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NORTH GEORGIA™

GRANT No: 2119990

Promoting Inclusive Excellence in Geoscience Education through Accessible Laboratory and Field-Based Learning Environments



Sharing is encouraged

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National Science Foundation (NSF) Grant Pathways into the Earth, Ocean, Polar and Atmospheric & Geospace Science (GEOPATHS)- Fall 2022 to Summer 2026



GeoEd Workshop: professional skill development, to provide STEM and Special Education teachers with geoscience & GIS skills and content.



Shadowing Research and Mentorship Program (SRMP): To facilitate Georgia's high school students' research experience and introduction to geoscience careers.



Project Objectives



Develop an inclusive, technology-driven framework to improve:

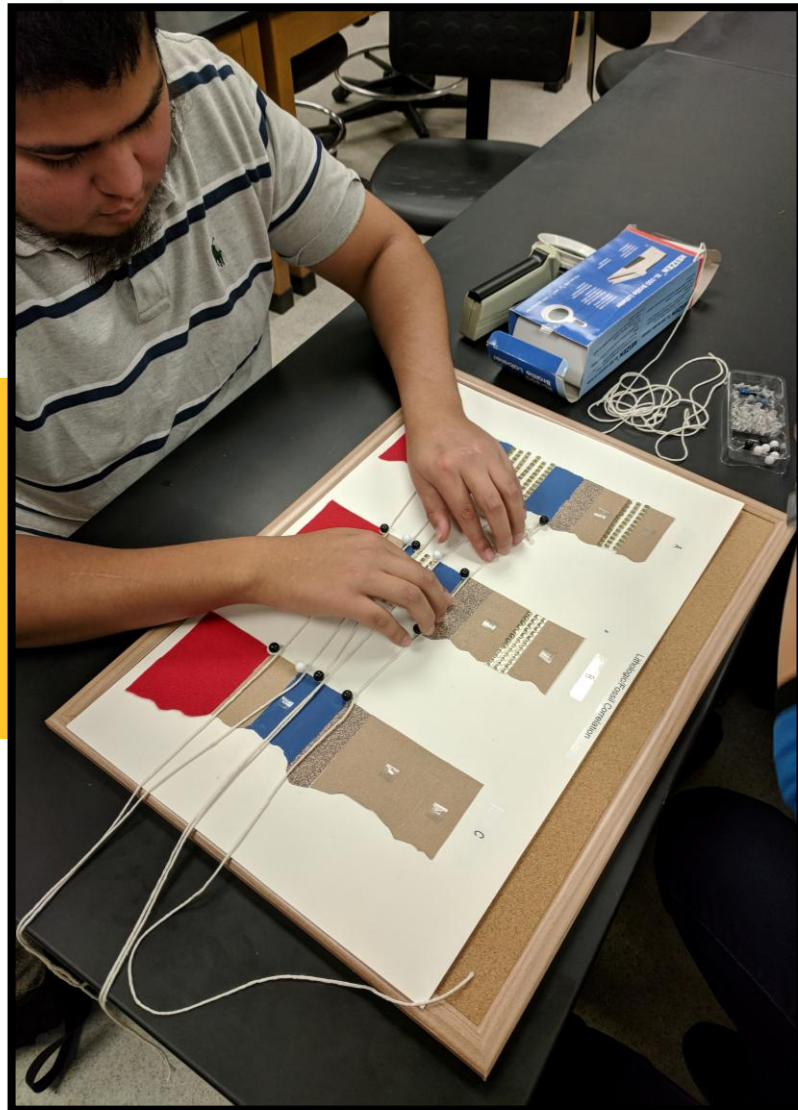
- Accessibility
- Engagement
- Learning outcomes

Two-Pronged Approach

- Visual Impairments → Tactile Tools
- Physical Disabilities → Virtual Fieldwork

Multisensory learners

Geoscience Laboratory Activities for Visually Impaired Students



Tactile Learning Tools

-) Multi-layered maps with Braille labeling for spatial understanding
-) 3D terrain models to explore topography
-) Tactile diagrams for key concepts

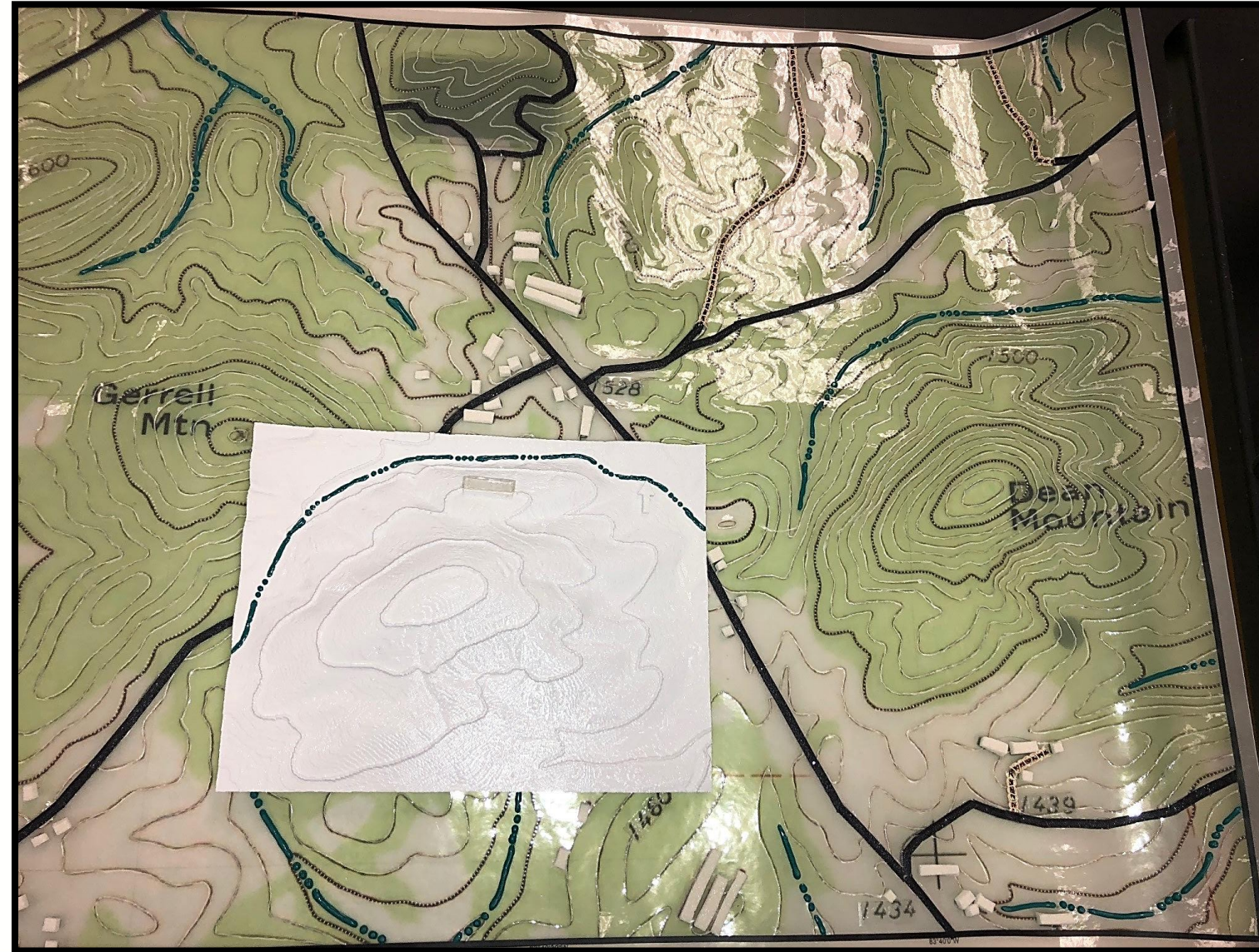
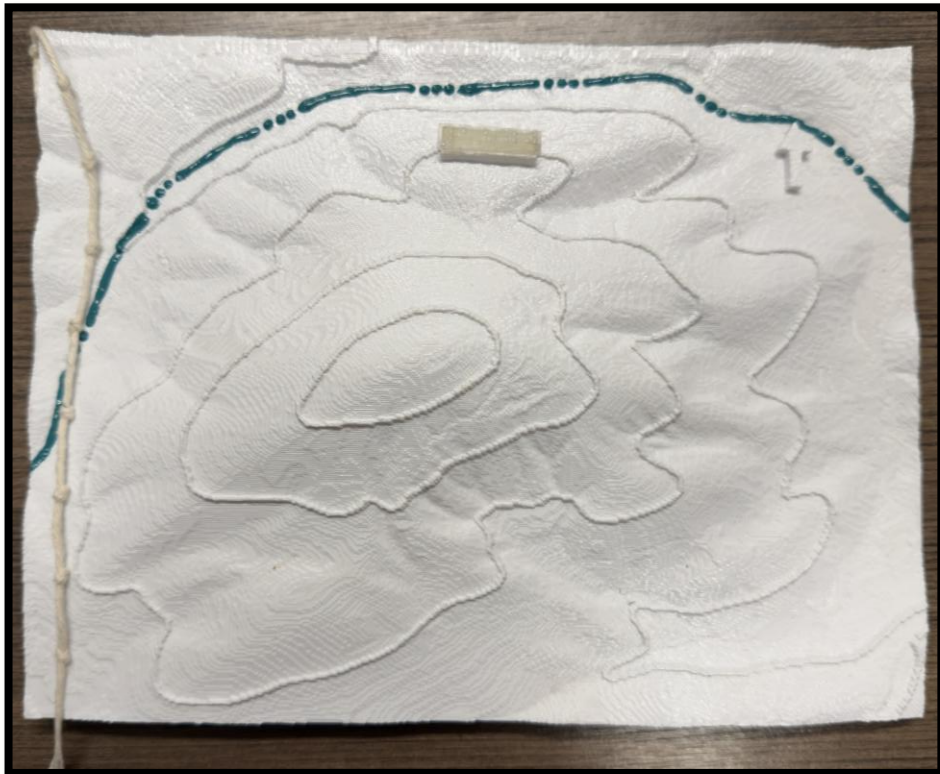
3D-Printed Models

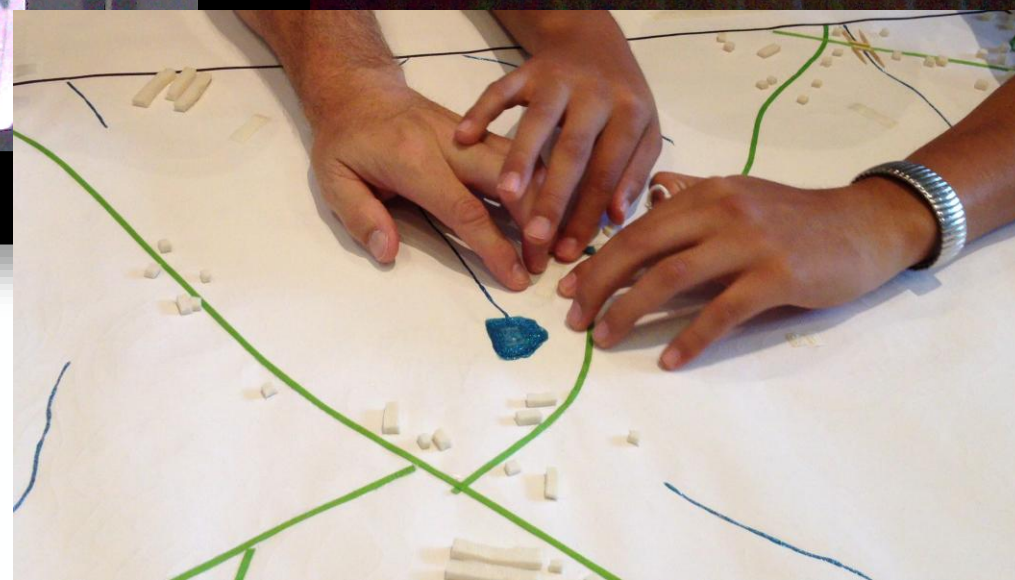
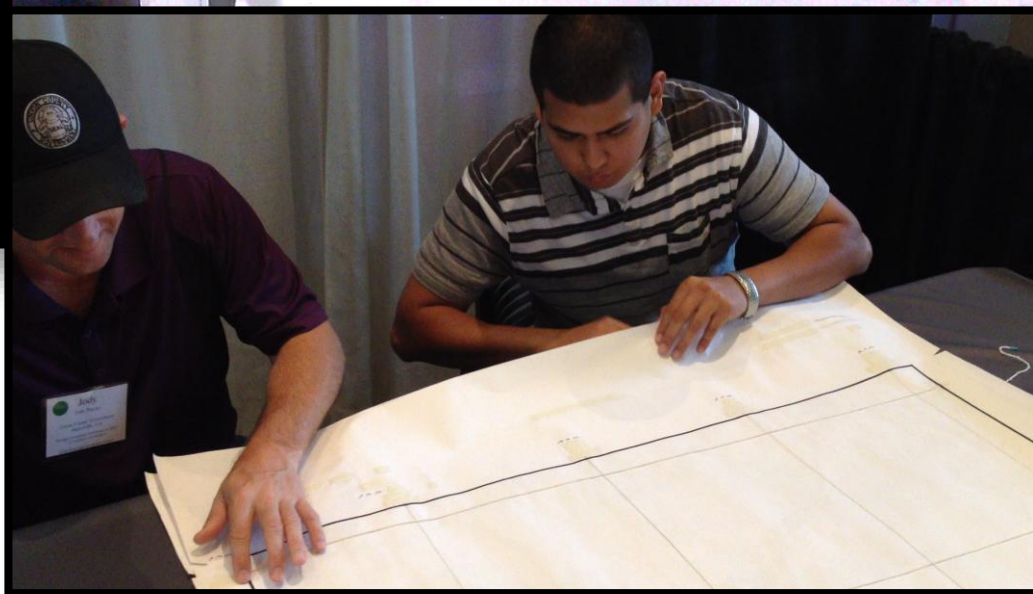
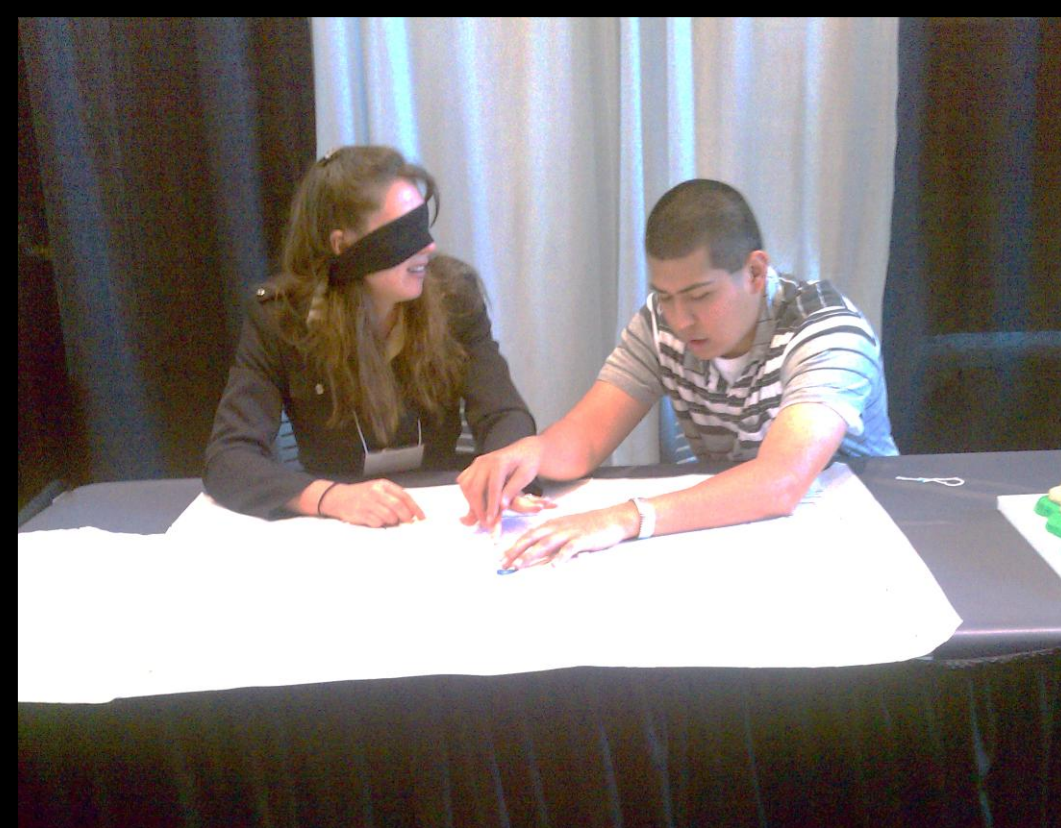
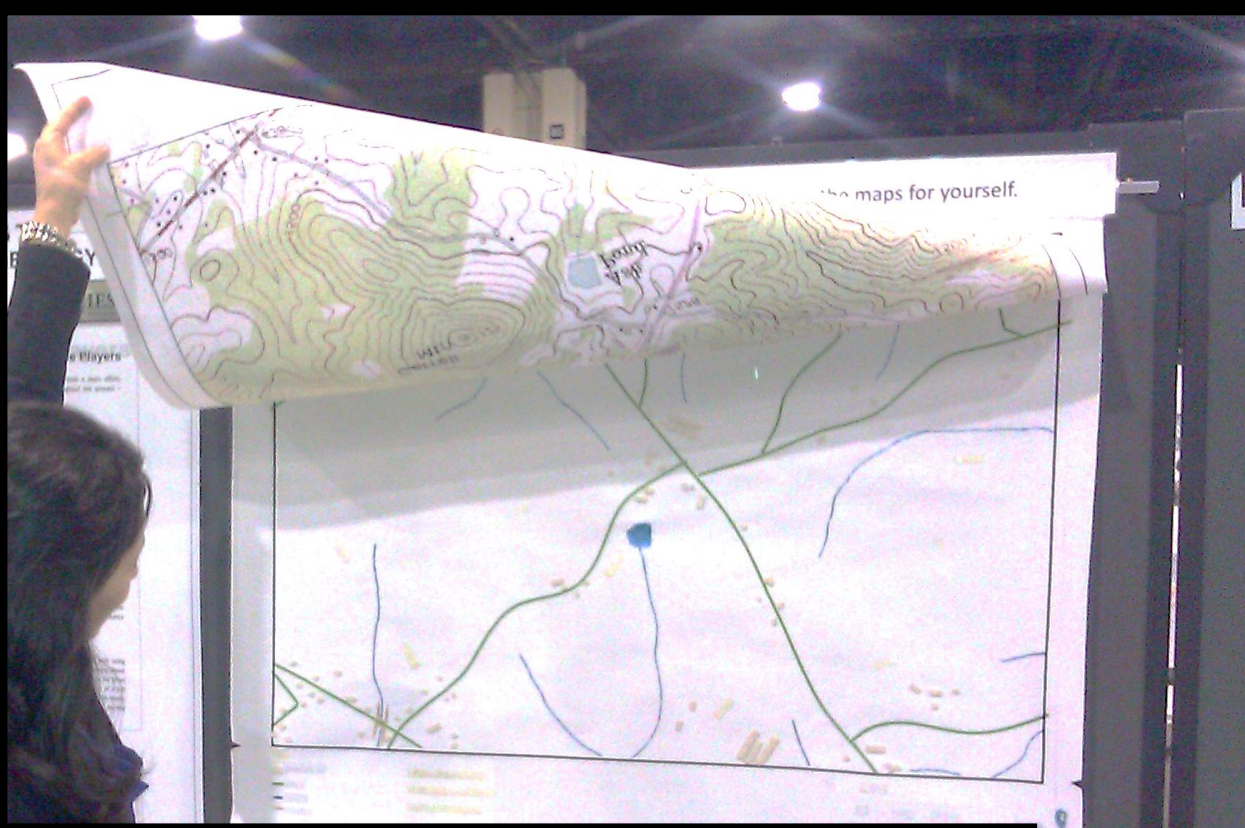
-) Fossils with enhanced tactile features to support hands-on learning



Tactile Topographic Map and 3D Terrain Model

3D printed model of
Dean Mountain,
Dahlonega, Ga, USA



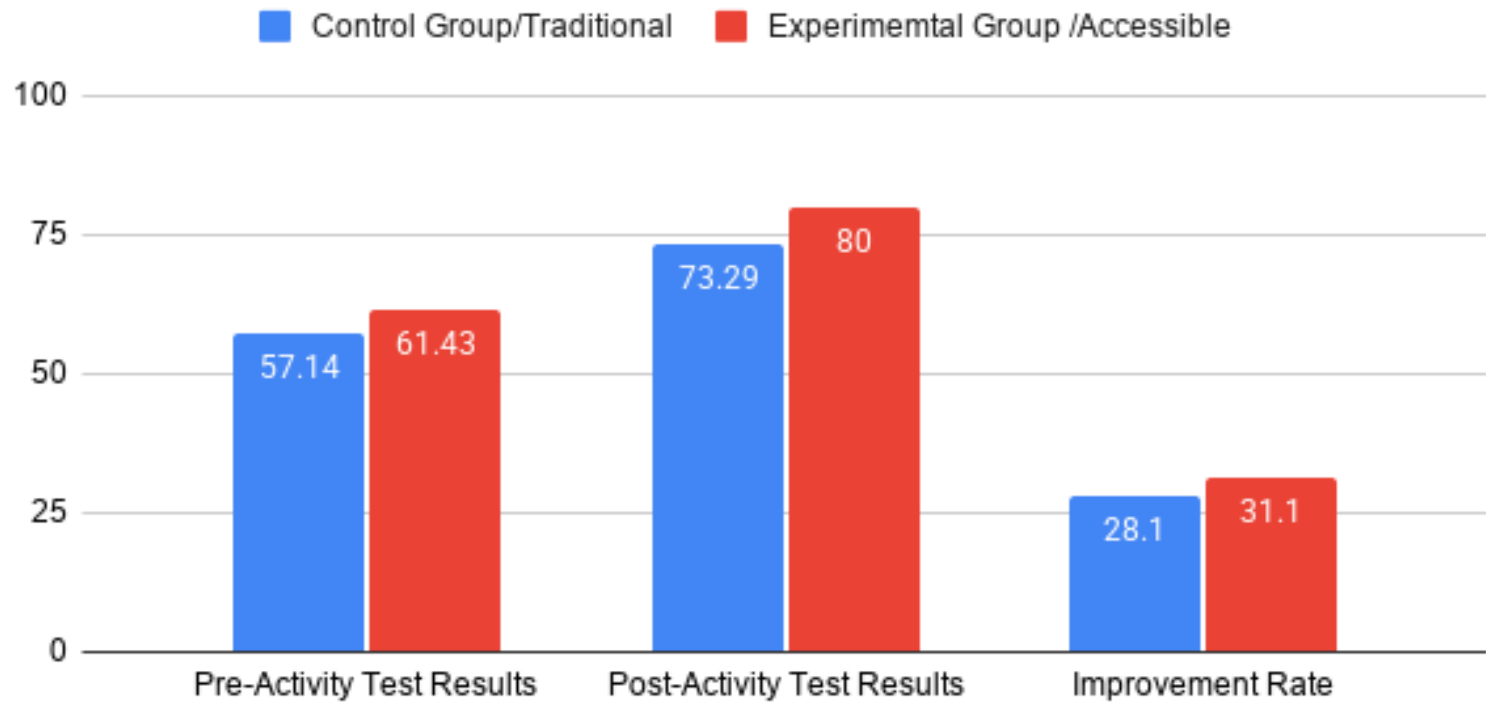




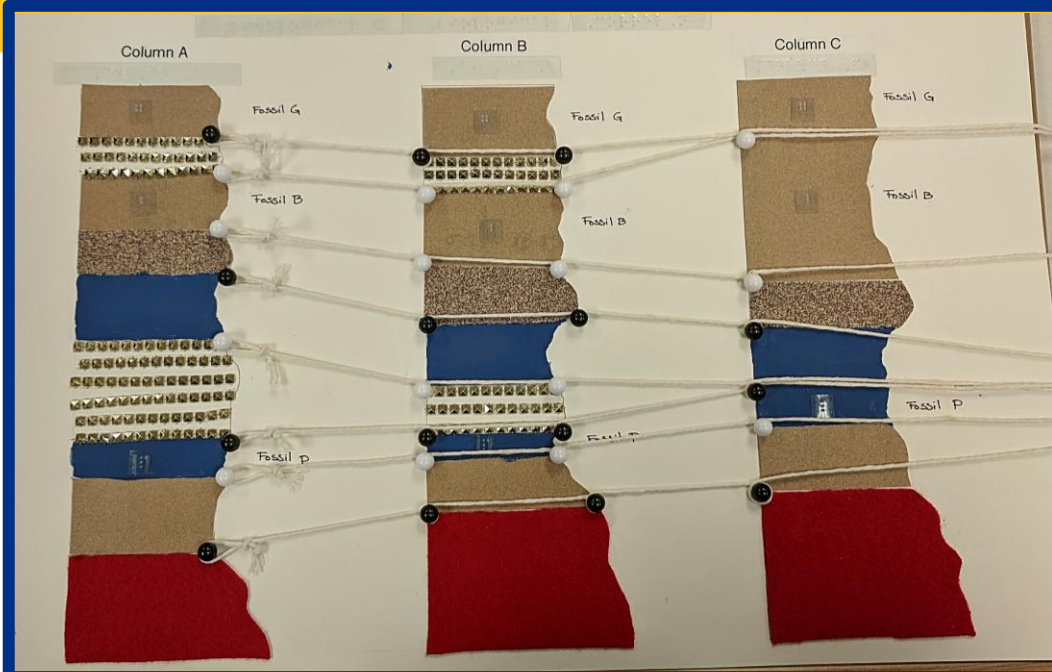
Survey Results: Learning Outcomes and Engagement

- ❖ Increased student engagement observed across activities
- ❖ Improved conceptual understanding, especially in **spatial reasoning tasks**
- ❖ Topographic interpretation improved from **61% → 80%** using accessible tools

Topographic Map Interpretation



Physical Geology Classes (n=48)

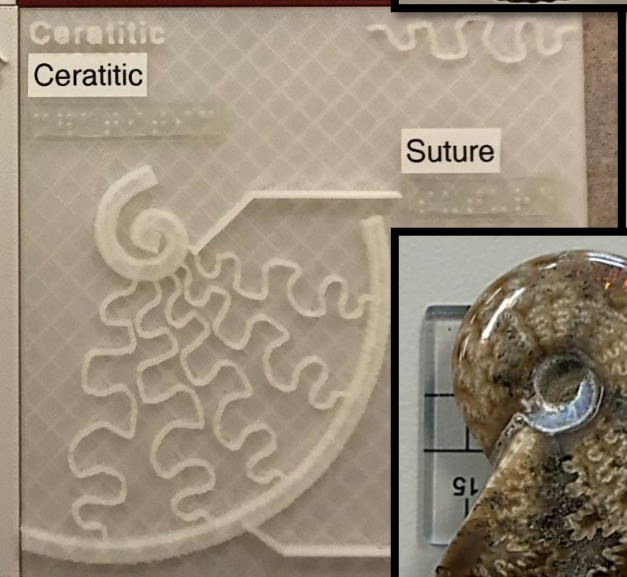
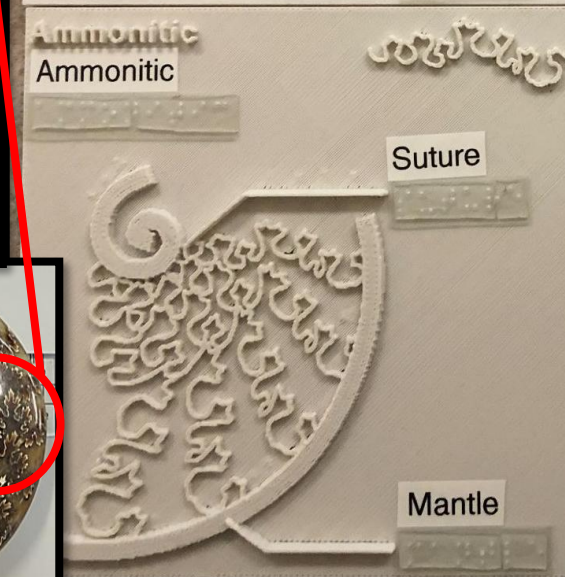
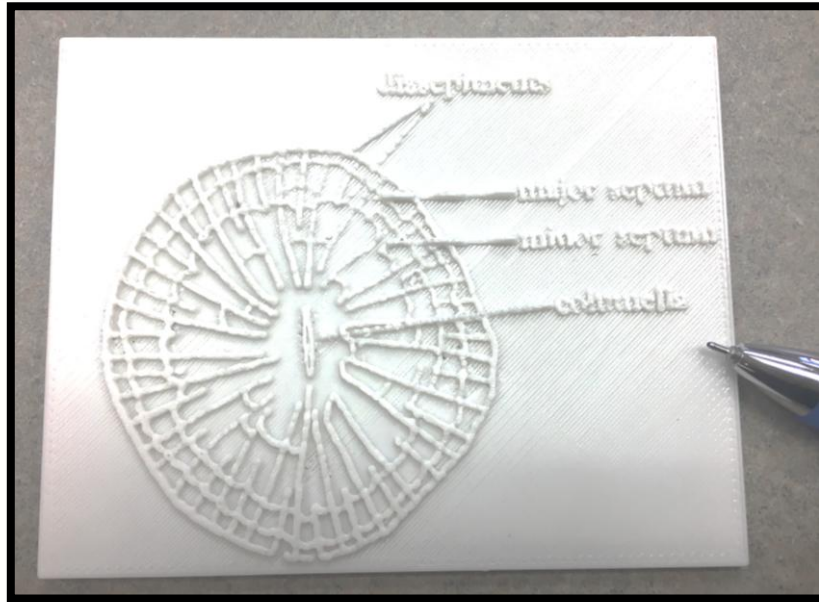
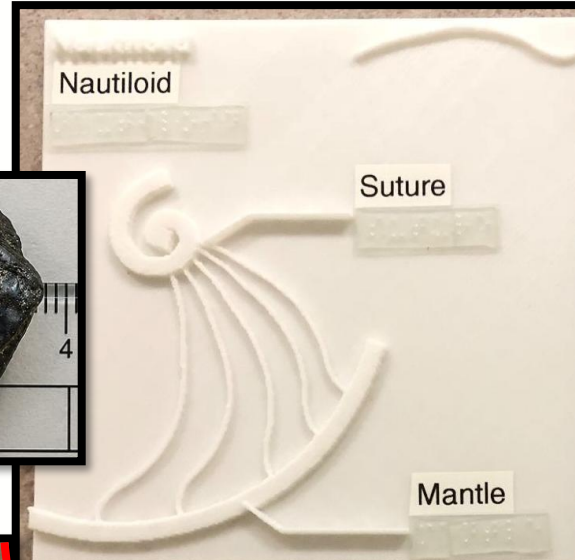
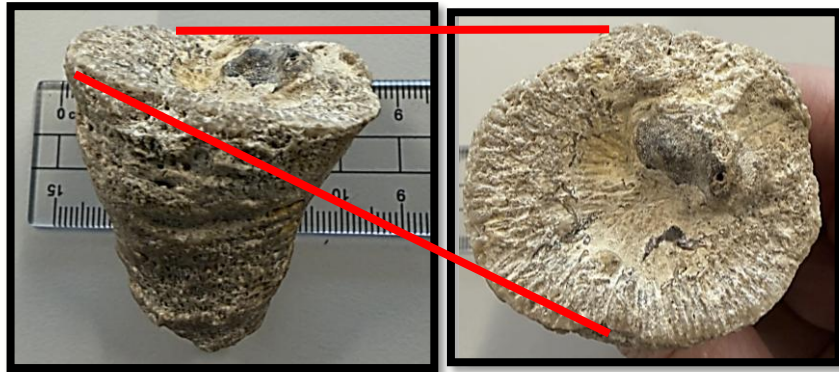


Tactile Diagrams and Models

- ✓ The principles of relative dating
 - ✓ Unconformities
 - ✓ Stratigraphic Columns
 - ✓ Stratigraphic Correlation
 - ✓ Seismograms
 - ✓ Geologic Structures

These materials support hands-on, concept-driven learning that extends beyond visual-only instruction.

3D Printed Tactile Fossil Models

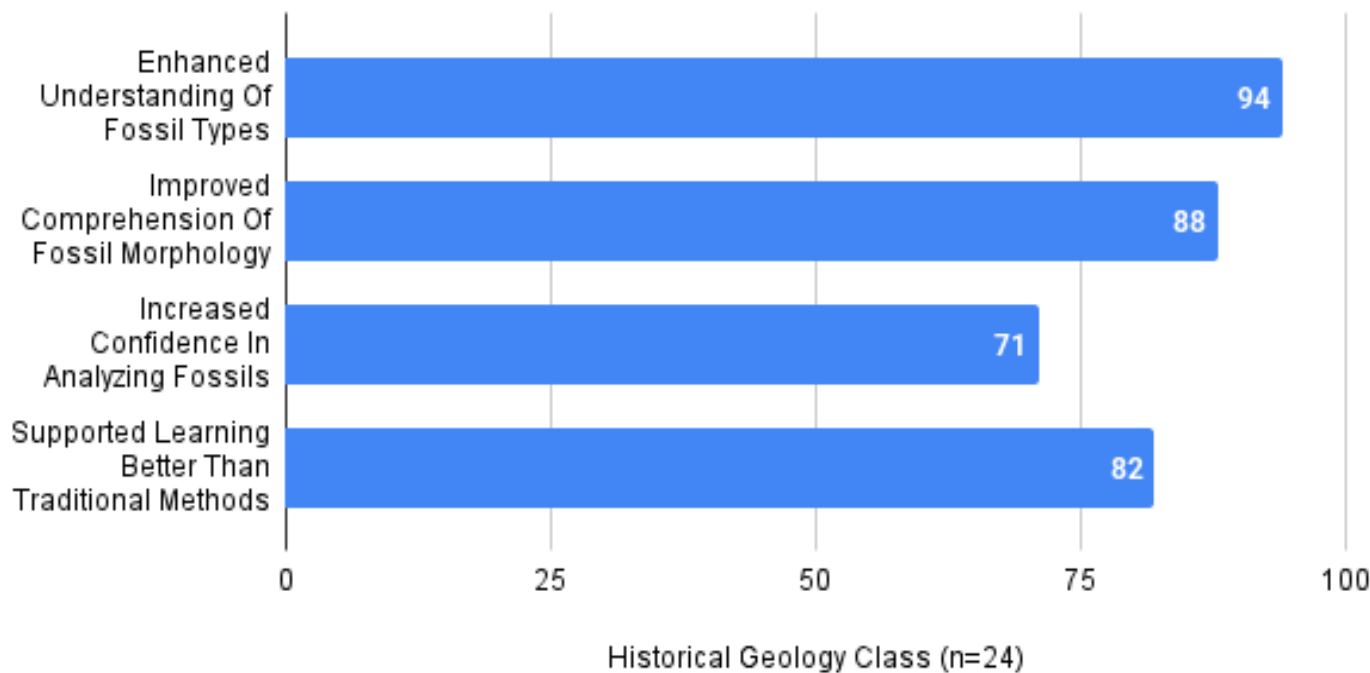


Survey Results: Learning Outcomes and Engagement



Impact of Accessible Materials in Paleontology Education

Survey on the Use of Accessible Materials in Learning



Student Voices:

“Feeling the fossils, even with my eyes closed, helped me understand them better.”

“Seeing different examples and the models up close made the details very clear.”

“I really enjoyed this because I am a visual learner.”



Field-based Learning Environments for Students with Mobility Disabilities

Supporting Multimodal Learning, Accessibility, and Spatial Understanding



ArcGIS StoryMaps
Georgia Geological Geodatabase
Field Data Collection Apps

Field map App
Survey 123 App

Details

View count

20,447

URL

<https://iesa-ung.maps.ar...>

API

JavaScript

GIS-based Field Guide (StoryMap)



A story map



Geology of Georgia

Monadnocks - Stone Mountain, Stone Mountain, GA

Crystalline rocks (igneous and metamorphic rocks) that are more resistant to erosion than their surroundings, often are left as isolated outcrops of rocks protruding above the surface and are called **monadnocks**.

The GigaPan Panorama and snap shots are from Joshua Hoynes. Click on the link provided below to access detailed views of the outcrop.

[Gigapan Imagery of Stone Mountain Monadnock-East Quarry](#)

Q 1: What type of rock is the Stone Mountain made up of?

What is its texture? Did it cool quickly or slowly?

How can you tell the rate of cooling?

Is it intrusive or extrusive rock? What would you name the rock?

What do you suggest for its setting?

Could we consider the Stone Mountain as a **stock**?

Stone Mountain is a large **exfoliation dome**. **Exfoliation** is a process (dilation) that forms onion-like set of joints parallel to the mountain face, mostly in exposed homogeneous rocks such as granite. Exfoliation has been exceptionally active at Stone Mountain and it is the greatest factor controlling the shape of the dome.

Q 2: What type of weathering forms exfoliation joints? elaborate

A number of **aplite dikes** occur in the granite on Stone Mountain. Aplite is a fine grained felsic



Conclusion: Advancing Inclusive Geoscience Education

- ❖ Multisensory, technology-driven approaches **enhance geoscience Learning**
- ❖ Learning outcomes equal or surpass traditional methods
- ❖ Accessibility **supports diverse learners** without sacrificing rigor
- ❖ Promotes a **more inclusive** and **equitable geoscience community**



Acknowledgment

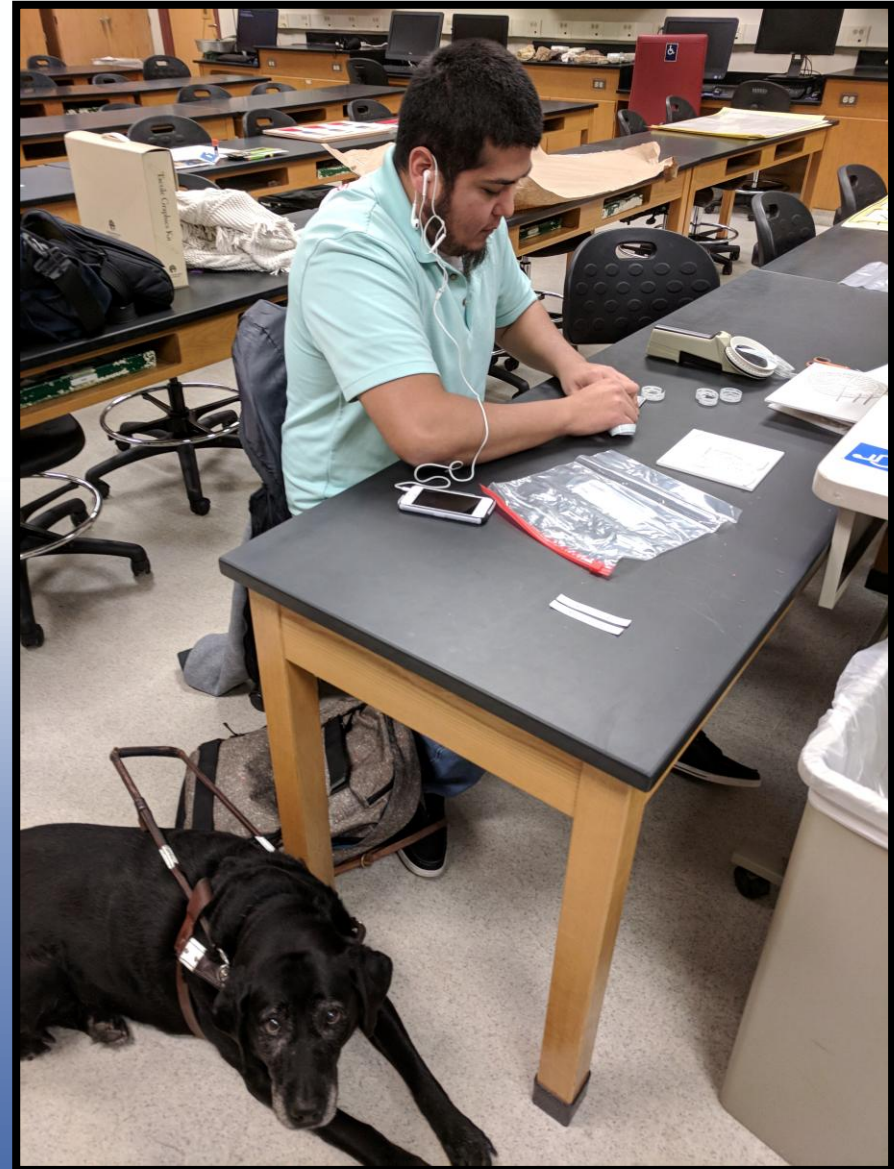
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UNG Presidential Semester Award

Mr. Efren Chavez and Mr. Jeffery Kitchen

Ms. Logan Moore, Mr. Matt Palmer, Mr. Derek Robertson

Make Nashville and 3D Printing Lab at UNG



Questions

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