TRAILS

Teachers and Researchers Advancing Integrated Lessons in STEM

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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 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**

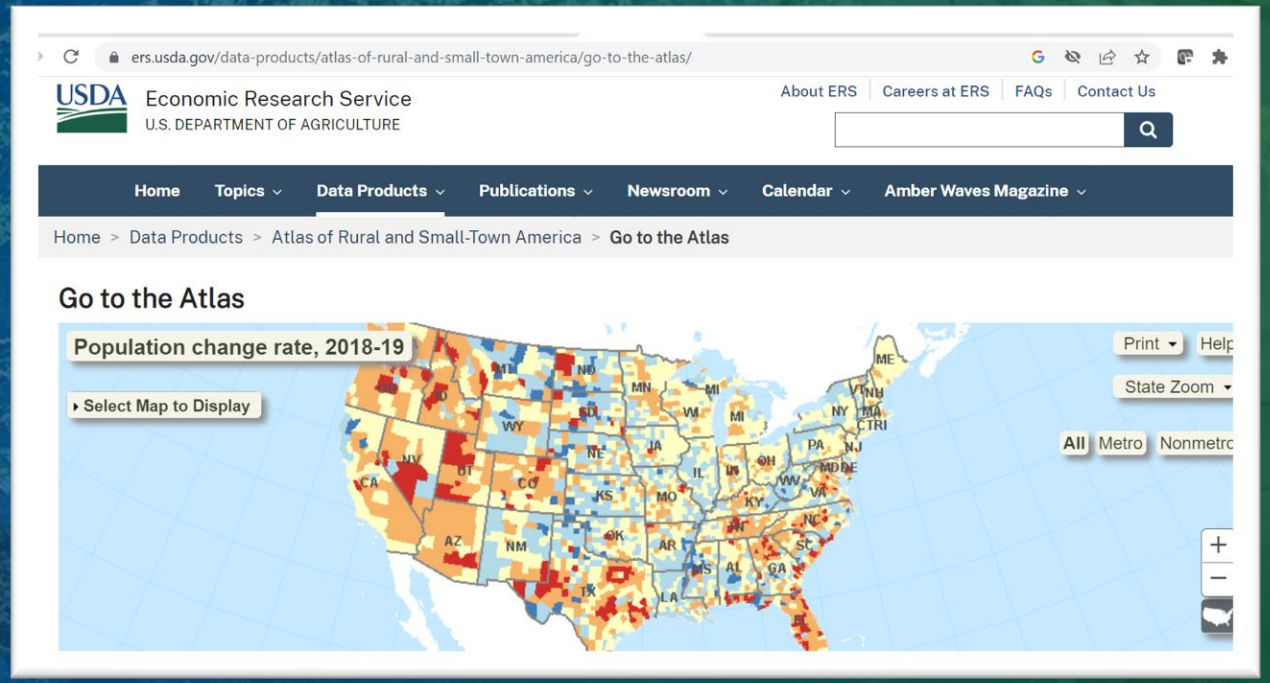
Scope: *Reach underserved and underrepresented rural populations, We will partner with up to* ***90 secondary STEM teachers*** *and impact over* ***10,000 students****.*

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

TRAILS Approach

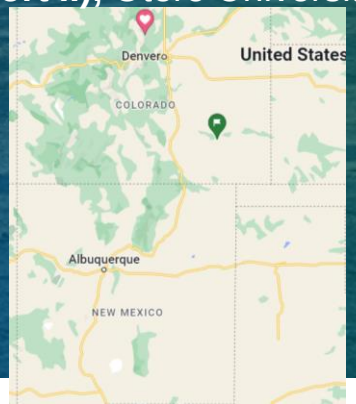
- Blend science inquiry and engineering design that lead to biomimicry solutions
- Partner Science (Life Sciences) and Engineering Technology Teachers
- Partner with people working in STEM careers living in the local community (community of practice)
- Construct 3D printed prototypes or models
- **New** Leverage local rural contexts to create place-based STEM learning

Locating Partners



Delmarva Peninsula (Cohort I)
(Delaware, Maryland, and Virginia)
University of Maryland ES

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



Hawaii Islands (Cohort III)
University of Hawaii at Manoa

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;
3. Culture: Indigenous/local values, practices, stories.

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
3. Case study American Samoa: PB, culturally sustaining Earth Science-archeology curriculum.

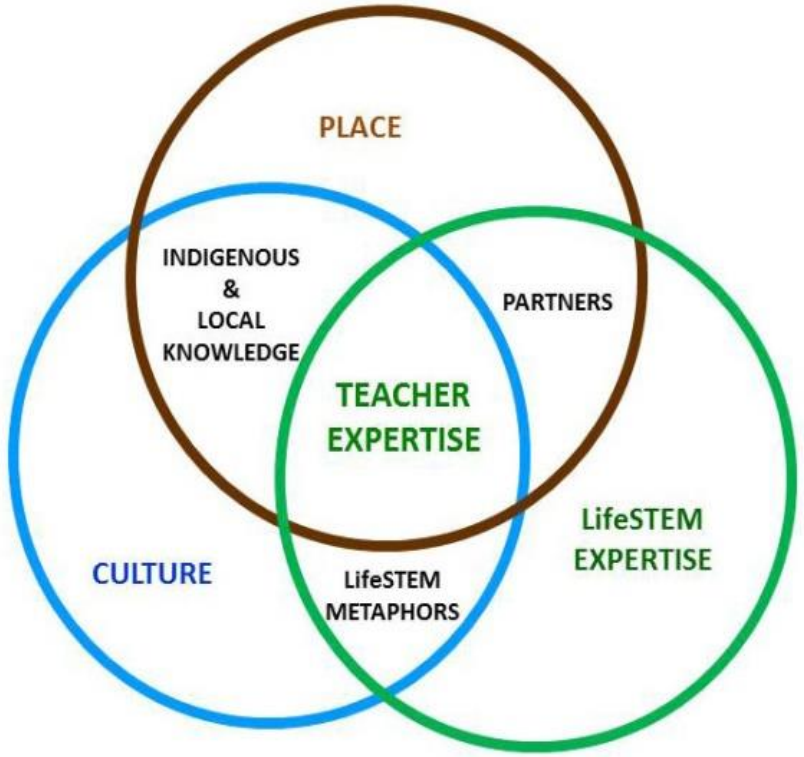


Figure 1. Intersecting knowledge domains supports teachers' interest, expertise and agency. P Chinn

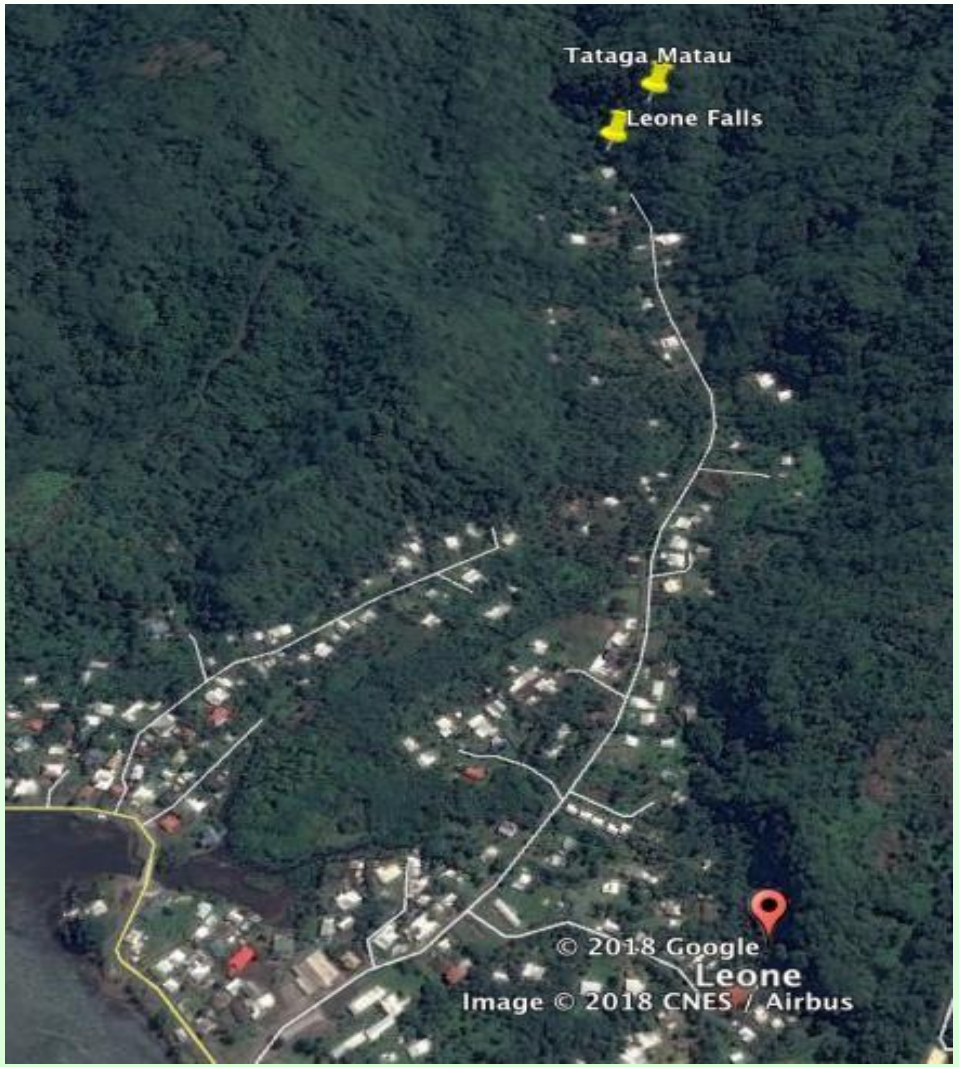
Teachers Discover: Leone Village rich in resources to create place-based STEM curriculum

1. 2009: 11 villagers die in tsunami (8.1 mag.Tonga Trench). Students create dioramas: 4 escape routes at 6 hour intervals.
2. Ancestral story of Leone Village - Cook Islands adze trade.
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 ʼōhiʻa lehua, Waiʻaleale Bog, Kauaʻi, (Photo: P. Chinn)

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