Engaging high school students of underrepresented minority groups in the geosciences through graduate-student led, challenge-based learning

Alissa Kotowski[1*], **Vanshan Wright**[2*], Nick Soltis[3] and Kathy Ellins[1]
** These two authors contributed equally to this work*

[1] The University of Texas at Austin, Jackson School of Geosciences
[2] Southern Methodist University
[3] Auburn University

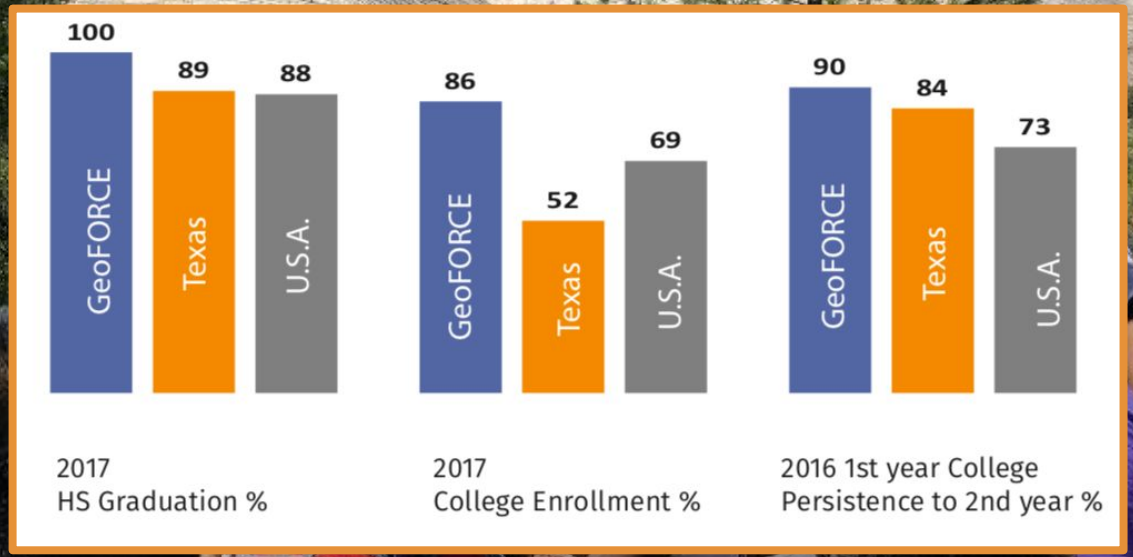
GEOFORCE TEXAS

TEXAS Geosciences
The University of Texas at Austin
Jackson School of Geosciences

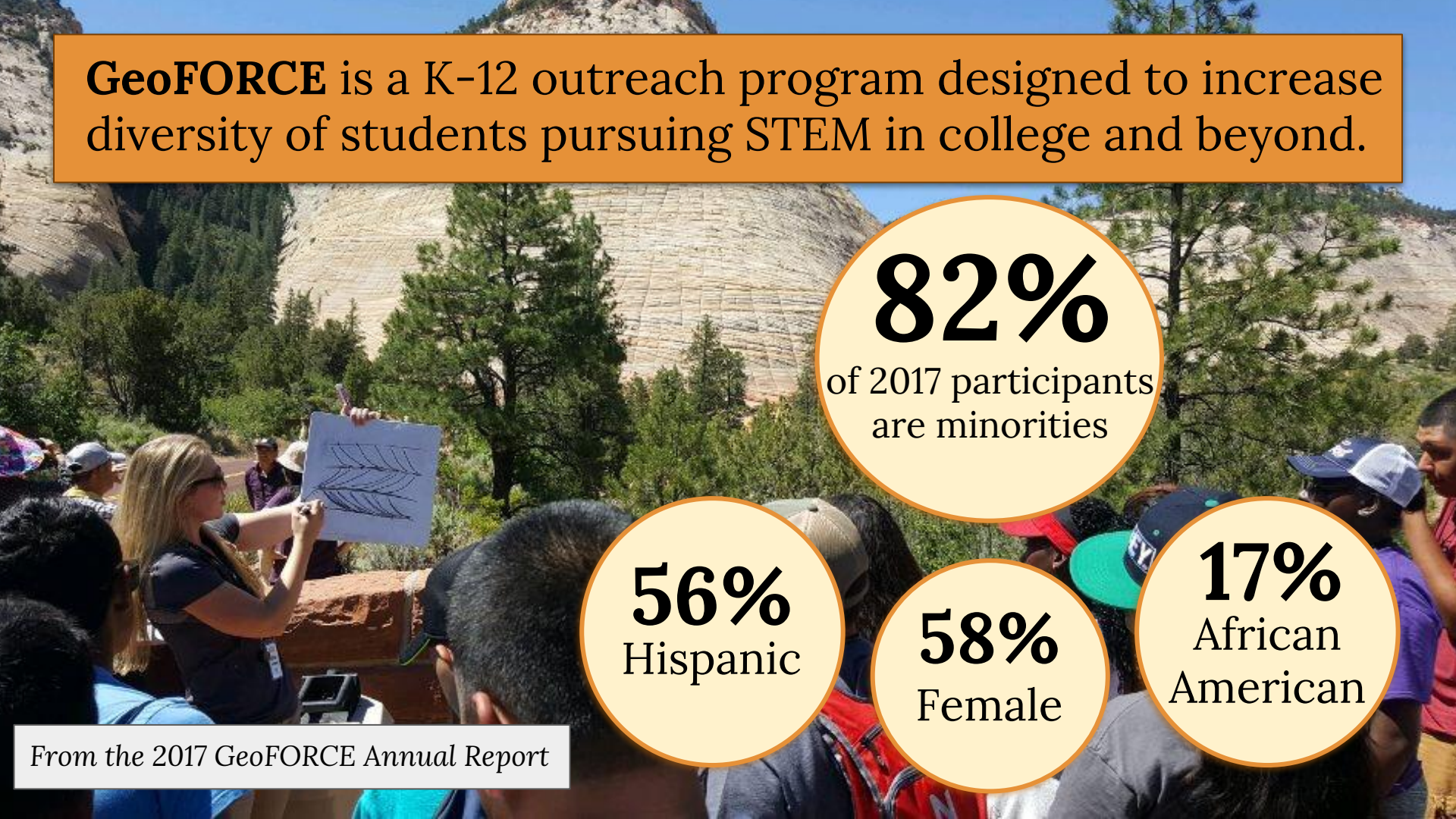
SMU

AU

GeoFORCE is a K-12 outreach program designed to increase diversity of students pursuing STEM in college and beyond.



From the 2017 GeoFORCE Annual Report


GeoFORCE is a K-12 outreach program designed to increase diversity of students pursuing STEM in college and beyond.
82%
of 2017 participants are minorities
56%
Hispanic
58%
Female
17%
African American
From the 2017 GeoFORCE Annual Report

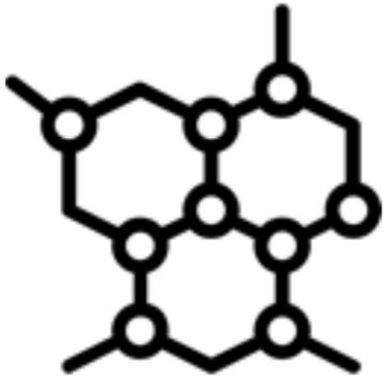
51% of GeoFORCE alumni in college are STEM majors yet *very few pursue the geosciences.*

10%

Declared Geology as a major in 2017

11%

Declared Engineering



14%

Declared Biology

51% of GeoFORCE alumni in college are STEM majors yet *very few pursue the geosciences.*

...Why? How can we improve this?

10%
Declared Geology as a major in 2017

11%
Declared Engineering

14%
Declared Biology

Does Pedagogy Influence Engagement and Retention Rates? Can Increasing Staff Diversity Improve Retention Rates?

Students of color are more likely to **identify with collectivist values** than their White peers. (*Guiffrida*, 2006)

"Institutional leaders should make efforts to cultivate cultures in which **students see administrators, faculty, and staff as human beings**... racial and ethnic minority students might be more likely to perceive that institution as invested in them, and be more motivated to succeed." - *Museus*, 2011

StemForce hired and trained a diverse staff of PhD Candidates, GeoFORCE Alumni & Preservice Teachers

Instructors

Educational Coaches

Logistics Coordinators

Teaching the geologic history of Texas using a modified version of the STAR Legacy Cycle pedagogy

STAGES OF A LEGACY CYCLE

Challenge Scenario A

Texas Department of Transportation

Assess the feasibility of building a railroad that connects the parks

Challenge Scenario B

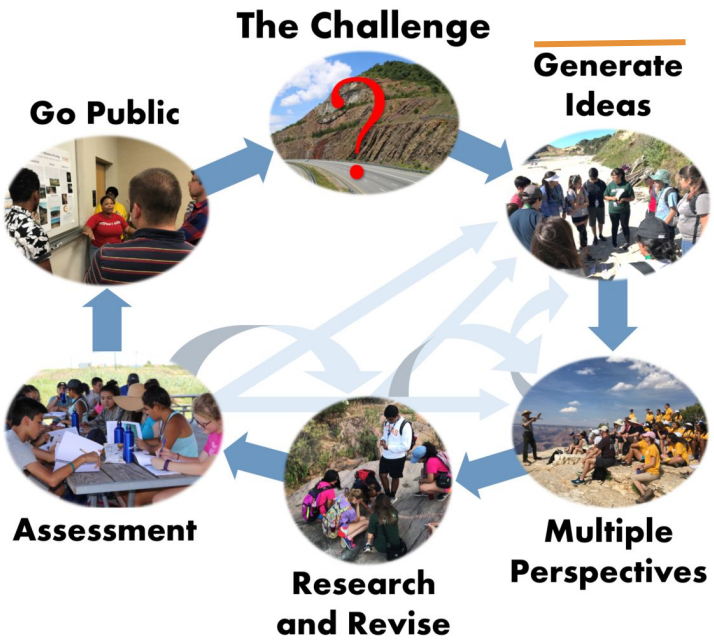
TEXAS PARKS & WILDLIFE

Improve parks visitation numbers using snapchat filters

Relatable and Real-Life Implications

GENERATE IDEAS

Providing background knowledge about key concepts

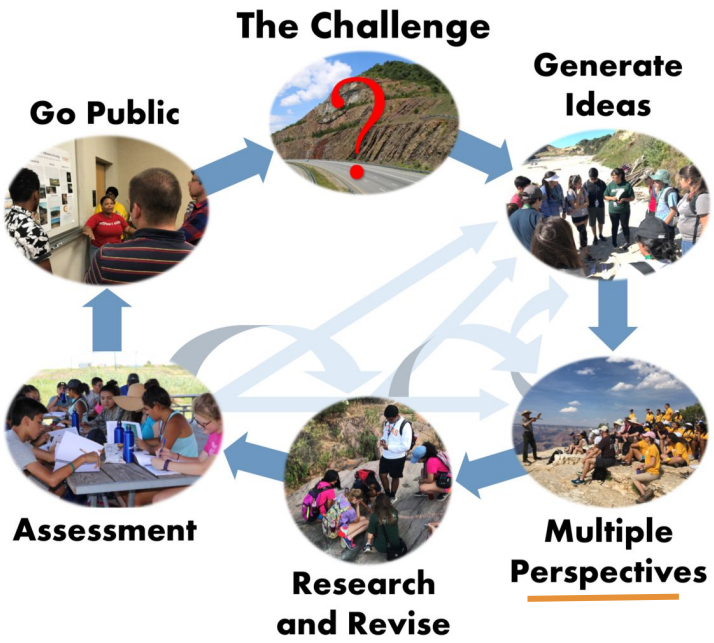


STAGES OF A LEGACY CYCLE

Replace Lectures with Group Workshops

MULTIPLE PERSPECTIVES

Introducing students to external resources



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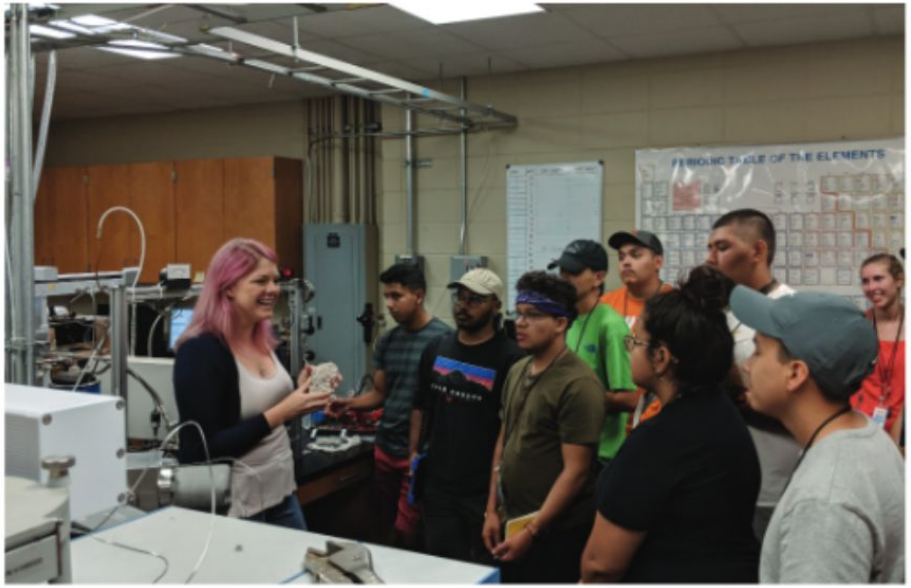
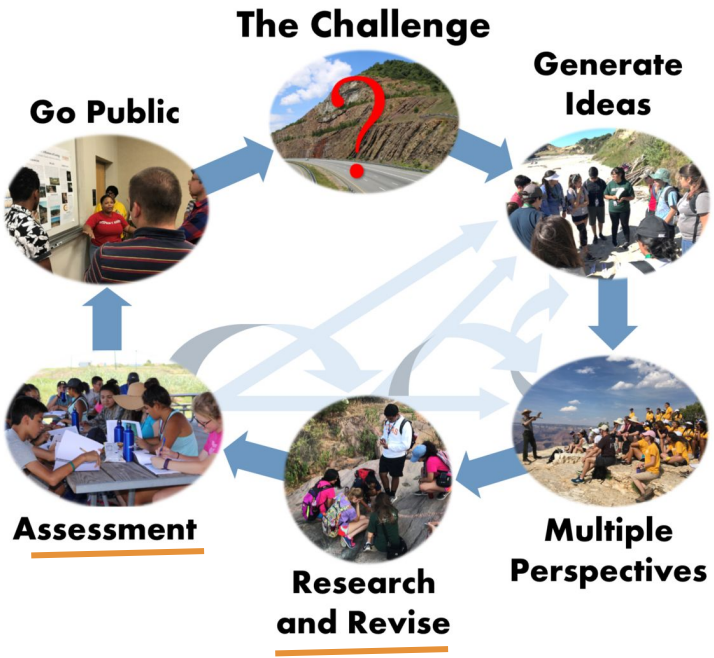


Diversify Resources (people and technology)

ASSESSMENT, RESEARCH AND REVISE

Conducting learning activities in the field and classroom



Teacher's Role -- Facilitator

Student's Role -- Principal Investigator

Develop an Overarching Question

E.g. How did Enchanted Rock form?

Develop an Overarching Question

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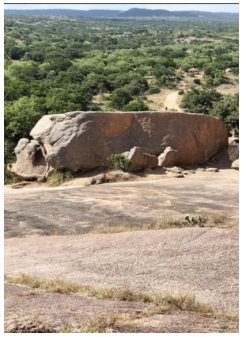
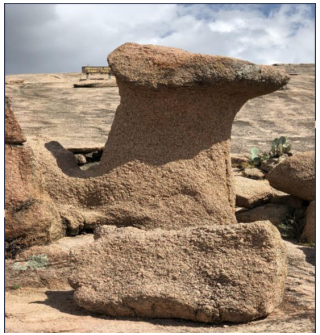
Direct Students to Data Collection Sites



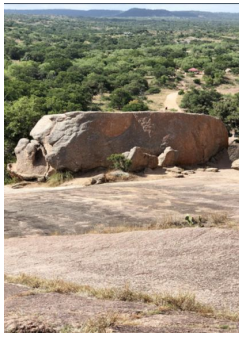


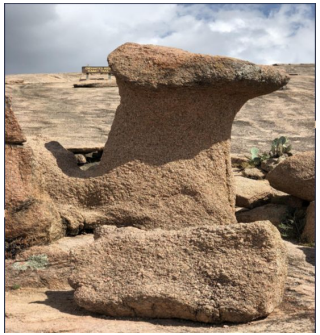
Teachers choose sites relevant to question

Develop an Overarching Question

E.g. How did Enchanted Rock form?

Direct Students to Data Collection Sites





Teachers choose sites relevant to question

Facilitate Student Data Collection

Students observe, sketch and take notes

Develop an Overarching Question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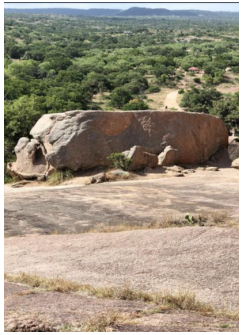


Teachers choose sites relevant to question

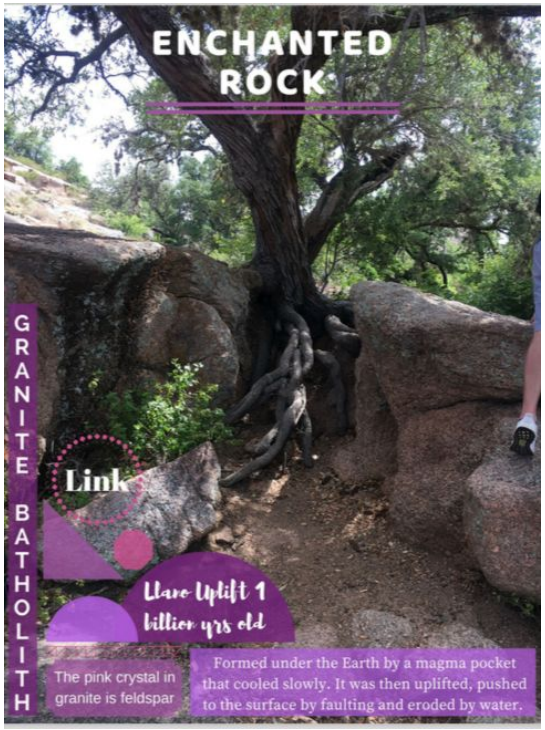
Facilitate Student Data Collection

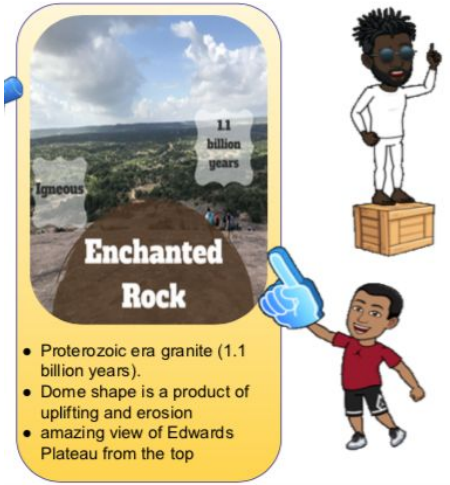

Students observe, sketch and take notes

Facilitate Student Interpretations


Students present daily results and are assessed

GO PUBLIC
Assessing Student Learning Through Realistic Deliverables





Deliverables:
AGU-Style Talk
Town hall Poster
Public Talk (4 min)

Challenges:

1. *Initial student frustration and discomfort*
2. *Clarifying roles within the instructional team*

25%

Expressed interest in pursuing Geology

PERCEPTION:

WHAT IS GEOSCIENCE?

"A very elaborate study of how the Earth works."

"A geoscientist learns about the Earth, how everything is formed, and the processes that happen."

"Geoscientists do a lot of observing... and we have been doing that for the past four years."

"What do you mean by geoscience? There's multiple paths, like a geochemist, geophysicist, or [geomorphologist]."