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

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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
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From the 2017 GeoFORCE Annual Report

- 82% of 2017 participants are minorities
- 56% Hispanic
- 58% Female
- 17% African American
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
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...Why? How can we improve this?

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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**

**The Challenge**
- Go Public
- Generate Ideas
- Multiple Perspectives
- Research and Revise
- Assessment

**Challenge Scenario A**
Assess the feasibility of building a railroad that connects the parks

**Challenge Scenario B**
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

STAGES OF A LEGACY CYCLE

Diversify Resources (people and technology)
Conducting learning activities in the field and classroom

The Challenge

Generate Ideas

Go Public

Assessment

Research and Revise

Multiple Perspectives

STAGES OF A LEGACY CYCLE

Teacher’s Role -- Facilitator
Student’s Role -- Principal Investigator
Develop an Overarching Question

E.g. How did Enchanted Rock form?
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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?

Facilitate Student Data Collection

Students observe, sketch and take notes

Direct Students to Data Collection Sites

Teachers choose sites relevant to question
Develop an Overarching Question

E.g. How did Enchanted Rock form?

Facilitate Student Data Collection

Students observe, sketch and take notes

Direct Students to Data Collection Sites

Teachers choose sites relevant to question

Facilitate Student Interpretations

Students present daily results and are assessed
GO PUBLIC
Assessing Student Learning Through Realistic Deliverables

STAGES OF A LEGACY CYCLE

Go Public
Assessment
Research and Revise
Multiple Perspectives
Generate Ideas

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

Expressed interest in pursuing Geology

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**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].”