# Growing the geoscience community through experiential learning activities with non-geoscience majors

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## Goal

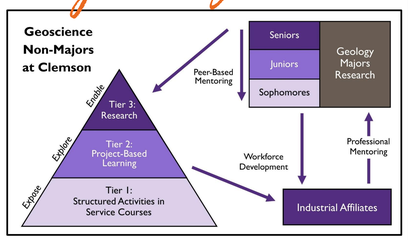
Increase the number of students at Clemson intending to pursue a geoscience-related career path.

## Objectives

1. Strengthen research experiences for Clemson geology undergraduates
2. Leverage these research experiences to engage non-majors in geoscience activities
3. Build the geoscience community at Clemson

## Community Integration

Integration of Geology majors, non-majors, and professionals in this project will help to build a community that supports the short and long-term pursuit of geoscience professions in South Carolina.




## Tier II: *Exploring Geoscience*

Students at Tier II explore geoscience through individual or group project-based learning activities in collaboration between non-major students, a geology major mentor, and a faculty mentor.

**Focus Areas:**

- Citizen Science
  - *simple data collection and analysis*
- Problem Solving with GIS
  - *translate scientific questions into real-world applications*
- Science Communication & Outreach
  - *synthesize and tailor communication about geoscience impacts to general audiences*

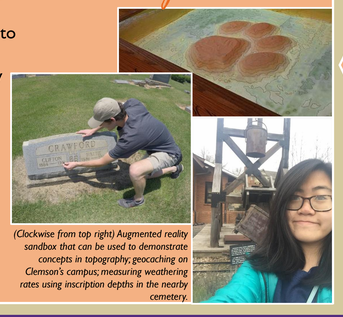
*Project interns Kathryn Abbott (Environmental Engineering) and Matt Wykel (Geology) assembling geocaches (above) and creating videos to inform and engage Tier I students in the different activities (below).*

## Tier I: *Exposing Students to Geoscience*

Students at Tier I will be exposed to geoscience through extra credit activities within their introductory geoscience course.

**Example Activities:**

- Geocaching
- Virtual Field Trips
- Take home exercises
- Augmented Reality Sandbox
- Geology in Minecraft



*(Clockwise from top right) Augmented reality sandbox that can be used to demonstrate concepts in topography; geocaching on Clemson's campus; measuring weathering rates using inscription depths in the nearby cemetery.*

# CLEMSON GEOPATHS ORGANIZATIONAL FRAMEWORK

## Tier III — Geoscience Research

*Geology majors will:*

- Define questions and methods to solve problems
- Synthesize and apply geoscience concepts and skills in settings relevant to real world applications
- Learn analytical, computational, and field practices to prepare a qualified geoscience workforce
- Develop professional written and oral communication skills
- Be ambassadors for geoscience professions

## Tier II — Project-Based Learning

*Non-geology majors will:*

- Actively participate in projects through data collection and analysis
- Account for the spatial nature of data in geoscience problems
- Apply knowledge and skills from their major to the geosciences
- Learn to communicate geoscience issues to the general public
- Be advocates for the geosciences

## Tier I — Classroom and Extracurricular Experiences

*Students in intro geology courses will:*

- Be exposed to undergrad research opportunities in geosciences
- Understand the importance of geoscience problems and careers to the future of our society
- Take part in active learning experiences in and out of the field
- Feel like a member of the geoscience community

## Tier III: *Enabling Geoscience*

Students at Tier III are enabled to participate in geoscience by receiving a research experience similar to that obtained by our own majors. This experience will simultaneously help them understand how their own domain can be applied to the geosciences and in turn allows our majors to see the value of other disciplines.

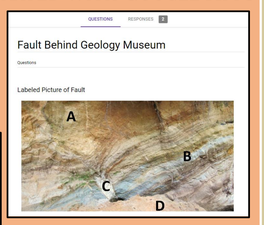
We expect that some non-major students that have participated in Tier I and II activities may have, by this point, opted to either double major in Geology or switch majors entirely.

*Field work by geology and computer science students in the Grand Canyon (above); engineering student Jillian Laird working on a CT scan of ocean sediments (below).*

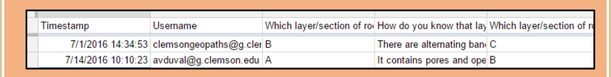
## Tier I Activity Submission

### Web Tool Development Integrated with Google Apps

1. Students receive extra credit for their Tier I activities through an online submission system that utilizes Google Forms and an image uploading script.

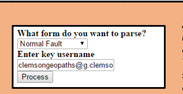




*Front end, student view of their activity submission form (above) and picture upload (left). Image submission integrated within the Google Form, as image uploads are not a feature of Google Forms. Photos can also be automatically uploaded to our project's Facebook page.*



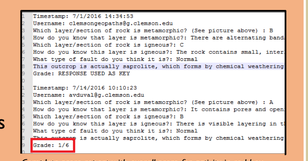
| Timestamp | Username | Which layer/section of ro | How do you know that lay | Which layer/section of r |
|---|---|---|---|---|
| 7/1/2016 14:34:53 | clemsongeopaths@g.cler | B | There are alternating ban | C |
| 7/14/2016 10:10:23 | avduval@g.clemson.edu | A | It contains pores and ope | B |

2. Activity grading utilizes Google Sheets and a grading script to automate scoring, creating a reduced workload for the instructors.




*Answer keys are created by the instructor when answering the appropriate Google Form (above). When ready to grade, instructors simply choose the activity to grade and the username to designate as the 'key' (left).*

3. Grade reports can be downloaded as .txt files with just the student name and score, or as a complete report.




*Complete score report with overall score for activity in red box (above).*

## Summary


This project exposes thousands of non-geoscience students to geoscience research and STEM communication. By building an accessible pathway for non-majors to the geosciences and enhancing research experiences for Geology majors, we expect to make a significant impact on the development of the geoscience workforce in South Carolina.

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