# Making Geoscience Education Accessible For Students Who Are Blind And Visually Impaired Gina M. Ceylan<sup>1</sup> and Savas Ceylan<sup>2</sup>

1. Science Education, University of Missouri, 65211, Columbia, MO 2. Geological Sciences, University of Missouri, 65211, Columbia, MO

- A geoscience track was designed and implemented during the Youth Slam 2011.
- Applied principles of Universal Design for Learning (UDL) to enable students with a range of visual impairment to participate fully.
- Focus on materials & strategies effective for blind/visually impaired learners.

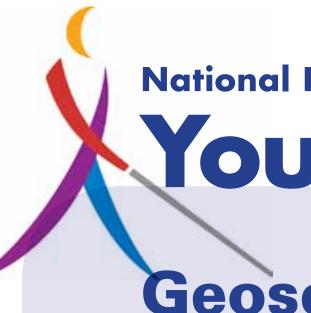


#### http://www.ThelAGD.org

"The International Advisory for Geoscience Diversity (IAGD) is an advisory committee composed of higher education faculty, staff and students, geoscience industry representatives, disabilities education researchers and members of the global community."

#### Research

Past, present and future research project data Global collaboration potential for new and existing partners



#### Materials

- laptops
- braille

#### **Strategies**

- group work

#### **Track Design**

### Multiple Means Of

- Instruction

Resources, suggestions, and best practices for instructors creating accessible content for students with disabilities

#### **Geoscience Track Topics**

 High school science, technology, engineering, and math (stem) academy run by the National Federation Of The Blind

tactile graphics

modeling clay

talking calculators

other non-visual aids

hands on/kinesthetic activities

flexibility of curriculum & materials

Universal Design for Learning (UDL) is a proactive approach to designing curricula and instruction that is accessible to all students.



 Representation Action & Expression Engagement







#### **Student Support**

A community of support for likeminded students studying in the geosciences with similar disabilities



# Recommendations

# Accessing Lecture Materials

	Challenges	Solutions
	ambiguity of lectures	unambiguous verbalizing/description, binoculars or desktop magnifiers, digital access to slides
	sketches, diagrams, graphs	enlarged and high contrast images, audio-tactile sketches, other tactile graphics, sonification softwares
	note-taking	online notes, audio- recorded lectures/ lecture capture, laptops/ other note-takers

#### Assessments

Challenges	Solutions
paper/pencil	enlarged or digital tests
pictures, diagrams, maps	large/high contrast materials, audio-tactile sketchpads, clay/ other manipulatives, computers
clickers/other formative assessments	tactile clicker marker, verbalize questions, use computers

# Lab Materials

Challenges	Solutions
rocks and minerals, fossils	group work, CCTV/ other magnification, emphasize non-visual properties, verbal description, audio- tactile practice, models
drawing, maps, diagrams, graphs, pictures	group work, 3D models, enlarged/high contrast, audio-tactile sketches, tactile graphics & graph paper, raised maps, sonification, verbal description
microscopes	connected to zooming screen or projector, verbal description

# Navigating and Observing in the Field

Challenges	Solutions
safety, hiking	sighted guide, group work, trekking poles, communication, knowledge of environment
observing, strike/dip, rock properties	group work, accessible compasses, tactile observation, background knowledge, lots of discussion
mapping	group work, large/high contrast, digital, audio- tactile, raised maps, verbal description

# Research

Challenges	Solutions
accessing softwares	pages, numbers, Matlab, Vinux, screen magnification and text- to-speech
accessing and synthesizing literature, referencing	accessible digital articles, occasionally tactile graphics, Kurzweil
manipulating mathematical and chemical expressions	softwares, audio stickers

# Where Progress Is Most Needed

awareness of and communication about possibilities, resources, and strategies

better availability of existing resources, support and strategies for teachers

accessibility of softwares, manipulation of math and chemical equations

increased opportunities