



The STEM Undergraduate Research Experience (SURE) program is funded by a Title III HSI STEM grant awarded to University College, Texas State University. US Department of Education Grant Program (84.031c), Award #PO31C160036

Resources used in developing the SURE Program

Successful STEM Mentoring Initiatives for Underrepresented Students: A Research-Based Guide for Faculty and Administrators (2016). Becky Wai-Ling Packard

National Academies of Sciences Engineering and Medicine (2009). On Being a Scientist: a Guide to Responsible Conduct in Research. Washington, D.C.: The National Academies Press.

National Academies of Sciences Engineering and Medicine (2017). Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities. doi: <https://doi.org/10.17226/24622>

Materials and communications with the National Research Mentoring Network and the Council for Undergraduate Research (CUR).

Acknowledgments

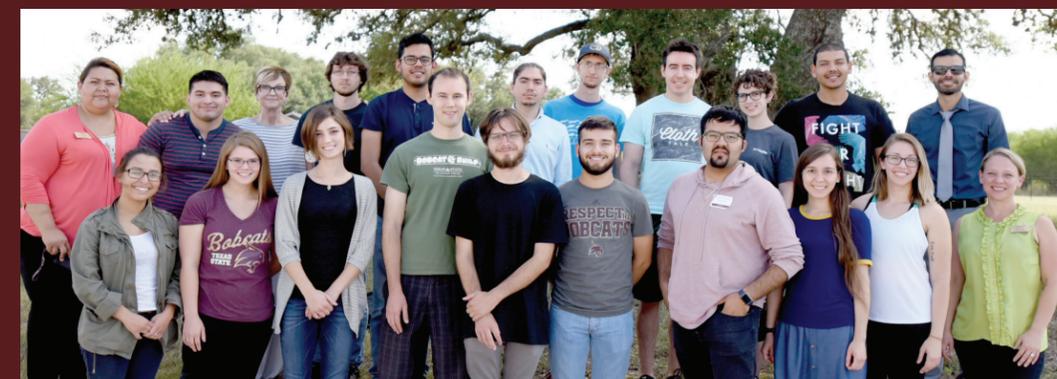
The staff of the SURE program would like to thank the following individuals for their assistance and support. Dr. Christine Haley, Dean, College of Science and Engineering, offered her encouragement and assisted in outreach by notifying all department chairs of the opportunity. Dr. Julio Soto, Professor of Biology at San Jose State University, lent his advice and expertise honed through 17 years of experience in undergraduate research programs. Dr. Samuel Garcia, LBJ STEM Institute led engaging activities in the orientation that were instrumental in building a sense of community among all participants. Faculty serving as mentors did so with enthusiasm and willingness to contribute in many ways beyond the mentor role, to assist in continuing improvement of the program. Sara Pivonka, Academic Budget Specialist, University College, went "above and beyond" in the processing of payments related to the program. The entire HSI STEM Impact team provided feedback and input along the way, and generously assisted in both training and event management.

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STEM Undergraduate Research Experience 2017 Pilot Highlights

A growing body of research suggests that undergraduate research programs allow students to experience real discovery and innovation, leading to an increase in the retention and completion of STEM students. This strong foundation of research led Dr. Dann Brown, Dean of University College, to include undergraduate research in the Title III HSI STEM Impact proposal awarded to Texas State University by the U.S. Department of Education. Texas State has since also made it a priority in the 2017-2023 strategic plan and a focus of the university's 2020 Quality Enhancement Plan for the Southern Association of Colleges and Schools Commission on Colleges.



The STEM Undergraduate Research Experience (SURE) program is a key component of the HSI STEM IMPACT Program. The program piloted in summer 2017, and offered first-generation and federal Pell Grant-eligible students the opportunity to participate in a six-week intensive research experience, mentored by Texas State faculty. Students spent two days in group orientation and a minimum of four weeks conducting research. At the conclusion of research, students had one week to prepare an oral presentation to their peers and mentors, as well as posters to present their research at a recognition ceremony.

Although the pilot initially had a modest goal of enrolling only five to seven students, strong interest from both faculty and students enabled a pilot with 11 faculty mentoring 19 students from six departments across the College of Science and Engineering: Biology, Chemistry and Biochemistry, Computer Science, Engineering, Math, and Physics (information on mentees' research topics on pages 4-5).

Who were SURE students? Of the 19 total:

- Eight were women
- 15 were first-generation
- Nine were Hispanic
- One identified as Native American
- 16 had transfer hours (average of 37 transfer hours)
- Expected graduation dates for all ranged from December 2017 to 2020.

This report briefly describes mentee training provided through SURE orientation and weekly mentee workshops; identifies mentors, mentees and their research; and suggests program modifications or future years of the grant.



Committed, trained mentors: key to program success



Eleven Mentors

Bahram Asiabanpour
Manufacturing Engineering
4 Mentees

Ivan Castro-Arellano
Wildlife Biology
2 Mentees

Caitlin Gabor
Biology
1 Mentee

Dana Garcia
Biology
1 Mentee

Thomas Hardy
Aquatic Biology
1 Mentee

Jennifer Irvin
Biochemistry
1 Mentee

Blagoy Rangleov
Physics
4 Mentees

Christopher Rhodes
Chemistry
1 Mentee

David Snyder
Mathematics
1 Mentee

Karl Stephan
Electrical Engineering
2 Mentees

Habil Zare
Computer Science
1 Mentee

Mentors

Twenty-one faculty from disciplines and specialties across the College of Science and Engineering indicated an interest in serving as mentors in the 2017 SURE pilot. Initially, program staff envisioned that SURE would support only one student per mentor, but when some faculty were interviewed, they asked to mentor multiple students. "Actually, I'd prefer you keep my compensation and redirect it to support an additional undergraduate researcher if that is possible," stated Dr. Castro. Soon after, other faculty indicated a similar preference.

Although almost all of the SURE mentors had previous experience as a mentor, the first step after the selection was mentor training, specifically in topics relevant to supporting women and minorities in STEM undergraduate research. Dr. Julio Soto led a full-day mentor training based on published research and enriched by examples from his 17 years of experience in mentoring programs. SURE mentors participated in discussion groups on improving a sense of community: belongingness, developing science identity, grit, self-confidence, and self-efficacy. Through a series of activities and discussions, Dr. Soto helped faculty develop their own mentoring goals and methods for assessing them.

He led discussion and provided tools to support mentors in delivering effective performance evaluations to mentees. Before ending the day, Dr. Soto also challenged all mentors to ensure that their mentees had created an Individual Development Plan (IDP) before the program's end, and provided them with a suggested format to follow. At the end of the program, a number of mentees said that creating their IDP was one of their "most valued" outcomes of SURE.

The Mentor Agreement

Facilitate all learning experiences for your SURE mentee(s) either personally or via a graduate student supervised directly by you.

Prior to the research period, thoroughly discuss your expectations for your mentee(s). Topics should include (as appropriate to your discipline and field of research) any lab protocols and safety guidelines; expected attendance and work habits; expected technical skills (or, alternatively, a plan to provide training in those skills); data collection guidelines; procedures for ongoing documentation of findings. All expectations should be put in writing to the student, have him or her sign, and submit a signed copy to SURE program office.

Provide a hands-on, intensive and guided research experience for your mentee(s).

Meet personally with your mentee(s) weekly to review overall goals during the six-week program, from July 5 through August 11, 2017.

Assist in at least one of six, one- to two-hour "Undergraduate Research Seminar" sessions for mentees during the six-week research period.

Attend an on-campus end-of-program convening to hear SURE presentations.

Provide feedback to SURE program staff for program improvement.

Leadership committed to excellence



HSI STEM Associate Director,
High Impact Services

HSI STEM Associate Director,
Undergraduate Research



Dr. Dann Brown
Dean of University College
Principal Investigator,
HSI STEM Impacting Success

The STEM Undergraduate Research Experience is supported by a Title III grant, "HSI-STEM Impacting Success." Undergraduate research is but one component of a strategic approach to student success. High-impact practices supported by the grant also include peer mentoring, academic coaching, peer-led team and collaborative learning. Dr. Dann Brown, Dean of University College is the Principal Investigator. He is supported in this effort by two co-principal investigators, Dr. Michael Nava and Dr. Kambra Bolch. The grant Director is Sylvia Gonzales, who is supported by two Associate Directors: Nina Wright, coordinating undergraduate research, and Kim May, coordinating the grant's High Impact Practices.

Planning for the Future

SURE Advisory Council

For the SURE program to be sustainable in the long term, it must be productive and have positive outcomes for faculty as well as for their mentees. To ensure that the faculty perspectives are represented, Bahram Asiabanpour, Manufacturing Engineering; Ivan Castro-Arellano, Biology; Dana Garcia, Biology; and Jennifer Irvin, Chemistry and Biochemistry will meet regularly with SURE leadership and staff to provide input on programmatic decisions.

Financing the Future

The HSI-STEM Impacting Success grant is a five-year grant that will support the SURE program through the summer of 2021. Sustaining the program beyond this period will require institutional support and/or new external funding. The independent, external evaluation will provide a rich source of outcomes data to tell potential new funders the SURE story.

The 2017 SURE Pilot Budget

The investment in SURE student support in 2017 was \$58,049. Because compensating students with a lump-sum grant would have had a negative impact on their financial aid, SURE compensated them at an hourly rate (\$17.50 per hour). Using this approach, the program encouraged participation of under-resourced students without having a negative impact on their financial aid.

Faculty were compensated for their participation in the program with \$2,500 stipends, for a total investment of \$27,500 in mentors.

The costs for student and mentor support, development of marketing and outreach materials, mentor training, space rental, and evaluation totaled under \$150,000.

Based on findings from the 2017 Pilot, the 2018 SURE program will implement some changes:

Earlier deadlines. In 2018, students will complete their applications by February 19 and selections will be finalized by April 2.

Longer research period. The second year program will last for 10 weeks rather than 6 weeks.

Housing option. Offering housing during the research period could make participation possible for students who otherwise could not be a part of the program. This option is currently under consideration for SURE 2018.

Lengthen orientation. Group orientation will be increased from one and a half days to three days. This will allow all subjects to be explored more deeply and to include reflection time and engaging student activities with every presentation.

Weekly seminars build community, increase competencies



Seminar Series

Five two-hour weekly seminars focused on three areas: community building; communication skills, and planning for career/professional development.

Community building was facilitated through structured opportunities each week for students to share progress on (or frustrations with) their research projects, and including a light meal for social time with no structured activity.

Communication skills training was varied by intended audience (academic audience or general public) and method of delivery (oral or poster presentation). An emphasis that began in orientation on the ability to communicate science to the general public was reinforced through the weekly seminars.

Individual development plans were completed by all mentees, with the help of their mentors, before the end of the program. A number of training materials under development by the National Research Mentoring Network was used in both orientation and the weekly seminars, and students participated in surveys evaluating these materials.

Week 1

Evaluate orientation process and follow up on "Your Brand" exercise. Become familiar with online tools to begin your Individual Development Plan (IDP)

Week 2

Communication Skills: Practice your research elevator speeches, led by Dr. David Snyder and Nina Wright

Week 3

Communication Skills: Learn the nuts and bolts of effective scientific poster design, led by Dr. Caitlin Gabor

Week 4

Oral Communication to the Scientific Community: Learn PowerPoint and oral presentation skills, led by Dr. Jennifer Irvin and Dr. Ivan Castro-Arellano.

Week 5

Individual Development Plans: led by Dr. Christopher Rhodes.

Asked what they most valued about the SURE program, mentees shared these observations:

A lot of support. You have so many people, faculty, mentors, on your side...that are helping you through the whole process. And they are not just helping you on research, they are helping you with a lot of other things, like public speaking, networking, developing your individual plan. It's not just about the research with SURE program. It extends beyond that."

~Female, first generation student

I always doubt myself. But with this program, I just decided I would submit that application. I'm terrified of giving speeches, for example, and I know that is a requirement. But I said, you know, I'm going to go for it. A lot of the meetings we had, talking to one another, and the circle times let me know I am not alone I wasn't the only one afraid going into this, or of going to present (orally). I was able to do it!

~Hispanic female first-generation student

The whole experience itself is really enriching. You feel challenged, but you find a way to overcome those things with the help of the mentor and all the presentations and speakers that we had at the meetings, it was easier to keep going and see "oh, I can do this."

The speakers and presentations gave me a more detailed explanation of what I had to do at the end of the program.

After every week, it was easier to relate to the other students, and we could discuss our work, and "hey, have you thought about this..."

~ Hispanic male, first-generation student

Orientation group work: learning, reflection, and sharing



Orientation

Research suggests that students' sense of belonging and community are important factors in keeping women and minorities in the STEM fields. SURE began the vital process of community-building in orientation and reinforced it throughout the program through weekly seminars.

The SURE Program mentee orientation, hosted at the beautiful Freeman Ranch facilities, provided an intensive day and a half of engaging training for students enrolled in the program. During orientation, a series of speakers and activities introduced students to a variety of topics directly related to their upcoming undergraduate research experience:

- The Culture of Science
- Communication of Science to the General Public
- Assessing Current Strengths as Related to Research Practices
- How to Get the Most from an Undergraduate Research Experience
- Ethics in Research
- An Introduction to Communicating Research with Posters and Presentations
- The Peer Review Process
- Creating a Mentoring and Support Network

Presenters facilitated student engagement through various methods and approaches to content delivery, including dialogue, reflection, and journaling. A panel titled "How to Get the Most from Your Undergraduate Research Experience" featuring faculty and recent graduates was a favorite of the first day.

Dr. Samuel Garcia of the LBJ Institute facilitated learning-circle activities designed to foster reflection and individual commitment to their field. On the second day of orientation, students shared their most significant accomplishment to date, favorite science learning experience, or research goals. A few of the accomplishments shared:

- Being a part of the best UIL team in the region
- Earning scholarships
- Continuing education post high school and working 40 hours a week
- Serving as tutor at Texas State
- Finishing first complete year at the university/setting example for infant son
- Presenting research at a poster session
- Making it to the university; honoring the sacrifices of family members
- Serving as a learning assistant/lab instructor
- Helping to write a proposal for a grant
- Escaping rural hometown where college isn't valued
- Making it to Texas State

At the end of the first day of orientation, SURE students were asked to share with everyone the "one word" that described their experience of the day.

The words they chose:

Enlightening	Relaxing
Relevant	Community
Persistence	Interesting
Challenged	Nervous
Collaboration	Exciting
Useful	Informative
Insightful	Motivating
Inspiring	Special
Confidence	Guidelines



STEM Undergraduate
Research Experience
SURE
ORIENTATION

Developing the scientist within you...

SURE 2017 Pilot supported nineteen talented undergraduate researchers from the College of Science and Engineering



Kyle Davidson August
Electrical Engineering
Research Topic: *Atmospheric Water Generation Using Thermoelectric Cooling Systems*
Mentored by
Dr. Bahram Asiabanpour



Luis Bichon III
Physics
Research Topic: *Analysis of the Whirlpool Galaxy with the Hubble Space Telescope*
Mentored by
Dr. Blagoy Rangelov



Clint Boldt
Physics, Applied Mathematics
Research Topic: *X-ray Sources from the Whirlpool Galaxy*
Mentored by
Dr. Blagoy Rangelov



Katherine Casey
Manufacturing Engineering
Research Topic: *Passive Sunlight Capture*
Mentored by
Dr. Bahram Asiabanpour



Kristin Dyer
Wildlife Biology
Research Topic: *Potential Effects of Hantavirus Infection on Activity Patterns of Sigmodon hispidus*
Mentored by
Dr. Ivan Castro-Arellano



Jose Hernandez
Electrical Engineering
Research Topic: *Electrostatic Pendulum as a Model for Ball Lightning's Motion*
Mentored by
Dr. Karl Stephan



Riley Kay Horner
Manufacturing Engineering
Research Topic: *Nutrition Delivery System*
Mentored by
Dr. Bahram Asiabanpour



Gabriel Hurtado
Computer Science
Research Topic: *Applications of RASL-Seq in the Analysis of Immune Response*
Mentored by
Dr. Habil Zare



Evelyn Ibarra
Biology
Research Topic: *Pigment Granule Position in the Retinal Pigment Epithelium in MRP4 Knockout Mice*
Mentored by
Dr. Dana Garcia



Noel Mireles
Chemistry and Biochemistry, Mathematics
Research Topic: *Investigation of the Effects of Iridium Substitution with Nickel Hydroxide Nanosheets*
Mentored by
Dr. Christopher Rhodes



Nicholas Moore
Physics
Research Topic: *Classification of Stellar Objects Through the Use of Machine Learning*
Mentored by
Dr. Blagoy Rangelov



Alyssa Parsons
Chemistry and Biochemistry
Research Topic: *Electroactive Polymer-based Biosensors for Cancer Detection*
Mentored by
Dr. Jennifer Irvin



Hannah Perkins
Biology
Research Topic: *Synergistic Effects of Roundup and Cort on Antipredator Responses in Incilius nebulifer Tadpoles*
Mentored by
Dr. Caitlin Gabor



William Poepelmeyer
Electrical Engineering
Research Topic: *Solid-State Electrometer and Ultraviolet Photoelectricity*
Mentored by
Dr. Karl Stephan



Karina Salinas
Biology
Research Topic: *Wild Vertebrate Exposure to Soft Ticks in Central Texas*
Mentored by
Dr. Ivan Castro-Arellano



Michael Sanchez
Physics
Research Topic: *A Spitzer Study of the Orion Nebula Cluster (ONC)*
Mentored by
Dr. Blagoy Rangelov



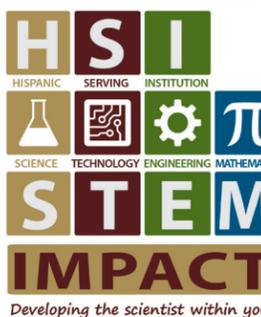
Mohamed Sghari
Electrical Engineering
Research Topic: *Thermoacoustic Refrigerator Project*
Mentored by
Dr. Bahram Asiabanpour



Isaiah Silaski
Mathematics
Research Topic: *Constructing Homogeneous Homology Manifolds*
Mentored by
Dr. David Snyder



Diego Torres
Biology
Research Topic: *Vegetation Mapping: Comparison between Ground-based GPS vs Aerial Imagery Mapping Using GIS*
Mentored by
Dr. Thomas Hardy



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Developing the scientist within you...