All partnership initiative focused on building educational programs for students, parents, and community members to engage in STEM activities that lead to STEM careers.**

A STEM-For-All "Night at Dell Diamond" event was held on September 12th in conjunction with the "Kids Day/Express Baseball Game" in Round Rock, Texas, with approximately 350 students in attendance. Participants engaged in a Moon survival scenario, prioritized items for a Moon mission, and described how to optimize a packing solution for all the supplies. Grant Specialist and Operations Manager Karen Fabac describes how students and parents received the opportunity to interact with STEM concepts. Fabac says, "Each STEM activity allowed participants to experiment with technological

devices such as UV sensitive beams and Google expedition glasses to view the solar system." These STEM principles are applicable lessons that give children and adults a practical basis of STEM fields.

As a part of the STEM-For-All Partnership, the Texas State University Round Rock Campus has hosted a community seminar series aimed at increasing community engagement with current and relevant health sciences topics. Some of the topics covered in these seminars included What Every Generation Needs to Know About The Aging American Population, A Look Behind the Curtain of Economics of Healthcare, and Viral Rumors and Information Hygiene: Combating COVID-19 Misinformation. It has been shown that investing in STEM contributes to the community's high tech sector workforce in the future. Seminars will continue to be offered as a part of this STEM-For-All Partnership to invest in community knowledge development to build a robust technologically literate society to meet future needs for workforce development of the central Texas region.



## REACHING TEACHERS

### BREAKING DOWN BARRIERS AND CONNECTING PEOPLE

Sitting in the parking lot of the MegaBites Café at Ames Research Center in California's Bay Area, with the NASA logo visible in her rental car's side mirror, Sara Torres needed a moment to take it in. She had to call her dad.

"Can you believe I'm here? I can't believe it."

It was 2017, and Torres was 1,740 miles away from her family in San Marcos, Texas. She had just picked up the badge for her new job as a specialist with the NASA STEM Engagement and Educator Professional Development Collaborative, or EPDC – but this opportunity had been decades in the making.

In fact, Torres's paternal grandfather came to this country from Mexico as a young man looking for opportunity. Her parents, both first-generation Americans, capitalized on opportunities in this country with careers that served their communities – Sara's dad as a

Child Protective Services officer and her mom as a teacher. Sara followed in mom's footsteps. Her own career in education started at an elementary school in San Marcos, where she jumped at the chance to teach science because no one else wanted to do so. However, it was a chance conversation in 2013 with Dr. Araceli Martinez Ortiz – who, at the time, was the executive director of the LBJ Institute for STEM Education and Research at Texas State University – that eventually launched the move to California. Together, the two pledged to collaborate on projects to promote STEM education with elementary students from underrepresented populations.

They started small with a Family Engineering Night.

A few years later, Torres was in the large parking lot at NASA, sitting in disbelief.

# WE SERVE AS BRIDGES

## PROVIDING NASA CONTENT TO LOCAL SCHOOL DISTRICTS.





Students work with Lego sets to build robots.

Torres is one of 10 EPDC specialists at NASA space centers in the U.S. – part of a \$15 million, grant-funded partnership between NASA and the LBJ Institute at Texas State. Collectively, the specialists and Institute carry out a mission of supporting STEM educators and students across the country with learning resources from NASA and culturally responsive STEM pedagogy. The goals are to inspire and motivate under-represented students to pursue STEM careers and opportunities and consider NASA as a potential workplace.

**EPDC utilizes NASA activities and provides robust corresponding math and science lessons for formal educators (K-12 teachers), informal educators (parents, grandparents, Scout leaders, etc.) and students.**

Specialists develop EPDC webinars and digital badge certifications to ensure that the topics and content meet the state educational requirements. Educators can take can then utilize these lessons and resources in a variety of educational settings.

Seven years in, the EPDC has awarded nearly 4,000 digital badges, representing 26,000 clock-hours, of professional development credit. During the switch to remote learning in 2020, the EPDC offered nearly 600 professional development and STEM engagement events. For teachers the EPDC has reached so far, the NASA content and activities are easy to understand and replicate, with all resources in one location.

Lindsay Hamby, an elementary teacher in the San Marcos Consolidated Independent School District, and her students have used NASA content from the EPDC to build Mars rovers with Legos and blocks. Hamby's older students learned about aerodynamics, and

others completed lessons about rockets. Another NASA activity Hamby's students engaged in involved designing a parachute to drop an egg from a distance. The goal of the egg drop activity is to keep the egg from breaking, figuring out the force needed without destruction of the egg. The egg drop lesson utilizes engineering design to simulate factors that engineers take into consideration when planning to land on the moon.

"Even classes where there are behavioral issues in the classroom, you don't see those problems when the students are having fun and engaged," Hamby said.

Dr. Leslie Huling, EPDC project director, says many parents and grandparents use NASA activities to inspire children and instill a love STEM.

"We want children to see STEM as a possible future career option," Huling said. "Parents like that idea, too, because everyone wants their kids to be successful in life."

Dr. Barbie Buckner is an EPDC specialist based at Goddard Space Flight Center in Maryland. She prides herself in leaving incredibly detailed notes in her webinar slides for educators of all kinds, including things she didn't get to in her presentation. One recent webinar focused on an activity involving red Solo cups and

rubber bands to teach about gravity and shock absorption. By 2 p.m. the next day, a teacher had already sent Buckner pictures of her students carrying out the NASA activity in the classroom.

"That's success in any book," Buckner said. "She took my PowerPoint. The videos are already embedded. The talk lines are already there. The activity is there. Everything she needs is there. That was probably one of the great compliments – to think I taught someone on Tuesday and they implemented it with their kids in their classroom on Wednesday. That's what gets me up in the morning."



The EPDC has awarded nearly  
**4,000**  
digital badges to educators.

# EPDC SPECIALISTS SUPPORT EDUCATORS.

Texas State University, based in central Texas, has faculty stationed at NASA centers across the country to inspire students to pursue STEM fields of study, plus opportunities and careers at NASA.

The faculty members are part of the NASA Engagement and Educator Professional Development Collaborative (EPDC) - specialists who support educators in teaching STEM content using NASA learning resources.

Through a partnership between the LBJ Institute for STEM Education and Research and NASA's Office of STEM Engagement, the specialists are located at eight NASA centers from Florida to California. The specialists integrate NASA STEM content with culturally relevant pedagogies to serve diverse student audiences.

Samuel Garcia, an EPDC specialist at the Kennedy Space Center, received his doctorate in school improvement from Texas State. Garcia is tasked with delivering educational professional development, preparing online webinars for educators and student engagement outreach.

His focus is to enhance STEM education to produce quality learning experiences.

"We serve as bridges by providing this content and information of the NASA world to the local school districts – not only locally but across the state and across the region to different states," Garcia said. "This is a great way to leverage this platform and to serve as a role model and connect with the community."

That connection with the community is one of the key missions of the EPDC specialists, explained Sara Torres. Torres is an EPDC specialist at Ames Research Center who received her master's in education leadership. Torres completed a doctorate in education at Texas State.

As an EPDC specialist, Torres works to bring NASA STEM content to the communities she works with and to motivate students to pursue career opportunities STEM offers. Torres said this work with schools in local communities allows her to share information about the free resources NASA offers and reach as many students as possible.

"The commitment comes in investing in the students that are in classrooms today because we're investing in the future," Torres said. "How do we get kids to grow up and become engineers? How do we get kids to grow up and become scientists? We need to inspire them when they are young."

NASA learning resources are available in both English and Spanish. Monica Uribe, an EPDC specialist at Armstrong Flight Research Center and a current Texas State mathematics education doctoral student, helps in the translations. According to Uribe, students get inspired when they see someone who works for NASA speaking Spanish. Uribe recalled going to a school to do a presentation and seeing a group of female students sitting together who were very quiet. It was not until she started speaking Spanish that the students' attention piqued.

"They knew then that somebody appreciates them being there, and somebody's going to help them," Uribe said.



For more information on the NASA EPDC program and NASA learning materials, visit [epdc.org](https://epdc.org).

## A major mission of the EPDC program is to provide STEM education to underrepresented groups, reaching out with resources that respect the culture and family.

EPDC specialists translate NASA lessons into Spanish and promote scaffolding, the process of matching the language level of students, as much as possible. The EPDC developed for NASA a framework of culturally responsive teaching, beginning with a review of NASA curriculum. The EPDC found that many of the NASA lessons were straight-forward instructions on how to build a rocket, but did not provide adequate cultural perspectives. The review prompted revisions of the activity instructions to assist teachers in providing the in-depth knowledge of the subject material to promote student understanding of the STEM concept being presented.

The revised framework can be applied to any STEM curriculum through a culturally relevant lens. With determining if the content has sufficient depth, it then examines components such as vocabulary. For example, students in central and south Texas have limited experience with snow and therefore educators may choose a different activity to illustrate the STEM concept under investigation. The framework also encourages highlighting NASA figures of diverse cultures and backgrounds. The EPDC has, so far, reviewed more than 25 NASA lessons with suggestions and resources.

Dr. Samuel Garcia is one of the specialists most involved in delivering this NASA content to underrepresented populations of students. He hosts the STEM Stars en Español segment on YouTube, which features a Spanish-



speaking NASA subject matter expert talking with high school students. Garcia also translates lessons and creates Quick Bits en Español – handy instructions for teachers and informal educators who speak Spanish.

Part of Garcia's job – and the job of all EPDC specialists – is to connect with the local community. He is stationed at Kennedy Space Center in Florida, and he always wants to remind young people that NASA is right in their own backyard.

"We serve as bridges by providing this content from the NASA world to the local school districts," Garcia said. "Essentially, what we're doing is putting a face to NASA."

**Part of the reason NASA chose the LBJ Institute to lead the EPDC is because of Texas State University's status as a Hispanic-Serving Institution, which means at least 25% of its undergraduate enrollment is Hispanic.**

NASA sees HSIs and other minority-serving institutions – or MSIs – as a way to spur a more diverse workforce for the future. As part of the initial grant from NASA, the LBJ Institute awarded sub-grants to faculty members at five additional MSIs. That number quickly grew to more than 10, including Lehman College, Alabama A&M University, Norfolk State University, Coppin State University and Salish Kootenai College. The EPDC also created grants to fund week-long camps for pre-service teachers at MSIs around the country. More than 115 institutions took part.

"Through the grant, I was able to get all tenure-track faculty and three cohorts of pre-service teachers down to NASA to get trained," said Dr. Christian Anderson, a professor at Morgan State University.

A few years later, Anderson said most of his pre-service cohorts who took part in the training are now STEM activists in the classroom.

**EPDC has also created the Emerging Stars Network of faculty from MSIs to provide an opportunity for those educators to share their expertise in STEM and diversity education.**

They've also done research and surveys with these faculty to see how they integrated what they learned into their teaching and research.

For Torres, joining the EPDC and making the move to California is proof of the power of opportunity. She knows how a random moment or conversation can lead to something big.

"It's about breaking those barriers, connecting people and then seeing what happens," Torres said. "I've worked hard to make sure I'm reaching underrepresented populations and making those connections in people because I know where it can lead. I know where it can lead. One conversation leads to another, and they bring their gifts and resources. All of a sudden, you're looking at this great opportunity for people."



# QUICK-BITS VIDEOS AND STEM IN ACTION

The LBJ Institute for STEM Education and Research at Texas State University and its NASA STEM Engagement and Educator Professional Development Collaborative have created several new resources to assist school districts, educators and families to guide learning in and out of the classroom.

EPDC developed Quick-Bits videos to demonstrate specialists working through NASA activities. Susan Kohler, a NASA EPDC specialist with the Glenn Research Center, said the goal is to have parents, caregivers and educators see the activities being completed so viewers can do so themselves at home.

“Every time you expose a student, whether they’re an

adult or child, to a new idea, you don’t want to just talk about that idea,” Kohler said. “You want to have them have an experience with the idea.”

Online learning has led to many parents and caregivers guiding learning at home, but they likely do not have traditional training with how to teach STEM materials, explained Michelle Berry, a specialist with EPDC. One of the new resources is a set of STEM Teaching Tips to serve as a road map for this type of learning.

“So many times parents would come see me at conference time, and the first thing they would say is, ‘Oh my goodness, I could never do what you do.’” Berry said. “That’s a really common

phrase among parents that did not go into the education field. It’s our job to make sure that we provide that comfort and kind of encouragement to parents and caregivers that are in this role.”

The Teaching Tips guide is also available in Spanish, which makes it easier for many families and students to complete the NASA STEM activities. Samuel Garcia, an EPDC specialist at the Kennedy Space Center, said the Teaching Tips in Spanish is to ensure everyone has access to quality STEM content.

“A lot of our students are Spanish speaking,” Garcia said. “Spanish is their first language at home, so we try to emphasize and create bilingual content. The mission is that we want to try to reach the communities.”

Another resource, STEM in Action, allows parents and caregivers to submit videos or pictures of their children completing STEM activities being done in the home. Five submissions will be selected and highlighted online each month through the EPDC.



Parents and caregivers can use these new, online initiatives with NASA content free of charge. Examples of STEM activities that can be completed at home can be found at [txstate-epdc.net](http://txstate-epdc.net)

## REACHING STUDENTS

EARLY POSITIVE STEM EXPERIENCES  
INSPIRE STUDENTS AND BUILD  
THEIR CONFIDENCE.

To celebrate both Black History and Women's History months, Lindsay Hamby – a teacher at Travis Elementary School in San Marcos, Texas – took several days at the end of February and beginning of March 2020 for a unit on Hidden Figures, the book and movie about the key role African-American women at NASA played in the race to space during the early 1960s.

One of the lessons prompted Zarah, an African-American 5th grader, to ask her teacher about the possibility of one day working at NASA. Zarah previously faced challenges with reading, in particular, but felt empowered after seeing herself in the Hidden Figures story.

"I think she had been told before what she can't do, and that was a time where she

realized what she can do," Hamby said. Hamby is just one of thousands of K-12 teachers across the country who regularly uses official NASA content in the classroom for lessons related to STEM – science, technology, engineering and math. This programming is gleaned from the NASA STEM Engagement and Educator Professional Development Collaborative, or EPDC – an initiative managed through a partnership between NASA and Texas State University's LBJ Institute for STEM Education and Research. Reaching the underrepresented populations in STEM – women, LatinX, African-American and Native American communities – is both a key research effort of the Institute and interest of NASA. It allows teachers to inspire students like Zarah as early as possible, before stereotypes and pressures from the outside deflate their internal interest in STEM fields.

WE'RE OPENING  
THE DOOR  
FOR THEM.

THIS PERTAINS  
TO YOU BECAUSE  
YOU CAN BE  
A PART OF THIS.



Students engaged with little-Bits during an engineering camp in which they were designing a self-driving rover.

The COVID-19 pandemic created unique hurdles in reaching this goal, but the situation spawned new ideas and opportunities. The Institute created Summer Camp in a Box for students to receive STEM programming at home.

LaTina Taylor, a Chicago public school teacher and STEM technology specialist, was brought on as a summer EPDC specialist and recruited 150 families in Chicago, many of them African-American and Hispanic, to take part in the Summer Camp in a Box program. Pre-service teachers at Texas State created the contents of the boxes, based on NASA resources and lessons. Students in 3rd and 4th grades focused on earth science. Fifth graders received content around space science and aeronautics. For 6th graders, the camp in a box taught block coding. Finally, 7th graders learned about astrobiology, and 8th graders studied physics and rocketry.

“I wish there were programs like this available to me when I was growing up,” Taylor said. “I grew up in a very poor neighborhood. I’m in the same shoes and same boat as the students I serve. I’m able to expose them and their families to the possibilities that there are careers out there they may want to consider.”

The Institute also used the summer of 2020 to develop a virtual high school internship for underserved students interested in STEM careers. The team recruited 13 interns from Texas, Chicago, Florida and California to take part. The students were mentored by Araceli Martinez Ortiz, the Institute’s former executive director; Kelly Stephenson, a graduate research assistant with the Institute; and Javier Ortiz, a recent industrial engineering graduate from Texas State. The interns worked on a project during the entire summer and learned skills related to robotics and coding, to name a few. Stephenson also

shared professional advice like how to write a business email, how to handle an interview and how to be a good college student. While the students showed interest in STEM before being accepted into the internship, they weren’t aware of all the career options available.

“This helped them explore deeper into that,” Stephenson said. “They didn’t know what aspect of engineering they may want. We helped guide them in that direction.”

Not to be outdone, EPDC specialists stationed at the different NASA space centers are constantly working to connect with students from diverse backgrounds.

Dr. Vermitra White, an EPDC specialist stationed at Marshall and Stennis space centers in Alabama, was recently hired to promote the EPDC’s digital badging system to professors and pre-service teachers in that state’s 14 historically black colleges and universities. White, who is African-American, was raised in a single-parent home in rural Mississippi and uses her upbringing as an example of what’s possible.

“When those populations of students see someone who looks like them, they have a sense of belonging,” White said. “To be able to share my story with a lot of students, I was able to show them that NASA hires beyond the typical STEM background.”

As part of her role, White also connects with teachers, students and families from school districts in rural Alabama and Mississippi, which have a NASA space center right in their backyard. She helps develop webinars for teacher professional development and to also help informal educators – parents, grandparents, guardians, etc. – teach NASA-related content at home to students from all backgrounds. White understands the challenges informal educators from



historically underserved communities face when helping their students with STEM-related lessons in the home.

“I always put myself in their shoes,” White said. “I really try to sell them on being there with them and holding their hand as they go through each step. You want people to feel comfortable. You don’t want them to feel like they’re going through it alone.”

This challenge is also faced in Hispanic homes across the country. That’s why EPDC specialists in California and Florida have created bilingual resources for educators and students. EPDC webinars are now produced in Spanish to promote professional development for bilingual teachers. Specialists also created Quick Bits en Español, which are 10-minute, guided lessons that parents or guardians can do with their students at home. Topics center around NASA programs like Moon to Mars and Giant Leaps. Torres and Monica Uribe, who are both stationed at Ames Research Center and Armstrong Space Center in California, work with teacher education groups to reach the different populations across the state. The two spend about a quarter of their

time focusing on schools near the centers, which are in the heart of Silicon Valley. Despite being located near the birthplaces of Apple, Google and Facebook, Torres said there is a number of schools that have very limited technological resources. She and Uribe have a checklist of what they’re looking for when approaching schools for collaborations – primarily targeting Title I schools who serve a diverse population.

“Of course you’re going to have your privileged kids whose families are so involved and take them to the NASA centers,” Torres said. “Those kids are great to work with, as well. But we’re broadening that spectrum. We’re casting that net wide. We’re making sure we connect with the kids who normally wouldn’t get that type of presentation.”

Teachers appreciate both the resources and being trained on how to implement them immediately in the classroom. That’s when NASA-related content has an impact on the students.

“We are serving the underrepresented populations,” Uribe said. “The Hispanic population is growing. When we work in Houston, Florida or California, they are the majority we work with. The percentage is huge.”

At Scott Lane Elementary in Santa Clara California, 80% of its 400 K-5 students qualify for free or reduced lunch. Nearly 85% speak English as a second language. That’s why the connection with the NASA EPDC is so important for teachers like Adelina Contreras. Torres has visited her class multiple times since 2019, presenting lessons and projects in both English and Spanish. Contreras said there’s an immediate connection when students see themselves being represented in a STEM professional.

“You’re opening the door for them,” Contreras said. “You’re bringing the reality that this is possible. It’s trying to get the hook in there for the students. This is not something that’s over there and doesn’t pertain to you. You can be part of this.”

Another community not typically associated with STEM-related fields is the Native American population. The EPDC is trying to change that, as well. Specialists work with professors at tribal colleges to introduce NASA-related content and teaching strategies. They’ve also attended conferences to speak with Native American teachers.

“With Native Americans, there are a lot of layers to reaching the population,” said Dr. Deepika Sangam, an EPDC specialist based in Texas. “They’re so embedded in culture, so culturally relevant pedagogy, to them, is so much more meaningful. It’s able to leverage their learning and their understanding of nature. Ultimately, with STEM, we hope to understand the natural world better and improve it.”

This idea of incorporating culture into the curriculum is a key component of everything the institute does. The LBJ team are major proponents of culturally responsive teaching, which is all about making the content relevant to students and their personal experiences. The EPDC offers digital badges for educators and informal educators but focused on culturally responsive teaching.

“Culturally responsive teaching is our value-added approach, and we really believe in its power,” Sangam said. “We’re hoping that at the end, teachers are able to see why it is important and how easily it can be done in the classroom.”

Because culturally relevant content and curriculum means students see themselves reflected in what’s being taught, it requires a mindset change for some teachers. Some of the more accessible examples of culturally responsive teaching includes displaying posters around the room of people who look like them, featuring women when discussing innovations in science or technology and learning about astronauts of color. Language and examples used in the lessons also play a key role.



# CULTURALLY RESPONSIVE TEACHING

When it comes to inspiring diverse student audiences to pursue careers in STEM, there is no one-size-fits-all solution. That’s why The LBJ Institute for STEM Education and Research at Texas State University and its NASA Engagement and Educator Professional Development Collaborative provide NASA resources with culturally responsive pedagogy to educators across the country.

The goal of an initiative like this is to make teaching and learning relative and responsive to the students’ cultural practices within the context of current events. EPDC specialists create lessons and activities and host events that take into account the backgrounds of the participants. Historically underrepresented communities in STEM – African-Americans, LatinX, Native Americans and women – have experienced institutional and racial roadblocks that have caused fewer of them to have an interest in STEM.

Bringing in the culture, involving others and valuing what people experience is what the LBJ Institute’s programs incorporate – so students can better understand STEM concepts.



Dr. Samuel Garcia, an EPDC specialist at the Kennedy Space Center, said teachers cannot teach all students the same in our multicultural society. Different students have different experiences, so the way students are taught should reflect that.

“We want to try to reach the communities, the spaces, the districts, the teachers, the students who have not historically had access to rich learning experiences and connections to STEM,” Garcia said. “The heart and soul of the EPDC is that we serve those communities and those individuals that have been left out for so long.”

The LBJ Institute aims to inspire students who have historically been underserved with STEM

education that anyone can go into a STEM career. Dr. Vemitra White, an EPDC specialist at the Marshall Space Flight Center, said was not made aware of the resources and opportunities that existed while she was growing up in Mississippi.

“It was never my dream to work at NASA - I just didn’t know that I could,” White said. “I didn’t know that there were so many opportunities at these different facilities, but that’s because of the lack of resources in my community.”

White now uses culturally relevant strategies when presenting STEM content and activities to students so they can gain interest in STEM careers.

The Institute also develops programming for educators and students who are under represented in STEM-related fields.

“If you go back to 1970, there was 0% females in engineering,” said Dr. Michelle Londa, an associate professor of practice in the Ingram School of Engineering at Texas State and LBJ Institute research fellow. “We have increased that nationwide to 18%, but there is still a huge chasm to cross. Why at that eighth grade level are females turned off by science and engineering?”

The Institute anticipates opportunities for women and, especially, young girls will help spur progress that is evident but slow.

That’s the question Londa hopes to solve through the Pre-Engineering Academic and Career Exploration Community for Girls in Engineering, Math and Science, or PEACE GEMS camp.

The week-long, overnight summer camp was created solely for high school girls, particularly girls of color, who have shown an interest in STEM. The Ingram School of Engineering funded the first camp in 2019, which saw 16 girls take part. They were primarily recruited from San Marcos and the surrounding cities. The girls experienced sessions in virtual reality, solar energy and bridge construction, to name a few, and they took field trips to Austin Energy and NXP to learn about jobs in semiconductor energy. Londa said the girls loved seeing first-hand what engineers are doing in the field.

“Many females just feel like they don’t belong in that world,” Londa said. “I remember

being an eighth grade student. I was the only female taking mechanical drawing. You get kind of isolated, so we do need more programs to show more females this is something you can do. It’s a profession that allows you to make the world a better place.”

Fifteen of the original cohort planned to return for the 2020 version of the PEACE GEMS camp, along with a new cohort of girls, but it had to be canceled because of COVID-19. Londa is pleased that the camp will return in 2022.

The Institute has also held writing retreats specifically for female professors of color.

These retreats provide opportunities for mentorship and networking. Fifteen professors took part in the latest retreat, which was free of charge and free of distractions. There were no phones allowed over the weekend getaway – just discussions, lessons, guest speakers and plenty of time to work on research.

“We all are dealing with our own insecurities and own struggles of trying to be taken seriously and trying to get funding,” said Dr. Diana Dolan, an assistant professor in the St. David’s School of Nursing at Texas State. “People don’t understand that it’s not a level playing field. It just isn’t. We’re just talking basic equity and we need to be recognized as partners who contribute unique strengths and perspectives.”



PEACE  
GEMS  
CAMP

PEACE  
GEMS  
CAMP

PEACE  
GEMS  
CAMP

PEACE  
GEMS  
CAMP

PEACE  
GEMS  
CAMP

PEACE  
GEMS  
CAMP

Dolan said one of her biggest takeaways from the retreat was to keep looking at her own North Star for guidance. She learned to find people who understand you're different – and celebrate it.

The Institute has also supported research from female faculty members targeting young women and maker space areas. Dr. Shaunna Smith, now a faculty member at the University of Hawaii and a former research fellow at the LBJ Institute, received a National Science Foundation grant to create the Bobcat Made Maker Space, a free-of-charge

“While I want to empower girls to think about how crafting extends beyond fashion and other items associated with girls – but I also want to know how we can empower boys to smash that stereotype, as well,” Smith said. “How can we strip away all the gender stereotypes and get down to the root of what it means to be a human who wants to create things, no matter the medium or outcome?”

Smith's research taught boys and young men how to stitch and sew, among other things, and allowed girls and young women to show off how to use power tools.



area in the Institute for students to interact and engage with technology and science. The Maker Space was run by volunteer students at Texas State, and thousands of other students have taken advantage of the opportunity to explore technology like VR and 3D printing. It also provided a home for Smith's research on gender stereotypes and maker spaces. When conducting workshops, Smith intentionally picked activities that broke the gender stereotypes that boys “tinker” and girls “craft.”

When students like Zarah, the San Marcos 5th grader inspired by Hidden Figures, are exposed to STEM-related fields, gain an interest and continue on that path, it is life-altering – not just for the student but for their families, as well.

For more information on the LBJ Institute and its offerings, visit [lbj-stem.education.txstate.edu](http://lbj-stem.education.txstate.edu).





[lbj-stem.education.txstate.edu](http://lbj-stem.education.txstate.edu)

MEMBER THE TEXAS STATE UNIVERSITY SYSTEM