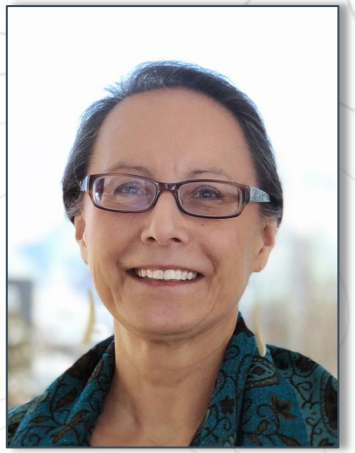
Diversity, Education, and Workforce Development (DEW)

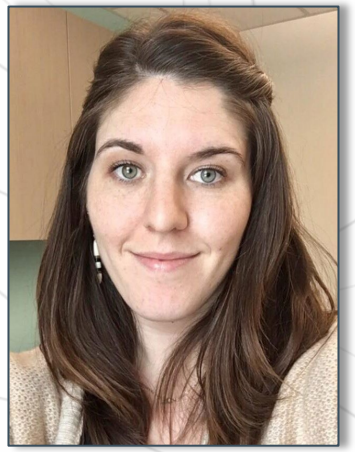
DEW Core Team Members

Dr. Laura Conner
DEW Lead



Dr. Beth Leonard
Indigenous Science

Dr. Megan McGinty
Learning Sciences Postdoc



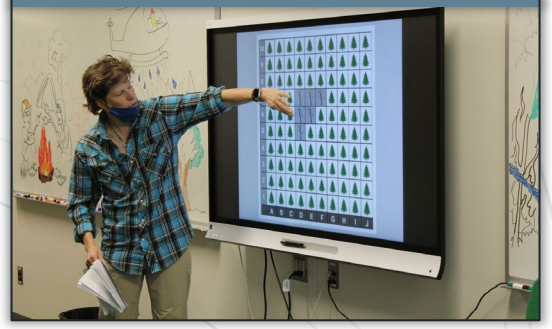
Courtney Breest
UAA/UAS Coordinator

Dr. Joanna Young
UAF Inspiring Girls Director

Sarah Clement
UAF Inspiring Girls Coordinator

DEW Goals

Goal 1



Build key competencies among stakeholders to address ecological change.

Goal 2

Build a diverse pool of STEM learners and workers in Alaska.

Goal 3

Increase capacity for F&I science and teaching among UA faculty and students.

GOAL 1: Build key competencies among stakeholders to address ecological change.

Objectives	Planned Activities	Accomplished to date
Objective 1.1 Increase K-12 student knowledge and skills about ecological change related to F&I themes.	• Reach 350 students via **STEM curricula** • Train 60 teachers through 3 **workshops**	• Estimated 1,000 students reached to date • Reached 57 teachers, with 4 workshops
Objective 1.2 Prepare UA students with F&I-related knowledge and skills.	• Implement **Fire & Ice content** in 4 UA courses per year	• 4-6 courses include F&I content annually

Wildfire Curriculum

- Partnered with Fairbanks North Star Borough School District to assess needs and define target audience, scope, length, etc.
- Set of five lessons for 3rd-5th grades (adaptable for other ages)
- Lessons use observation and science sense-making (aligned with Next Generation Science Standards)

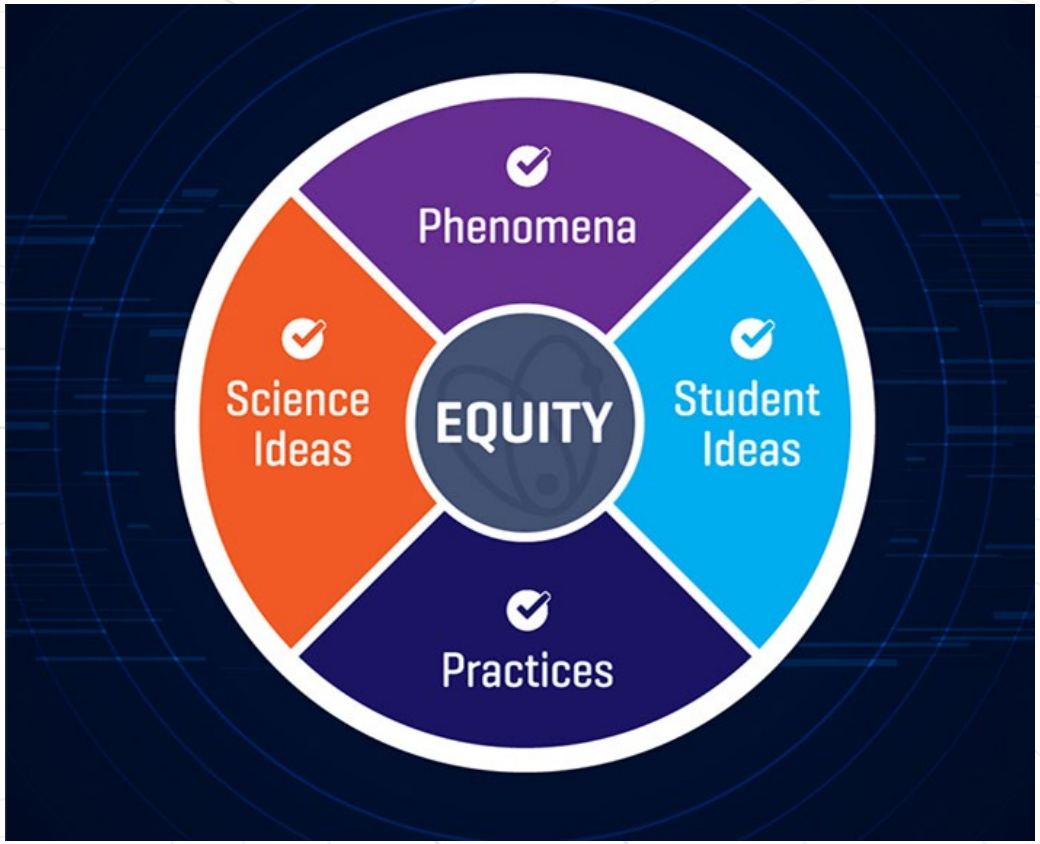
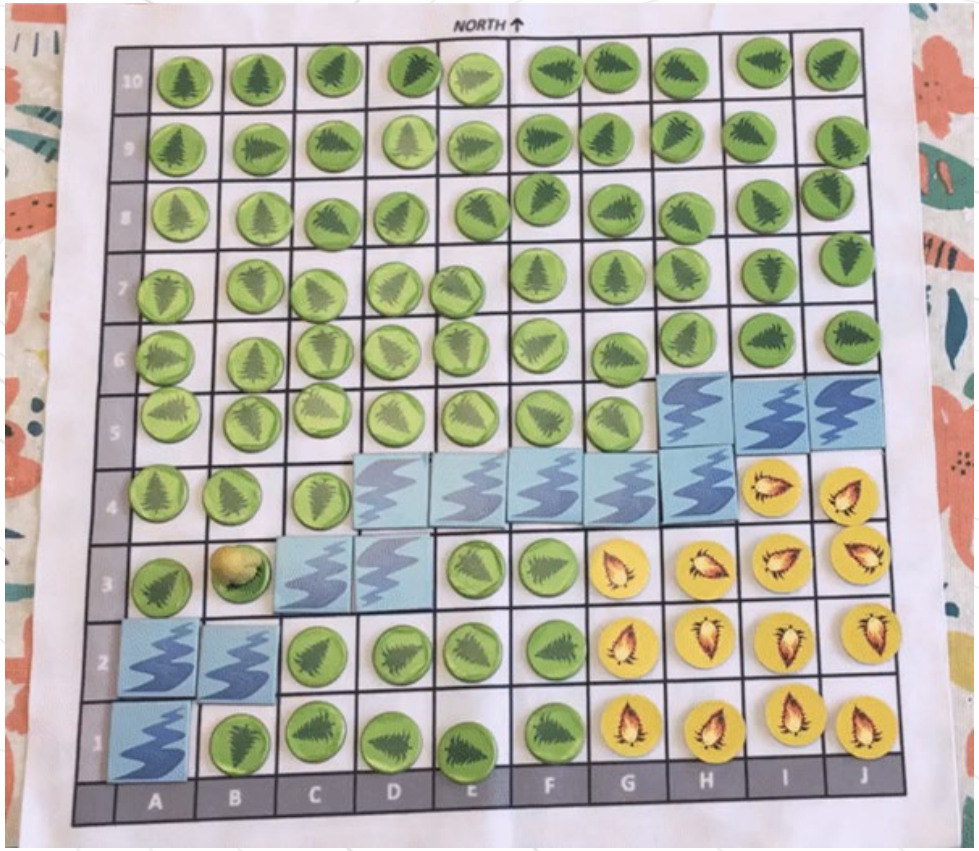


Image Courtesy: NSTA

Wildfire Curriculum

- Lessons centered on “Forest Fire Simulation Game” that explores wildfire behavior
- Students work through scenarios, explore their own ideas
- Learn that humans are part of the cycle and can influence it

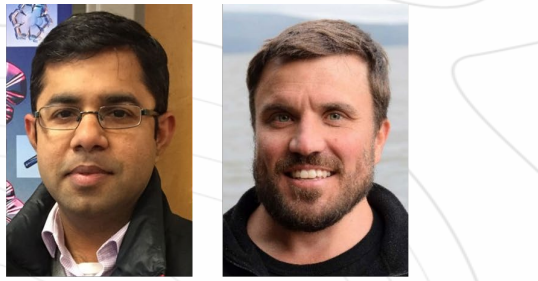
“You have been asked to conduct a prescribed burn that is big enough to cover 10 squares, but ONLY 10 squares. Where will you cut the fire break?”



Wildfire Curriculum

- Curricula used in partner schools, After School programs, PLT, and Alaska Consortium Educators partner schools
- Created additional teacher resources to support curriculum
- Evaluation shows gains ($p < 0.001$) in teacher skill around:
  - supporting systems perspective
  - supporting students ideas about fire cycle and behavior
  - integrating multiple disciplines through the wildfire curriculum

Fire and Ice content in UA courses







Faculty teaching courses

Geoscience Applications of Remote Sensing (UAF)

- Incorporated remote sensing of wildfires

Principles and Techniques of Wildlife Management (UAF)

- Addressed wildfire impact on moose, caribou and other ecosystem services
- Completed implicit bias exercise to facilitate discussion of gender issues in the field

Human Dimensions of Wildlife Management (UAF)

- Included presentation on human development in wildlife refuges and facilitation of land management issues

EPSCoR seminar (UAF)

- Students presented project data and discuss related papers

Environmental Geochemistry (UAA)

- Students analyzed F&I stream data

Earth and Environment (UAS)

- Students visited F&I field site and discussed F&I data

GOAL 2: Build a diverse pool of STEM learners and workers in Alaska.

Objectives	Planned Activities	Accomplished to date
Objective 2.1 Support diverse UA STEM undergraduates (focus on First-Generation students); diversify hires	• **Tutor** 180 First-Generation (FG) students • Reach 215 FG students through **difference- education interventions** • Conduct **research** on undergraduate FG STEM pathways • Produce 5-10 **"Faces of STEM"** stories • Support diversity in **research hires**	• Supported eight STEM tutors, reaching 271 students to date (more in Year 5) • Held six difference education events, reaching 270 students (final count) • STEM research presented at a conference, paper in review • Completed 10 "Faces of STEM" stories • Created and implemented hiring plan
Objective 2.2 Increase interest in, and identification with, science among pre-college girls	• Enroll 54 girls in **Girls on Water** (GOW) and **Girls in the Forest** (GIF) programs	• 45 girls participated in person, 36 reached virtually (18 more in summer of 2023)

Girls on Water & Girls in the Forest

- Based on successful NSF-funded "**Girls on Ice**" program
- Two-week backcountry expeditions for 16-18 year-olds
- Community of practice model includes:
  - Authentic science practices: observation, experimentation, gathering and analyzing data, presentation
  - Artistic inquiry
  - "Leave no trace" ethic
  - Physical challenge
  - Leadership training

Model supports **tacit and explicit science skills & knowledge***

*Carsten Conner et al. 2018 International Journal of Science Education

Girls on Water & Girls in the Forest

- Two programs are unique to Fire & Ice but spun off from “Girls on Ice” model
- Girls on Water: kayak expeditions in Kachemak Bay in Southcentral AK
- Girls in the Forest: hike/packraft expeditions on Chena River in Interior Alaska

Clayton (2003): Environmental identity

- **Personal history**
- **Place attachment**
- **Autonomy**
- **Social influences**
- **Competence**
- **Relatedness** - spiritual relation or sense of fitting into a larger picture
- **Pro-environmental motivation** - desire to act on behalf of nature

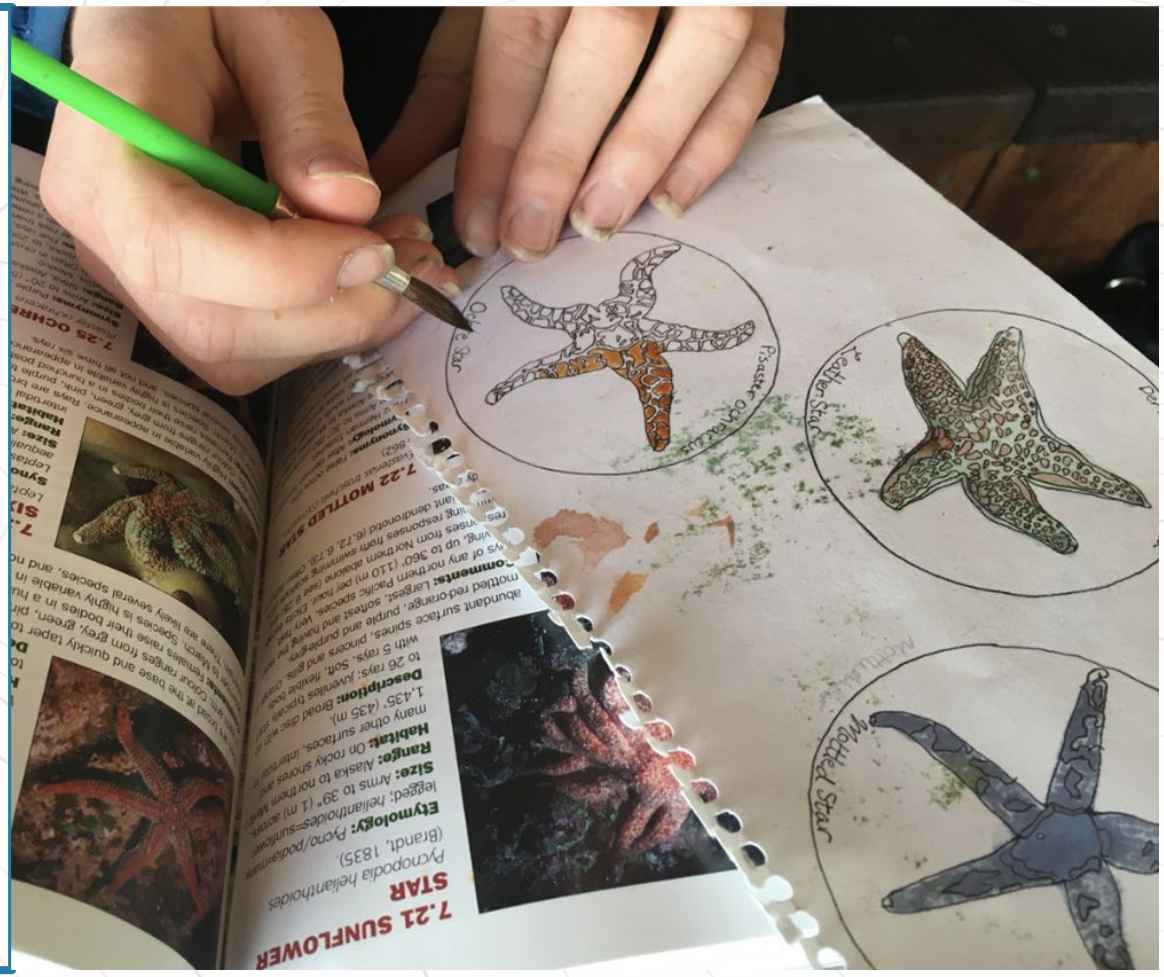
Girls on Water & Girls in the Forest - Past research

Model supports **environmental identity shifts****

**Young et al. 2020 International Journal of Science Education

Best practices for increasing DEI in STEM

- Tuition-free; equipment provided; travel scholarships
- Application: no grades, personal essays
- Building diverse teams
- Connect relevance of STEM to personal lives
- Integrate art as foothold into STEM
- Instructors: DEIJ workshops, professional development scholarships, broad advertising
- Pilot DEIJ program evaluation Qs



Girls on Water & Girls in the Forest - New article

Model utilizes best practices in diversity, equity and inclusion

**Young et al. 2023 (in press) Sibirica journal special issue “Intersectionality in the Arctic”

Program Evaluations

- Currently underway; prelim findings include Year 1 GOW and Years 3 & 4 GOW & GIF (n=46)
- 6 items indicate participants report being very satisfied with their experience
- Constructs: general science interest, science career interest, science identity, systems thinking
- Increases in all constructs
- Significant increase in science career interest

STEM Pathways Research

Introduction to research

- First-Generation STEM students are increasingly represented at colleges across the nation
- Documented higher drop-out rates, lower academic performance, and longer time to finish degree*
- Some research shows cultural capital deficits, such as low levels of family support, and ill-defined educational degree expectations and plans**
- While this research illuminates the need to support FG students, it has led to a *deficit-based* narrative

First-Generation event at UAF

* Davis, 2012; Engle & Tinto, 2008; Harackiewicz et al., 2014; Sirin, 2005;
** reviewed in Pascarella et al., 2004

STEM Pathways Research

Theory

Example of deficit-based frame.

Image Courtesy: Trabian Shorters

We approached the research from an *assets-based* frame: what strengths do students bring?

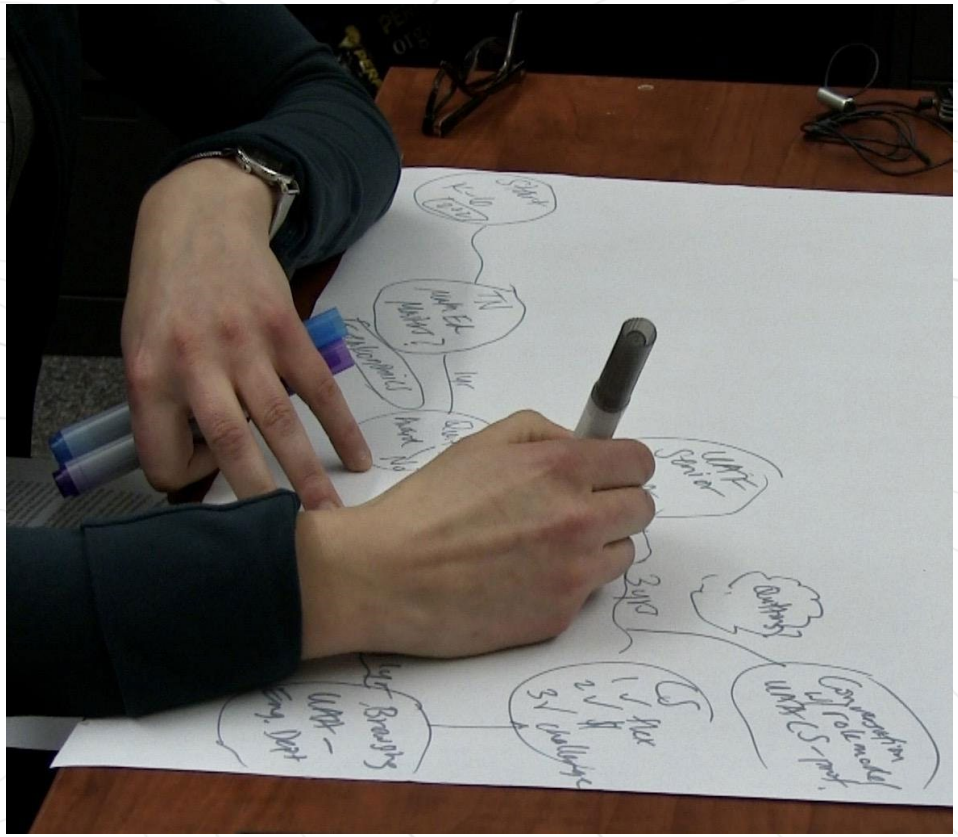
- Looking at STEM pathways before and during college
- Some theory suggests possible tensions between STEM pathways and cultural roots
- Others suggest that connection to roots could be a form of *cultural capital*

Research question: What forms of cultural capital do First-Generation students leverage along STEM pathways?

STEM Pathways Research

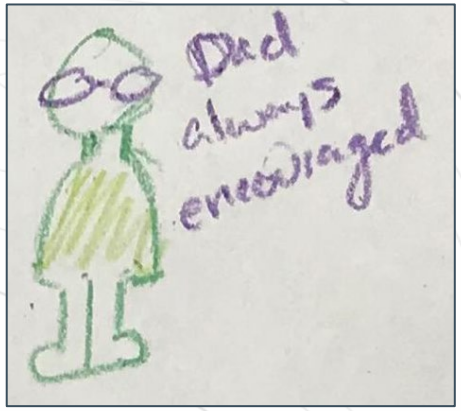
Methods

- Qualitative study of 19 First-Generation STEM undergraduates
- Semi-structured interviews
- Students asked to draw their personal STEM timelines
- Grounded theory used for analysis (codes emergent from data)



STEM Pathways Research

Findings



In contrast to dominant narratives, students reported robust familial support that took several forms:

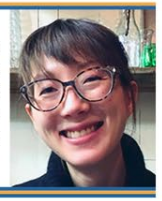
1) *Nurturance* of college aspirations and early STEM interests
2) *Financially related support*, including direct support, or emphasizing the value of/pushing for college attendance education even in the absence of financial resources
3) *Modeling STEM careers* that don't require bachelor degrees
4) *Expectations of attending college*

Faces of STEM

Many University of Alaska students have gone on to exciting careers in science, engineering, technology and math (STEM). We interviewed 10 UA graduates from different backgrounds and STEM fields to learn more about their unique paths to success.

James Campbell received a doctorate in Atmospheric Sciences from UAF and is now a meteorologist for the Naval Research Laboratory.

Mindy Kim Graham got her bachelor's in Chemistry from UAA and works as a postdoctoral cancer researcher at Johns Hopkins.



Thomas Farrugia earned his doctorate in Fisheries at UAF and now monitors harmful algal blooms for the Alaska Ocean Observing System.

Nikki Grant-Hoffman's Ph.D in Ecology at UAF led to a career as an Ecologist and Science Coordinator for the Bureau of Land Management in Colorado.

Liz Dennett got her bachelor's in Geology and Earth Science at UAA and builds cloud-based solutions for Amazon Web Services' Energy Data Platform.

Shawn Takak turned an Engineering B.S. from UAA into a career improving village water, sewer, and energy systems with the Alaska Native Tribal Health Consortium.

Carla Cartagena De Jesus received her B.S. in Biological Sciences from UAF and works as a pediatrician at Fairbanks' Tanana Valley Clinic.

Thomas Hughes earned his bachelor's in Civil Engineering at UAF and is an engineer for the Alaska Department of Transportation.

Lee Foulkes received a Bachelor's in Marine Biology from UAF and has a job as a Program Support Biologist for the Muckleshoot Tribe in Western Washington state.

Sigrun Hreinsdottir received her Ph.D in Geophysics from UAF and now studies earthquakes and volcanoes as a geodetic scientist in New Zealand.

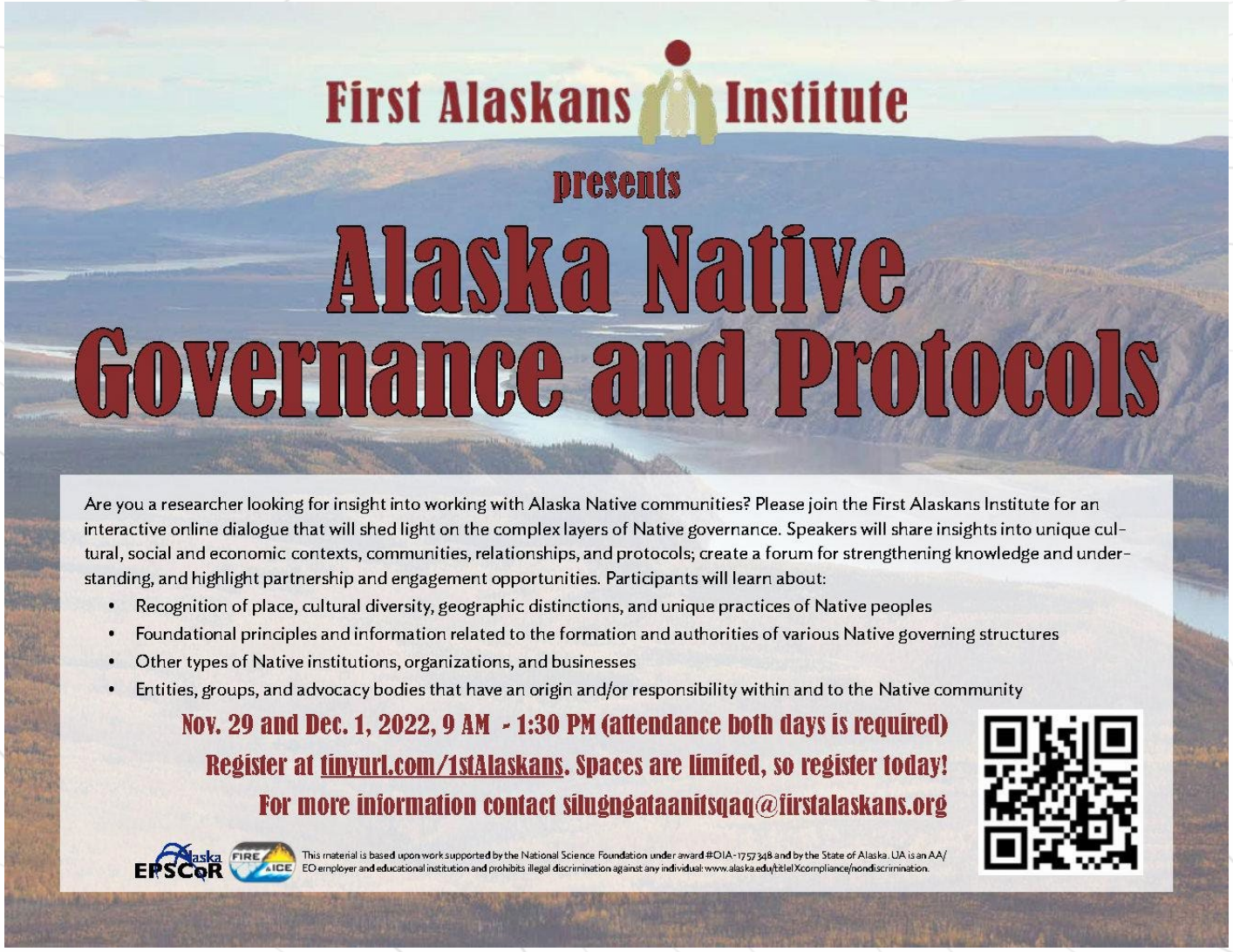
Read the interviews at
tinyurl.com/Faces-of-STEM

 This material is based upon work supported by the National Science Foundation under award #OIA-1757348 and by the State of Alaska.

GOAL 3: Increase capacity for F&I science and teaching among UA faculty and students.

Objectives	Planned Activities	Accomplished to date
Objective 3.1 Provide mentorship, training, and travel opportunities to F&I faculty and postdocs	• **Mentor** at least 12 F&I faculty and postdocs • Provide 40 faculty **travel awards**	• Reached 77 people through workshops and/or postdoctoral mentoring group (more in Year 5) • Awarded 155 travel awards
Objective 3.2 Increase UA faculty capacity to teach diverse students	• Reach 230 people through **diversity** and **teaching and learning workshops**	• 169 participants in diversity workshops • 40 participants in teaching and learning workshops • 1 conference presentation

Diversity Workshop



Activities in partnership with Central and KBNERR

Alaska EPSCoR

UAF University of Alaska Fairbanks
College of Natural Science & Mathematics

CEM

Alaska EPSCoR

NSF

Science Pubs

Alaska EPSCoR

NSF

Webinar with Alaska Travel Industry Association (ATIA)

“Natural History Information for Tour Guides”

Rick Thoman
Climate Change
UAF IARC

Molly McCarthy-Cunfer
Alaska’s Salmon
Alaska Department of Fish & Game

Allison York
Wildfire
UAF Alaska Fire Science Consortium

Eric Klein
Glaciers
UAA Geology

Omega Smith
Aurora Borealis
UAA Planetarium

Student Collaborations

Let's connect!

- **Community Presentations**
  - Science Pubs
  - Stakeholder presentations
- **Materials**
  - Wildfire Game
  - 3D maps - Lynn Canal & Kachemak Bay
  - Coastal Margins related hands-on activities

Alaska EPSCoR

NSF

Connecting Coastal Margins EPSCoR Research to Community through DEW Activities

Kachemak Bay National Estuarine Research Reserve

Syverine Bentz
Coastal Training

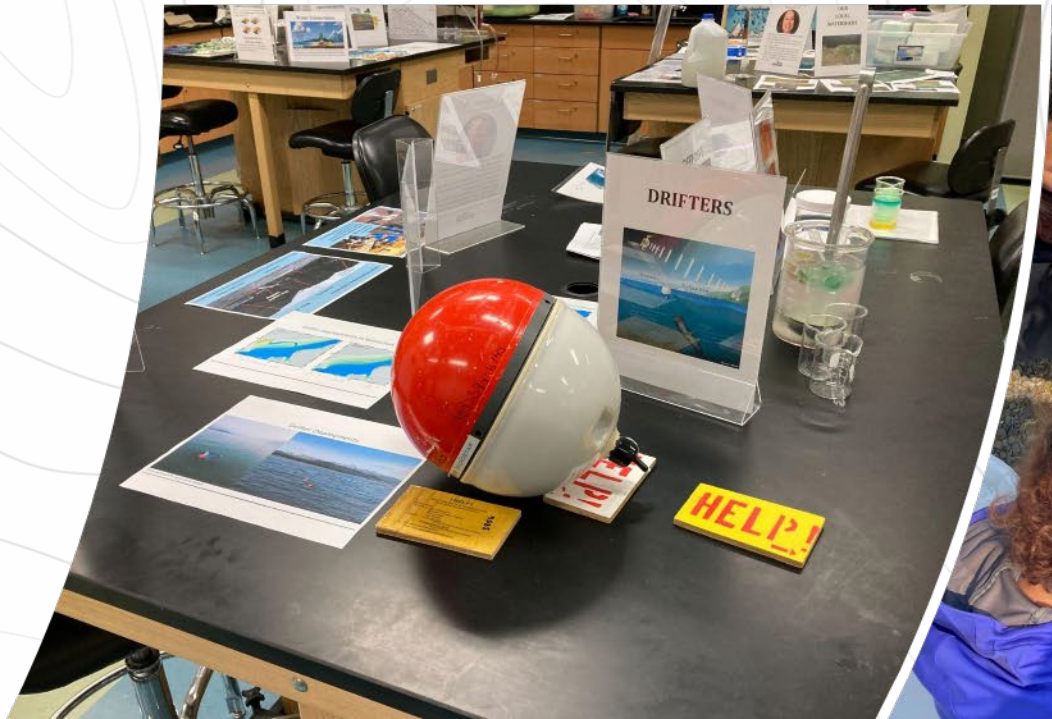
Ingrid Harrald
Education

Alaska EPSCoR

NSF

Transferable Education Modules

- Evergreen Resources
- Local Context
- Diverse Audiences



Alaska EPSCoR

Student Knowledge and Skills

- Practical experience
- Systems thinking
- Learner centered

Alaska EPSCoR

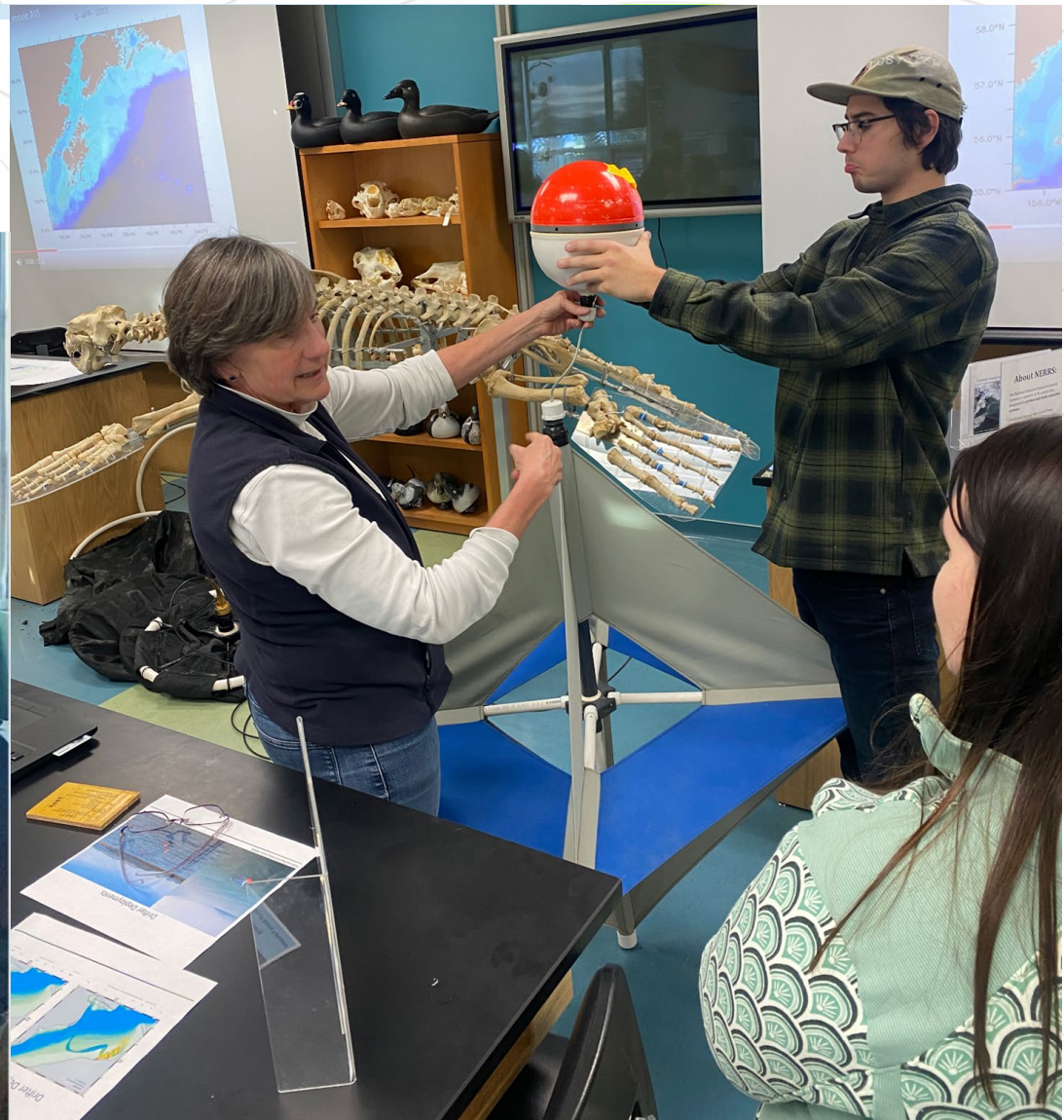
NSF

Teacher Workshops

“I had no idea there is so much research happening in my backyard!”

Researcher Opportunities

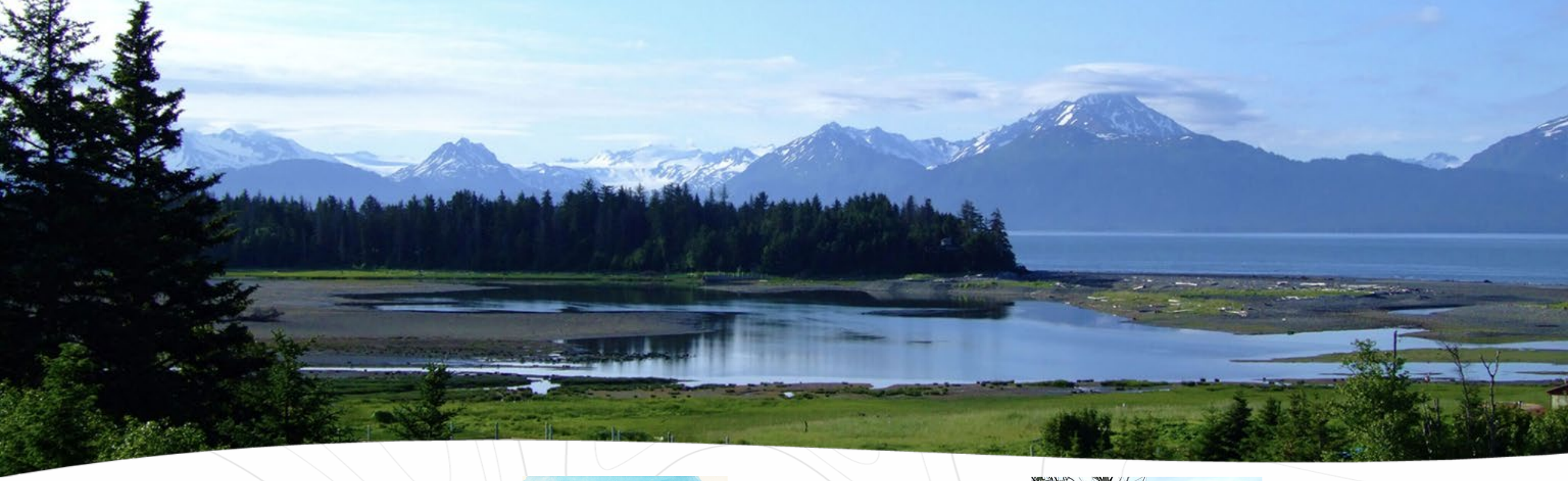
- Connect with Stakeholders
- Professional Sharing



Sharing Success

- Engaging multiple ways of knowing
- Connecting with different dimensions of community
- Stimulating future project ideas

Alaska EPSCoR



See student art inspired by Coastal Margins and connect with us at the Poster Session!

Syverine Bentz
Coastal Training
syverine@alaska.edu

Ingrid Harrald
Education
ieharrald@alaska.edu

Alaska EPSCoR

UAA Kachemak Bay National Estuarine Research Reserve
Alaska Center for Conservation Science
University of Alaska Anchorage

NSF

DEW seed grant awards

Awarded eight DEW seed grants to date, including:

- Engaging Juneau students in STEM through whale dissection and drones
- Expanding access to STEM for youth in care of the state
- Participatory research on children as environmental stewards

Image courtesy of C. Green

Image courtesy of S. Atkinson