Collaborative Research: SEI: Teachers and Researchers Advancing Integrated Lessons in STEM (TRAILS) 2.0

**Project Overview:** TRAILS 2.0 will expand, scale, and innovate a tested model of integrated STEM to enhance rural students’ STEM learning and interest in STEM careers

- Significant growth in **teacher self-efficacy** teaching integrated STEM ($p<0.05$).
- Significant teacher **STEM career awareness** ($p<0.001$)
- Significant growth in **student STEM content knowledge**

**Scope:** Reach underserved and underrepresented rural populations. We will partner with up to **90 secondary STEM teachers** and impact over **10,000 students**.

**Expanded Partners:** 8 faculty across 5 universities and non-profit Spark 101.
TRAILS Approach

• Blend science inquiry and engineering design that lead to biomimicry solutions

• Partner Science (Life Sciences) and Engineering Technology Teachers

• Partner with people working in STEM careers living in the local community (community of practice)

• Construct 3D printed prototypes or models

• New Leverage local rural contexts to create place-based STEM learning
Locating Partners

Hawaii Islands (Cohort III)
University of Hawaii at Manoa

Colorado and N New Mexico (Cohort II), Otero University

Delmarva Peninsula (Cohort I)
(Delaware, Maryland, and Virginia)
University of Maryland ES
Professional Development (PD) Goal: Increase Teachers’ Expertise and Agency by Intersecting Three Knowledge Domains

Three Domains of Place-based Knowledge (PBK)
1. STEM content and practices;
2. Landscape: science, history, culture, place names;

Three PBK Challenges:
1. Limited PBK STEM;
2. Limited PBK & STEM/culture networks;
3. Limited PBK of culture(s)

PBPD: Strengths-based, cultural funds of knowledge
1. Start with familiar places, stories, local issues
2. Strategy: community map, curricular map, PB pedagogy

Figure 1. Intersecting knowledge domains supports teachers’ interest, expertise and agency. P Chinn
Teachers Discover: Leone Village rich in resources to create place-based STEM curriculum


3. Archeology FTs: quarry, grinding facets, petroglyphs, archeology lab, Heritage Preservation Office.

4. PB STEM: EQ, tsunami, local plate tectonics of Tonga Trench, past/current activity of Samoa hotspot.

5. Stewardship: restore mangroves, remove tsunami litter.

PBPD supports teacher agency & expertise

Iutita Savali, Sarah Pritchard-Su’a:

“This placed based paper using our backyard as a starting point has really opened our eyes to knowledge that wasn’t known before. It can be the foundation to build new knowledge and to develop a complete, localized, STEM place-based curriculum.”

Leone Village: 2009 tsunami reached Leone Falls, 11 die. Tataga Matau adze quarry at top of falls.
Map: I. Savali, S. Sua-Pritchard.
What do we learn as place-based, culturally responsive educators?

PBPD supports learning, engagement, sense of place, stewardship.

1. Creates community-based knowledge networks;
2. PB inquiry builds new PBK;
3. Sustains language, culture, places of native and local peoples;
4. Supports participants' engagement, expertise, agency;
5. Supports entry of underrepresented students into STEM.

Above Dwarf ‘ōhi’a lehua, Wai‘aleale Bog, Kaua‘i, (Photo: P. Chinn)

Left, Leone Bay: Mr. Taua‘i walking past polishing facets (Photo: P. Chinn)