

Recruitment and retention of underrepresented minorities in the geosciences

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Successful Geoscience Programs at UTEP

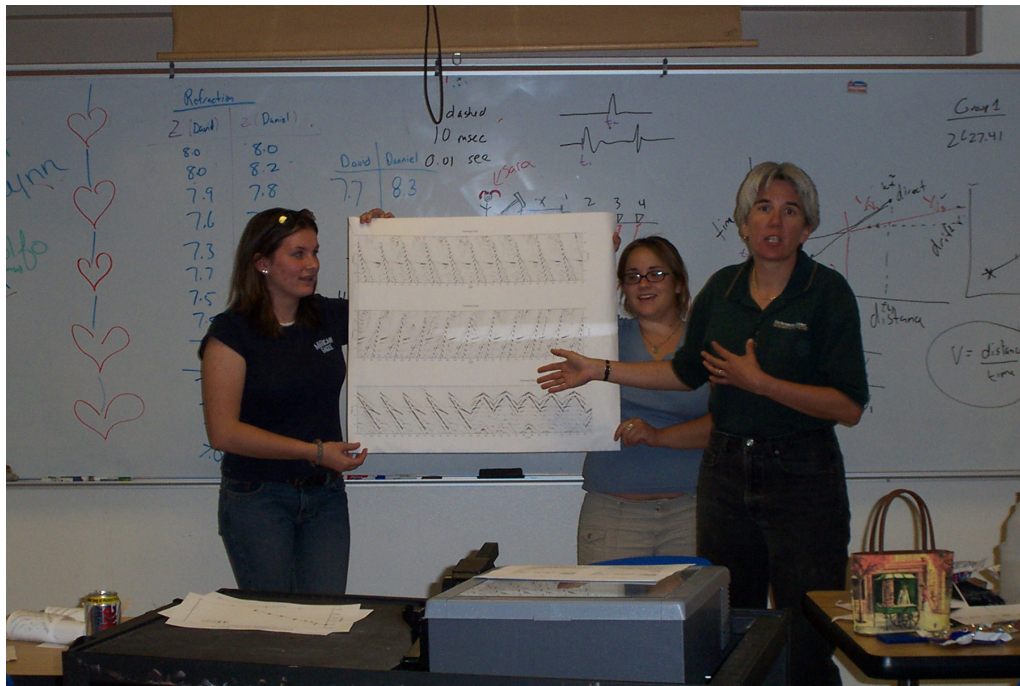
- ▶ Pathways to the Geosciences (originally funded in two tracks from NSF)
 - ▶ Summer high school program
 - ▶ 2002 - July 2012 (NSF and Shell Oil supported)
 - ▶ 2017 - current (Shell Oil supported)
 - ▶ Research Experience Program (PREP) - undergraduate research during academic year
 - ▶ 2002 - 2012
- ▶ Academic Year - Pathways Research Experience Program (AY-PREP) undergraduate academic year (IUSE Geopaths)
 - ▶ 2015 - 2019
- ▶ Other programs at UTEP/EPCC for geoscience and environmental science (TIERRA, ROCS)

Pathways to the Geosciences: High School Summer Camp

- ▶ Two-week summer program designed to expose high school students from groups underrepresented in STEM to the geosciences originally supports by NSF grants and later Shell Oil Company
- ▶ Goals
 - ▶ The short-term goal of the program was to introduce students, with a strong interest in STEM, to the geosciences and to give them insight into the possibilities the geosciences have as a college major and career choice.
 - ▶ The long-term goal of our summer program was to form a pipeline to the UTEP geology undergraduate program and eventually to the graduate program.

Pathways High School Summer Camp: The Program

- ▶ Two two-week camps (dependent upon funding)
- ▶ 15 students attend each camp
- ▶ During each two-week session, participants engaged in a variety of field and laboratory projects located in and around UTEP and the broader El Paso region
- ▶ Pre- and post-surveys were administered to measure the influences of the camp on the participants.



Impact

- ▶ The Pathways to the Geosciences Summer Program proved to be a very effective strategy for inspiring interest in and recruitment into the geosciences among Hispanic-American high school students with a strong interest and ability in math and science.
- ▶ Data from our program's pre- and post-surveys showed statistically significant positive changes in attitude towards science, more specifically the geosciences.
- ▶ Longitudinally, the data show a positive correlation of the Pathways program with retention of participants in the geoscience pipeline.

2003- 2012 Cohorts	No. Participants (n=230)	% Participants
<i>Gender</i>		
Male	111	48%
Female	119	52%
<i>Grade Level</i>		
Entering 10 th grade in the fall	99	43%
Entering 11 th grade in the fall	94	41%
Entering 12 th grade in the fall	37	16%
<i>Race/Ethnicity</i>		
African American	4	1.7%
Asian	8	3.5%
Hispanic	179	78%
Native American	1	.4%
Pacific Islander	2	.8%
White	33	14.3%

Longitudinal Analysis

College Attendance of Program Participants

	No. of Respondents (n=86)	% Respondents
Attending UTEP	39	45%
Attending EPCC	16	19%
Attending another 4 year college	31	36%

Declared College Major of Program Participants

	No. of Respondents (n=86)	% Respondents
Engineering	13	15%
Geology	17	20%
Science	17	20%
Other	39	45%

Longitudinal Analysis

- ▶ Other known information:
 - ▶ One summer participant successfully completed their MS degree in geology and is currently employed at Exxon Mobile
 - ▶ One summer participant earned their PhD and is currently employed by JPL and working on the Mars Mission
- ▶ Additional statistics from Doser and Villalobos (2013) indicate that since the summer of 2008:
 - ▶ Over 20 students have entered the A.S. in Geological Science program at EPCC, with about 10 students continuing to UTEP's B.S. program and 2 currently in graduate programs.
- ▶ This suggests a pipeline from the high schools to UTEP and EPCC is feasible.

What Works

- ▶ Some of the key elements from the Pathways program that we believe contributed to its success were:
 - ▶ 1) the local, accessible geology that surrounds the El Paso region;
 - ▶ 2) exposure on and to the UTEP campus; and
 - ▶ 3) the interaction between the participants and UTEP faculty and graduate students, many of whom were Hispanic origin.



Pathways to the Geosciences: Research Experience Program (PREP)

- ▶ UTEP proposed a *non-traditional* research experience for undergraduate program (REU)
 - ▶ Provided financial support to UTEP students in exchange for participation in a research program located at the university for the length of an *academic year*.
 - ▶ Students were not allowed to work outside of the program
- ▶ Supported from 2002 - 2012 through two grants from the NSF OEDG program.
 - ▶ Over that time period, the program provided financial support that enabled 59 students to conduct research with a faculty mentor,

PREP: The Program

- ▶ **Goals**
 - ▶ Allow undergraduates to participate in professional development workshops, and be enculturated to the geosciences community.
 - ▶ Mentor students through an undergraduate degree in geosciences and prepare them for graduate education.
 - ▶ Immerse students in department activities by paying them and restricting outside employment
- ▶ Teamed students with faculty to conduct research
- ▶ Weekly meeting that exposed students to cutting-edge research, graduate programs, and career opportunities

Pathways Research Experience Program (PREP)

- ▶ Research experience program was conducted throughout the academic year, by contrast to the traditional summer months
- ▶ The program was distinctive in that its participants were dominantly Hispanic, and
- ▶ attending a regional university with a large research portfolio, as well as a significant population of masters and doctoral students.



Impact

- ▶ Analysis of time-to-degree data for PREP participants compared undergraduate majors shows that the PREP participants took much less time to obtain their degrees
- ▶ On average, PREP participants completed their degrees 6-9 months sooner than the group of undergraduate majors regardless of gender, ethnicity, entry status or status as first generation in college.
- ▶ PREP participants who were also first generation in college completed their degrees more 15 months sooner than their peers. Those who entered as transfer students completed their degree more than 13 months sooner than their peers in the department.
- ▶ Across the board, female students completed their degrees 6 months to a year earlier than their male counterparts.

Impact

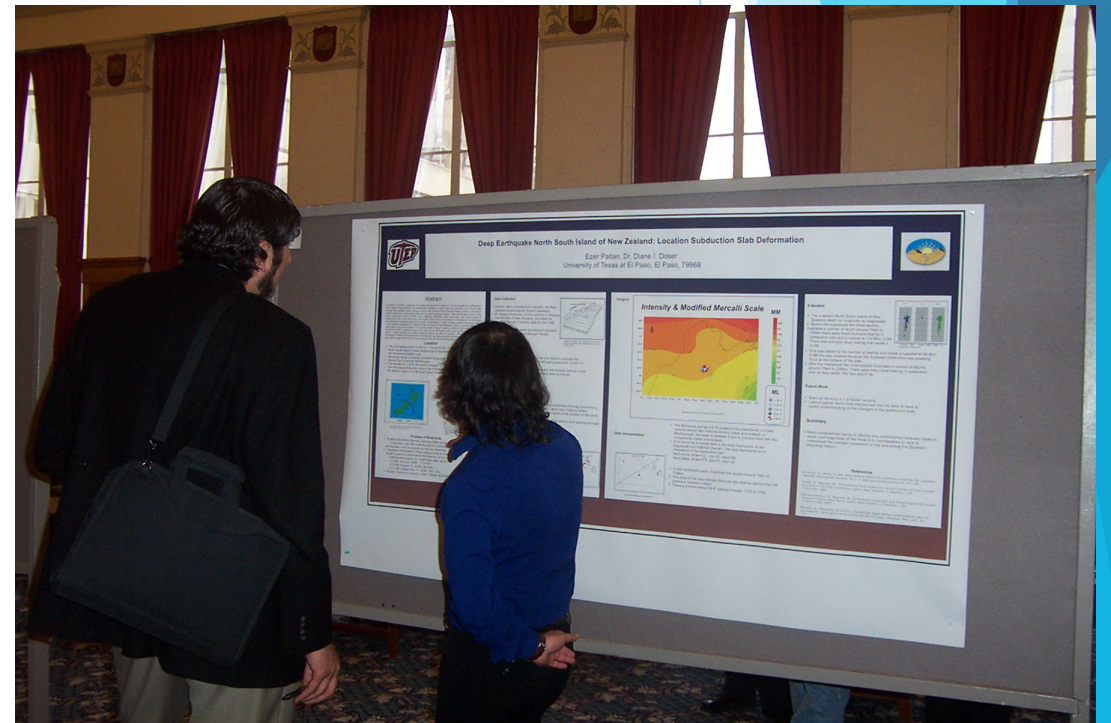
- ▶ The PREP cohort (59) generated 11 potential Ph.Ds, 28 masters, and 49 bachelors degrees in the geosciences/environmental sciences
- ▶ 27 careers in the oil and gas industry, environmental consulting, and academia.
- ▶ Statistically the PREP program recruited and retained 71% of the participants into the geoscience pipeline.
- ▶ Formal numbers since 2014 are still being formulated

What Worked

- ▶ Created an environment in which students expect to enter graduate school on completing a bachelor's degree
- ▶ Participants chose to overcome traditional cultural ties to home and leave El Paso to pursue their graduate education
- ▶ Financial support
 - ▶ Allowed them to spend more time on campus, time to focus on studies, and the ability to take more classes
- ▶ Belonging to a group
 - ▶ Provided them with support both mentally and emotionally. Being able to have discussions with your peers (about research, classes, fatigue, etc.) and knowing they understood what you are experiencing was a huge component

What Worked

- ▶ PIs and a program coordinator that understood what the participants were *dealing* with and could relate to.
 - ▶ Sense of a personal connection
- ▶ Overall sense of belonging and support.
 - ▶ Strong bonds between participants became very evident
 - ▶ Hispanic culture of “family”
- ▶ Professional development activities



Conclusions on PREP

- ▶ We conclude with thoughts on the key aspects of the program that led to its success:
 - ▶ Among these are those common to other REU programs such as mentoring and research guidance
 - ▶ Our *non-traditional* REU provided financial support for the fall and spring semesters, a program coordinator, additional funding for supplies and travel, and a sense of security remaining at home.

Academic Year - Pathways Research Experience Program (AY-PREP)

- ▶ Funded by the IUSE Geopaths program at NSF (2015-2019)
- ▶ Goals
 - ▶ Increase minority participation in the geosciences and environmental sciences
 - ▶ Increased awareness of importance of geosciences
- ▶ The program includes
 - ▶ An academic year interdisciplinary research experience
 - ▶ Academic year workshops to prepare and expose students to cutting-edge research, graduate programs, and career opportunities
 - ▶ A stratified mentoring program
 - ▶ Two-week summer bridge

Impact and Summary

- ▶ Analysis is still being formulated
- ▶ We believe undergraduate research experiences are critical for success of students from underserved communities
 - ▶ Provides monetary incentive to stay at school and immerse themselves in department of activity (Sense of belonging)
 - ▶ Provides student with problem solving skills and exposes them to knowledge creation (instead of book learning)
 - ▶ Provides opportunity for students to become familiar with faculty, demystifying academic careers, and reducing fear
 - ▶ Exposes students to alternate careers
 - ▶ Enhances career building skills
- ▶ Successful programs require faculty and staff that believe in the mission and have an understanding of student perspectives