UTSA. PREFRESHMAN ENGINEERING PROGRAM

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WHY WE TEACH

STUDENTS BRING RICH AND UNIQUE EXPERIENCES FROM HOME - STEM PROGRAMS CAN SUPPORT MANY CAREER DREAMS My family, who emigrated from Mexico City, firmly believed in education as a path to a better future for us kids. We loved the public library and were astounded that we could be loaned as many books as we wanted. We quickly learned to speak English even though Mami made us speak and write in Spanish at home so that we would never forget.

Our early experiences at home were fun and motivating. We learned to dance and sing songs from Mexico, we played games and learned our family history just by talking. Those early, motivating experiences were an important foundation. We followed the STEM pathway, exploring science and math clubs, pre-engineering Saturday and summer programs, and eventually engineering careers!

So, from first-hand experience, and now as a professor of engineering, I recognize how important it can be to expose young people to new ideas in a supportive setting. A significant opportunity exists to guide young students from our community to develop broader academic skills and to help them to discover careers in engineering. Often, young people do not see themselves pursuing certain careers because they are not directly exposed to such professions. Therefore, we must create opportunities for them to recognize the potentially rich and interesting ideas they can explore in a variety of science, technology, engineering, and mathematics (STEM) professional settings and the many ways these careers can help them, their families, and our diverse communities. This is one of the purposes of the Prefreshman Engineering Program (PREP).

Araceli Martinez Ortiz, Ph.D. UTSA PREP Program Director A SIGNIFICANT **OPPORTUNITY EXISTS** TO GUIDE YOUNG **STUDENTS FROM OUR COMMUNITY TO DEVELOP BROADER** ACADEMIC SKILLS AND TO HELP THEM TO DISCOVER CAREERS IN ENGINEERING.

OUR IMPACT





PREP changed my mind. It changed the way I thought. It changed the way that I looked at the world. It also made me more confident knowing I'm not the only one who wants to succeed.

Source: future.utsa.edu/freshman/prep/



OUR STRONG FOUNDATION



Source: mdpi.com/2227-7390/9/11/1240

OUR SINCERE GRATITUDE TO DR. MANNY AND MRS. MÁRIA BERRIOZÁBAL FOR **THEIR SHARED INSIGHT AND WISDOM AS WE GUIDE THE PREP PROGRAM SO THAT IT** MAY CONTINUE MOTIVATING AND PREPARING THE YOUNG **PEOPLE IN THE SAN ANTONIO COMMUNITY.**

For over 40 years, the UTSA Pre-freshman Engineering Program (PREP) has empowered young students to believe in themselves by experiencing interesting and challenging STEM content. PREP, founded by UTSA Professor Emeritus, Dr. Manuel Berriozábal, a life-long champion of mathematics education and student success, has demonstrated powerful impact on the academic and professional direction of thousands of participants. PREP is designed to offer culturally relevant, researchbased instruction in mathematics, physical science, engineering design, and problem solving. Our goal is reach a broad range of young learners, particularly those from historically underrepresented backgrounds or low-income households.

While the hallmark of PREP continues to consist of highlyengaging summer classes for 6th-12th grade students, we are expanding our efforts to establish professional development opportunities for locally based K-12 teachers and providing STEM engagement activities for younger students. With consistent support and motivation at home, generous donors (Drs. Mathur and Kamat; and others) and initiatives like PREP, we can support the ideals of social mobility and equity, creating a professional workforce that closely aligns with the diversity of the entire community.

Our 2022 PREP student population (grades 6-11, ages 11-17) consisted of students who identified as:

HISPANIC

20% ASIAN **AFRICAN AMERICAN/** BLACK

WHITE **MULTI-ETHNIC**

MALE-TO-FEMALE **STUDENT RATIO**

LEADERSHIP **FOR THE FUTURE**

2022: NEW PREP LEADERSHIP TEAM

ARACELI MARTINEZ ORTIZ, PH.D. PREP DIRECTOR



Dr. Araceli Martinez Ortiz is a leading voice in engineering education. Born in Mexico City and raised in Detroit, she

excelled at math and science, and participated in multiple summers of the Detroit Area Pre-College Engineering Program (DAPCEP), a program similar in approach to PREP. Dr. Ortiz became a first-generation college student at the University of Michigan's College of Engineering where she received a Bachelors degree in industrial engineering. She earned her Ph.D. in engineering education at Tufts University in Massachusetts. Dr. Ortiz spent 15 years in industry as an engineer and engineering manager followed by a teaching and administrative career in K-12 STEM education. She has been a university professor for more than ten years and is now the UTSA Microsoft President's Endowed Professor of Engineering Education and the Director of PREP.



Dr. Ydania Medina-Pezzat is an educator with years of experience serving as a mentor, professor. administrator, and conference speaker. With a passion for equity, she has successfully launched new educational programs and community partnerships that provide access to learning opportunities to all students, especially those from underserved areas of San Antonio. Dr. Medina-Pezzat earned a bachelor's degree in clinical laboratory science and a master's degree in educational administration from the University of Texas Pan American. She also holds a doctorate degree in Health Sciences with an emphasis in Leadership and Organizational Behavior from A.T. Still University

MIA DE LEON, SENIOR EVENTS COORDINATOR

Mia de Leon is originally from Corpus Christi, Texas. She completed her undergraduate degree from Texas State University in December 2015 where she majored in Public Administration with a minor in Diversity studies. Here, she became committed to serving the community. After a career in the San Antonio event world, Mia achieved her goal of working for a university. While she is new to the PREP team, she has worked for UTSA for five years.

The PREP leadership team proudly contributes to the program's continuing success by remaining engaged with key community partners, updating curriculum, and designing innovative learning experiences.

YDANIA MEDINA-PEZZAT, DHSc. PREP ASSISTANT DIRECTOR

GABRIELA GOMEZ, ED.D. CURRICULUM AND PROFESSIONAL **DEVELOPMENT MANAGER**



Dr. Gabriela Gomez is a San Antonio native with a bachelor's degree in biology and secondary

education, an M.Ed. in C&I with a focus in integrated science, and an Ed.D. in higher education administration. After 13 years as a high school science teacher and holding various teacher leadership positions, she transitioned into higher education. Dr. Gomez began teaching C&I courses at UTSA, followed by her current position in PREP. As a former PREP student, she is arateful for the opportunity to contribute her expertise and continue to give students the opportunity she was once offered.

WHO WE TEACH

THE PREP 2022 SUMMER PROGRAM EXCEEDED ITS GOALS

In summer 2022, PREP brought high level learning experiences to more than 300 6th-11th grade students from school districts across Bexar County. Students participated in STEM educational programming at UTSA Main Campus, UTSA Downtown Campus and St. Mary's University. Working with cohorts of students in various levels of PREP courses, students engineered safety vest prototypes, discussed fundamental ideas in physics, participated in a student-led research symposium, and gained an understanding of nanotechnology. They also participated in a speaker series where they learned from professionals in industry and academia.

STUDENTS

COMPLETED THE 5-WEEK

PROGRAM AT 3 CAMPUSES



COLLEGE STUDENTS WORKED AS PREP PROGRAM ASSISTANTS/PEER MENTORS

TEACHERS & PROFESSORS SERVED AS PREP INSTRUCTORS

TEA APPROVED PREP COURSES WERE ENHANCED AND OFFERED TO STUDENTS

SCHOOL DISTRICTS WERE REPRESENTED ALONG WITH PRIVATE/CHARTER SCHOOLS

WHAT WE TEACH

THE CURRICULUM

PREP is comprised of four separate courses, each of which includes a different disciplinary emphasis and leverages the resources available to create an environment where students can discover, design, achieve, and learn. Each innovative course is designed to promote the application of mathematical concepts in STEM fields.

LEVEL 1: ENGINEERING DESIGN, LOGIC & ALGEBRAIC REASONING

Level 1 provides students an opportunity to apply the engineering design process to develop an original solution to an open-ended technical problem. Students develop problem-solving abilities, STEM mindsets, STEM career awareness, and connect the problem to their lives and communities.

LEVEL 3: PROBABILITY & STATISTICS AND TECHNICAL WRITING

Level 3 focuses on probability and statistics, STEM technical writing, topics in problem solving, and college and career awareness components. Students develop knowledge and skills on topics including basic probability theory, analytical statics, proper usage of technical language, and reporting results.

LEVEL 2: ENGINEERING PHYSICS & INTEGRATED ALGEBRA

Level 2 students explore physics, mathematics, and engineering practices by considering real world challenges. This engineering physics and integrated algebra course integrates core concepts such as electrostatics, energy, and motion to allow students to apply academic content with evidence to generate and internalize scientific principles.

LEVEL 4: INNOVATIONS IN ENGINEERING

Level 4 includes some of the latest trends and topics being addressed within engineering science. The course focuses on materials science and nanotechnology, leveraging available resources at UTSA. This course places a special emphasis in the application of STEM content to research by visiting different engineering research labs on campus.

HOW WE TEACH

INCLUSIVE, INQUIRY-BASED AND INTEGRATED-CONTENT LEARNING

PREP brings together the expertise of UTSA faculty and staff as well as that of a select and talented group of teachers from the San Antonio area. Together, our instructional group aims to offer the most comprehensive, engaging, and inclusive instruction possible. Our instructional approach is to value the experiences and voices of all of our students, while guiding them to develop a deeper sense of appreciation for their skills and confidence in their future career pursuits.

PREP courses focus on increasing the students' ability to apply mathematical and scientific concepts, while collaborating with a team to develop and build solutions to problems. The integrated curriculum is designed to increase problem-solving abilities, foster STEM mindsets, STEM career awareness, and to connect the problem in a culturally relevant way to students' lives and community concerns. Students also develop oral and written communication skills emphasized in STEM fields.

INQUIRY-BASED LEARNING IS A STUDENT CENTERED **APPROACH THAT** TAPS IN TO A YOUNG PERSON'S NATURAL CURIOSITY TO DRIVE THEIR INVESTIGATION INTO REAL WORLD PROBLEMS.



PARTNERS IN EQUITY.

THE SCHOOLS

Many school districts in the San Antonio area are committed to delivering instructional and support services in novel ways to improve student educational outcomes in a manner that broadens participation. PREP partners with local school districts to provide enriching summer programs to students throughout San Antonio and the surrounding area to prepare them for future STEM careers. Collaboration allows PREP to continue its mission of creating equitable access and participation of underrepresented and/or low income students in STEM while ensuring that school districts connect their students to valuable educational opportunities.

OF STUDENTS REGISTERED IN PREP SUMMER 2022 BY SCHOOL DISTRICT

Alamo Heights	3
Boerne	10
Comal	5
East Central	1
Edgewood	2
Floresville	2
Fort Sam Houston	3
Harlandale	6
Huntsville	1
Judson	2
Medina Valley	1
Natalia	14
North East	33
Northside	74
Randolph	1
San Antonio	78
Schertz-Cibolo	2
Somerset	21
South San	1
Southside	2
Southwest	6
Charter/Private	80
TOTAL	348

ESTIMATED # OF STUDENTS REGISTERED IN PREP SUMMER 2023 BY SCHOOL DISTRICT

Alamo Heights	
Boerne	9
Comal	4
East Central	3
Edgewood	2
Fort Sam Houston	9
Harlandale	8
Huntsville	1
Ingram	1
Judson	13
Medina Valley	1
Natalia	10
North East	32
Northside	84
Randolph	2
San Antonio	90
Somerset	55
South San	7
Southside	14
Southwest	4
Charter/Private	

TOTAL

454



DUR IMPA



THREE DAYS

ACCEPTED STUDENTS ON CAMPUS FOUR DAYS

OUR IMPACT



COMMUNITY AND WORKFORCE

INDUSTRY AND COMMUNITY

TEACHERS AND

PEER MENTORS

In 2022, students had the incredible opportunity to hear from professionals currently working with NASA. Students learned about NASA missions, career pathways in STEM, and about the NASA research initiatives led by UTSA researchers such as the Center for Advanced Measurements in Extreme Environments. They were also fascinated to learn about the exciting work that goes on at the NASA Johnson Space Center and the Artemis mission. Students also had the opportunity to interact with professionals currently working at Microsoft. Students learned about Microsoft's data centers here in San Antonio and how they play an integral role for businesses and organizations throughout Texas.

With future careers in mind, students in 2022 engaged in a "Big Dream" exercise and gained personal insights regarding choice of career, preparation, and key recommendations towards defining a successful professional pathway.

Eighteen teachers from across the San Antonio area served as our expert instructional staff in the summer 2022 PREP experience. Each teacher contributed their expertise in various content areas such as science, mathematics, engineering, and English. In preparation, teachers received professional development in inquiry-based teaching and culturally relevant pedagogical strategies necessary to teach their assigned course effectively.

Sixteen Peer Mentors/Program Assistants who were either STEM or STEM education university students played an integral role in the PREP student experience. Many PREP students go on to work as Peer Mentors after they start college and report that they enjoy giving back in this way. Near-peer mentors (mentors near the age of the participating high school students) have been shown to have the potential for positively influencing and motivating STEM students in both their perceptions of ability to excel in STEM content and to pursue a STEM career.

Science, Technology, Engineering, and Community Cultural and Art field trips are an important aspect of the PREP program. Older students (Level 3-5) will have opportunities to participate in at least one field trip. While younger student (Levels 1-2) will have opportunities to participate in local experiences with their families, by receiving at least 1 family pass to a museum in San Antonio.



COMMUNITY CULTURAL

INDUSTRY AND

FIELD TRIPS





PREP'S LONGEVITY IN THE SAN ANTONIO COMMUNITY ILLUSTRATES WHAT IS POSSIBLE WHEN SCIENTISTS, MATHEMATICIANS, EDUCATORS AND COMMUNITY LEADERS WORK HAND-IN-HAND TO MAKE A DIFFERENCE IN THE LIVES OF CHILDREN.

UTSA'S COMMITMENT TO PREP

OUR PLANS TO ENSURE QUALITY AND SUSTAINABILITY:

- UPDATES TO CURRICULUM WITH TEA ACCREDITATION
- INCREASE INNOVATIVE COURSES
- PROFESSIONAL
 DEVELOPMENT IN STEM FOR
 TEACHERS
- PARTNERSHIPS WITH RESEARCH CENTERS FOR INTERNSHIP OPPORTUNITIES
- BUSINESS AND COMMUNITY ADVISORY BOARD DEVELOPMENT
- MORE STEM SCHOLARSHIP
 OPPORTUNITIES
- CONTINUOUS IMPROVEMENT OF OPERATING PROCESSES
- IMPROVED DATA COLLECTION FOR RESEARCH & EVALUATION
- DEVELOP A LONG-TERM SUSTAINABILITY PLAN FOR PREP WITH MAJOR FINANCIAL GIFTS AND GRANT SUPPORT.



"Dr. Martinez Ortiz is an established leader in her work to extend STEM education access to underserved and underrepresented communities," Espy said. "She has been instrumental in the development of the bold new vision for the UTSA Prefreshman Engineering Program, and we are thrilled that she will take the reins to see that exciting vision realized. Building on the strong PREP foundation that has served as a national model for more than 40 years, Dr. Martinez Ortiz will lead the way for PREP to expand the pathways encouraging and preparing young students to succeed in future STEM careers."

"UTSA has a long history of community programming that impacts San Antonio and the local area," said JoAnn Browning, dean of the Klesse College of Engineering and Integrated Design. "For over four decades, PREP has been an integral part of our community engagement, seeing our faculty introduce K-12 students to key engineering concepts and inspire those students to pursue a career in the field."

College of Education and Human Development Dean Mario Torres added that the partnership between the two colleges has been an integral to the program's success.

"PREP's longevity in the San Antonio community is not only symbolic of its transformative impact but illustrates what is possible when scientists, mathematicians, educators, and community leaders work hand-in-hand to make a difference in the lives of children," Torres said.

Source: utsa.edu/today/2022/04/story/araceli-martinez-ortiz-PREP-director.html

UTSA. Klesse College of Engineering and Integrated Design

In April, 2022, UTSA Provost and Senior Vice President for Academic Affairs **Kimberly Andrews Espy** announced the appointment of Araceli Martinez Ortiz as director of the Prefreshman Engineering Program (PREP). Ortiz is the Microsoft President's Endowed Professor and a professor of engineering education in the Department of Biomedical and Chemical Engineering.

> UTSA. College of Education and Human Development

STRENGTHENING RELATIONSHIPS

PREP ADVISORY BOARD



PREFRESHMAN ENGINEERING PROGRAM (PREP) AT UTSA

The PREP advisory board is comprised of professionals who believe in the PREP mission and support strategic initiatives by sharing their experience, skills and network support. Members contribute their time and talent to lead special projects, raise program funds, and to provide much-needed guidance. PREP Advisory Board members are an extension of PREP in their own spaces. They play an integral role in strengthening our relationships with leaders who will champion the cause to the larger organization and community. They also encourage more families and their students to consider participating in our transformative PREP programming.

ENRIQUE BONUGLI, BSIE, MSBME

TECHNICAL DIRECTOR BIODYNAMIC RESEARCH CORP

ANGELICA COLLAZO, CISSP, GSLC

AIRFORCE CYBERSECURITY EXPERT & SENIOR LECTURER THE UNIVERSITY OF TEXAS AT SAN ANTONIO

CORY CORTESE

CLINICAL MANAGER, MCS SOUTH CENTRAL REGION, ABBOTT LABS

ERNEST GOMEZ

ASSISTANT DIRECTOR HR SOUTHWEST RESEARCH INSTITUTE

STEPHANIE SUAREZ VICE PRESIDENT INTEGRITY ROOFING AND SIDING

BRANDON MIDDLETON-PRATT

SENIOR ASSOCIATE WILSON SONSINI GOODRICH & ROSATI

TO BE NAMED

COMMUNITY LEADER SAN ANTONIO

EARLY CAREER AWARENESS

FROM PREP TO STEM WORKFORCE



Elementary grade students in the San Antonio area now have the opportunity to engage with the PREP organization by participating in STEM Saturday workshops or UTSA College of Education and Integrated Design "PREP First Fridays". These activities take place in neighborhoods schools or at our UTSA campuses. Students have fun gaining early, and motivating career awareness and are ready to apply to our summer programs the following Fall.

In addition, PREP outreach staff participate in local STEM education events, special school visits and community events that allow us to reach more families across San Antonio and in communities ready to support their students in STEM college and career readiness. Early every Fall, we begin recruiting students, so that by February we have hundreds of applications submitted and in June, students can begin their wonderful summer PREP experience.

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6.7.23 & 6.1
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6.14.23-7.1

14.22	Т	PREP 2023 APPLICATIONS OPEN FOR STUDENTS, TEACHERS, PAS
14.23	+	STUDENT AND TEACHER PREP APPLICATION DUE
14.23	+	STUDENT SELECTIONS MADE
14.23	+	STUDENT ACCEPTANCE NOTIFICATION SENT
14.23	+	STUDENT REGISTRATIONS AND PAYMENT DUE
12.23	+	STAFF ONBOARDING AND PD
14.23		PREP 2023 PROGRAM

UTSA KLESSE COLLEGE OF ENGINEERING AND INTEGRATED DESIGN (KCEID) COMPETITIVE SCHOLARSHIPS FOR PREP ALUMNI

\$2,000
 Complete at least 2 PREP courses with honors.
 Apply and gain acceptance to UTSA's KCEID.
 Apply with transcript and essay for chance of being selected.
 \$55,000
 Complete at least 3 PREP courses with honors.
 Apply and gain acceptance to UTSA's KCEID.
 Apply with transcript and essay for chance of being selected.
 \$7,5000
 Complete at least 4 PREP courses with honors.
 Apply and gain acceptance to UTSA's KCEID.
 Apply with transcript and essay for chance of being selected.



