the RESEARCHER

IDAHO NSF EPSCoR

November 2024

I-CREWS partners from University of Idaho, Idaho State University, Boise State University, Shoshone-Bannock Tribes, and Idaho National Laboratory, participated in a tour hosted by the Coeur d'Alene Tribe's Natural Resources Department. Participants learned about Tribe's history, experiences, and research interests related to energy-water resilience.

A newsletter publication of the Idaho EPSCoR Office

the RESEARCHER

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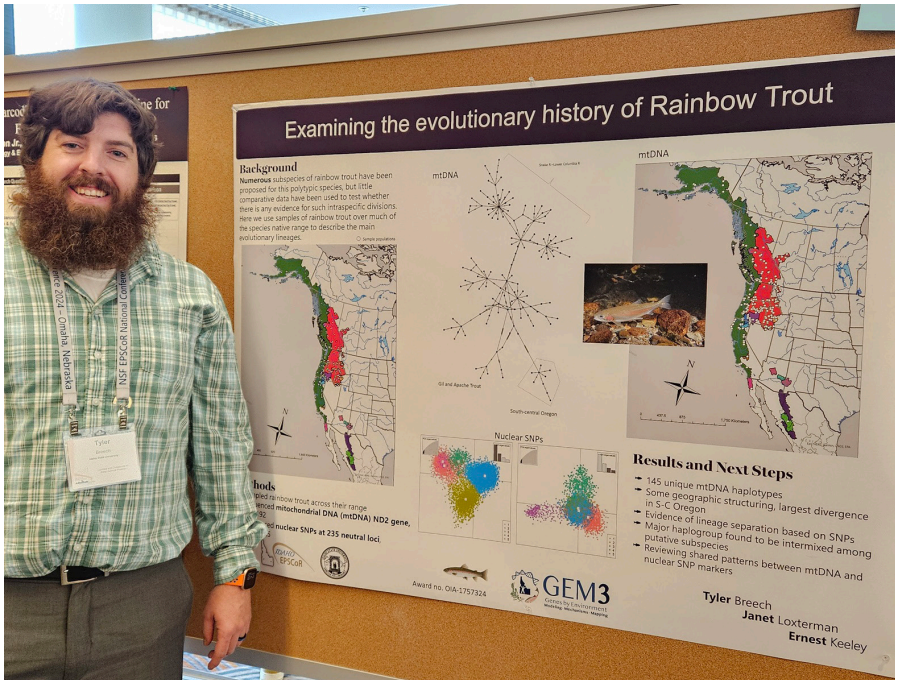
Andy Kliskey

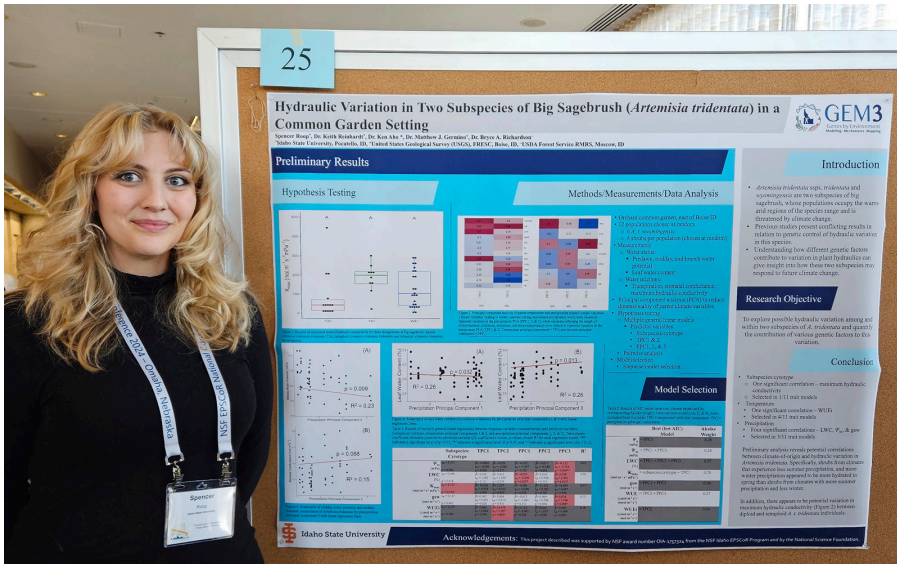
LETTER FROM THE DIRECTOR

This October 2024 the 28th NSF EPSCoR National Conference was held in Omaha, Nebraska. This event attracted over 500 participants across the nation's 28 EPSCoR jurisdictions as it showcased national NSF EPSCoR accomplishments and highlighted future opportunities to advance research and education. Thank you to the NSF EPSCoR and Nebraska EPSCoR for making this event possible.

I was very pleased to see Idaho so well represented in the event. Eighteen colleagues from Idaho were in attendance. Idaho had representation from Boise State University, College of Idaho, College of Southern Idaho, Idaho State University, University of Idaho, Coeur d'Alene Tribe, and the Idaho EPSCoR Committee. This included two students from Idaho State University, Spencer Roop and Tyler Breech, who each presented posters about their research completed under the recent Track-1 GEM3 award on sagebrush and trout. Idaho was also well represented on conference panels, with speakers in five separate sessions: 1) Working with American Indian and Alaska Native Communities in EPSCoR Jurisdictions, 2) Evaluation of EPSCoR Projects, 3) Use-inspired research, 4) Best Practices for EPSCoR Jurisdiction Offices, and 5) Postdoctoral Research Development.

A highlight of the event was to hear from the NSF Director, Dr. Sethuraman Panchanathan, as a keynote speaker on **"Innovation Anywhere, Opportunities Everywhere: Accelerating the Frontiers of Science and Technology Through Talent, Ideas and Innovation."** Dr. "Panch" emphasized NSF's commitment to supporting people and programs across the nation in keeping with and exceeding the





Two graduate students from Idaho State University, Tyler Breech (on top) and Spencer Roop (bottom), each presented posters about their research completed under the recent Track-1 GEM3 award on trout and sagebrush.

annual funding targets passed with the "CHIPS and Science Act of 2022". He highlighted many recent key NSF investments across the EPSCoR jurisdictions.

One key message to all of us is to make the most of the opportunities from the CHIPS Act through the increased percentage of NSF funding to EPSCoR jurisdictions – now is a great time to be developing and submitting proposals to NSF. If you have an idea for a proposal or an idea already underway I encourage you to develop it to the submission stage, and contact our Idaho EPSCoR Office or your institution's office of sponsored programs or research and faculty development if you need proposal development support.

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Unless otherwise noted in feature byline, articles and features in this publication are written by Sarah Penney-Jackson with editing and content contributions by EPSCoR administrative team.

I-CREWS Research

Advancing Understanding of Idaho's Energy-Water Systems

The Idaho Community-engaged Resilience for Energy-Water Systems (I-CREWS) project focuses on addressing complex interactions between energy and water (E-W) systems under stresses such as population, climate, and technological changes. These systems are vital to Idaho, given its unique energy and water landscape, particularly the extensive reliance on hydropower and agriculture. Researchers across the state are striving to build ground-breaking research competitiveness and research capacity within Idaho. They are doing so by characterizing, modeling, and assessing alternative futures and technologies related to complex E-W systems under stress, with local input and the co-production of knowledge.

Energy-water systems refer to the interconnected processes where energy production, transmission, and use are interdependent with water resources, as well as water system management that is tied to energy inputs. Nationally, and in Idaho, these interactions occur both in physical systems such as the natural environment, dams/power plants, transmission lines, and pumps/irrigation systems in addition to the non-physical systems such as water rights, water policy, water management, data collection, local knowledge and the effects on the end users.

Managing Power and Energy

Power is an instantaneous quantity. Energy is a sum of electric power over periods ranging from seconds to years. Electric power is largely used at nearly the same instant it is generated and, at any instant of time, power generation balances the end use load and power losses in the transmission and distribution of electricity. There are limits currently on our ability to store large quantities of electricity in other forms such as chemical energy in a battery or in reservoirs. Fast-responding generation, such as hydroelectric generation, are the primary sources used to respond to fluctuations in end use load or production from wind and solar generation. Idaho utilities also buy and sell power in the Western Energy Imbalance Market.

Hydropower

Hydropower represents a key example of the E-W intersection and plays a pivotal role in Idaho's energy production landscape, through both large and small hydroelectric facilities. The energy aspect of this E-W interaction is often in the form of production of electric power.

Several Idaho utilities produce much of their annual energy using a combination of large hydroelectric generation facilities. In addition, most of the public power organizations in Idaho purchase hydroelectric power from the Bonneville Power Administration, with a few organizations owning hydropower facilities.

Because electricity is transmitted over long distances, energy users are impacted by hydropower even if the users are located far from the hydroelectric dams. Hydroelectric generation is the first choice for Idaho utilities to cover these variations when sufficient capacity to regulate up or down is available. Meaning that the water demand can fluctuate significantly over periods of tens of minutes to hours. This dependency on hydropower makes water management integral to energy production.

Agriculture and Related Conditions

Water use in Idaho, particularly for agriculture, from both surface and groundwater, is also pivotal by driving energy demand and water consumption. Southern Idaho, for example, relies on large-scale irrigation for crop production, which requires significant energy inputs, primarily for operating pumps and irrigation systems. This means that fluctuations in water availability — whether due to climate change or population-driven shifts in land use — affect energy demand. Other uses for land have different water use characteristics such as industrial facilities or residential/businesses.

Population growth can shift land use outside of an urban area from agricultural to residential use. This in turn, changes the characteristics of water use, and the timing of that use. Some uses of water are non-consumptive, like hydroelectric generation or municipal water treatment, passing the water for downstream uses. Others uses like agriculture are consumptive, with a more terminal use of water; nothing is passed downstream.

Inseparability of Energy and Water

Given the interconnectivity of energy and water, fluctuations in water availability will affect energy demand. This makes energy and water inseparable in future planning, and the resilience of these systems will be tested as they face disruptions from climate change, population growth, and technological shifts. Addressing these challenges requires a systemic approach to managing resources that considers trade-offs, conservation, E-W capacity building (water and energy storage), efficiency, and governance. Communities within the State will be engaged and community site locations will be examined to advance this complex intersection of knowledge. Maintaining balance in these interdependent systems is crucial to ensuring both water and energy security.

Idaho's E-W systems face numerous challenges driven by environmental and socio-economic factors. Changing precipitation and snowmelt patterns will affect water availability for hydropower generation and agriculture, potentially leading to increased competition for water between energy production, agricultural needs, and other sectors. Technological change, particularly the integration of renewable energy sources, can alter how energy and water interact. Wind and solar energy, for example, are less water-intensive than traditional thermal power plants but require modified grid management strategies to account for intermittency and variability. Additionally, increased energy demand from population growth and economic expansion, such as data centers, introduces further complexities into Idaho's energy-water nexus. As noted, these changes may have significant consequences for energy or water systems, but these changes rarely happen to only one or the other. Some changes may affect the longer-term trends and vary relatively slowly, while others will be time varying over short time periods and have shorter term impacts.

I-CREWS Contribution to Advancing Community- Engaged Solutions

A goal of the I-CREWS team is to investigate and develop multisystemic E-W resilience approaches with community input to assess the role that components like the storage of energy/water, efficiency, conservation, local knowledge, and governance dynamics play in determining E-W systems resilience.

The I-CREWS team intends to build research capacity alongside community engagement to address these challenges by constructing research frameworks that combine the physical and social sciences with machine learning and take them one step further by leveraging local knowledge. Interdisciplinary I-CREWS teams from across the state are concentrating on characterization of the existing systems, modeling the system responses with machine learning-based simulations, and applying community-engaged input in alternate future for scenarios.

Partnerships are key to this process as we are collaborating with utilities, state agencies, local communities and Tribal nations on these research problems. By integrating these various dimensions, I-CREWS aims to not only advance Idaho's research capacity but also provide possible solutions for the state's E-W systems to adapt to current and future challenges. The project's interdisciplinary approach brings together experts from diverse fields, including engineering, hydrology, economics, and social sciences, to deliver solutions that are scientifically robust and practically relevant.

Content was written by I-CREWS E-W Working Group members: Brian Johnson (UI), Kathleen Araujo (BSU), Bruce Savage (ISU), and Kitty Griswold (ISU).

Coeur d'Alene Tribe Hosts I-CREWS Participants

During the summer of 2024, the Coeur d'Alene Tribe's Natural Resources Department hosted I-CREWS partners from the University of Idaho, Idaho State University, Boise State University, the Shoshone-Bannock Tribes, and Idaho National Labs, to share about the Tribe's history, experiences and research interests related to energy and water resilience. After a welcome from Tribal Fisheries and Wildlife Program Manager Ralph Allan, Scott Fields, Water Resources Program Manager, shared how the Tribe has fought to protect its waters, both in the courtroom and in the development of its research, monitoring, and regulatory programs. Laura Laumatia, Environmental Programs Manager, gave an overview of the Tribe's renewable energy and energy efficiency programs. After a robust discussion of these topics, the group had the opportunity to tour the southern end of Coeur d'Alene Lake and the lower Coeur d'Alene and St. Joe Rivers, where they learned more about the Tribe's long-term research and monitoring efforts. The site visit gave both Tribal staff and I-CREWS representatives a rich opportunity to discuss opportunities for collaboration and research partnerships. A visitation to the Shoshone-Bannock Tribes homelands is anticipated to take place in Spring 2025.

To learn more about the Coeur d'Alene's energy-water initiatives, visit the June 2024 newsletter here: **http://www.idahoepscor.org/newsletters**

Site visit participants were able to explore traditional Coeur d'Alene waterways via boats while listening to presentations from the Tribe's Natural Resources Department.

PUI Liaison's Bring Expertise and Connections to the I-CREWS Program

Miranda Striluk

Miranda Striluk

Miranda Striluk, Assistant Professor in the Biological Sciences Department at the College of Western Idaho (CWI), is taking on a new role within the I-CREWS project as the Primarily Undergraduate Institution (PUI) Liaison.

In her new role, she will be promoting I-CREWS research and education opportunities to undergraduate students from Idaho 2-4 year colleges and fellow PUI faculty.

Connecting students to research opportunities is something that Striluk has already been doing for quite a while, having served as a faculty mentor during the Idaho EPSCoR's GEM3 Summer Authentic Research Experience (SARE) in 2020. During this research project, Striluk and team explored research from vertebrate genome annotation and assembly to sagebrush microbiomes and even remote sensing.

Striluk, who received a BS in Biology-Chemistry and an MS in Microbiology, has a broad research background, specializing in microbiology, genetics, and bioinformatics, and has an understanding of the unique needs of PUI students. She states, "I attended a PUI for my undergraduate degree and was inspired by my professors to pursue a career at a PUI. I am thankful for my path that has taken me through a diverse research landscape that I can draw from to bring research into my classroom, but also that has allowed me to jump into new opportunities and expand my collaborative network to support other faculty and students looking to grow their knowledge and expertise."

Striluk's current focus is engaging CWI students in Course-based Undergraduate Research Education (CURE) and states that her early involvement with EPSCoR as a faculty member has helped build community connections and open many doors for PUI students.

The I-CREWS role will expand upon getting 2-4 year college students engaged in the CURE and SARE roles, and will include having students get involved in Vertically Integrated Projects (VIP) and Community Integrated Projects (CIP), which are larger teams comprised of undergraduate, graduate students, faculty, and community and industry, working together to address energy-water related issues.

According to Striluk, "I am excited to continue supporting PUI faculty and students engaging in primary research opportunities in I-CREWS."

Bill Ebener

Bill Ebener

Bill Ebener, who has a BS in Agronomy and an MS in Seed Physiology from Colorado State University, has been engaging students and faculty from Idaho's 2-4 year colleges for many years.

Having recently retired as an Instructor in the Agriculture Department at the College of Southern Idaho in Twin Falls, Idaho, Ebener is devoting his time and efforts to assist with I-CREWS in a number of capacities, including serving with Miranda Striluk as an additional I-CREWS PUI Liaison.

Ebener has a knack for engaging PUI students and faculty and getting them excited about research. He notes, "My education journey has been inspired by many individuals that have nurtured my curiosity. Perhaps the most significant aspect of this nurture is a sense of belonging. A big part of my role as PUI liaison will be to ensure that those experiencing EPSCoR find relationships of belonging that nurture their curiosity."

In addition to serving as a liaison for Idaho's Primary Undergraduate Institutions (PUI), Ebener is a member of the I-CREWS Education and Workforce Development team, and has been co-leading a working group focused on the topic: Energy-Water Systems Literacy and Community of Practice.

Over the last year, this working group has set out a framework for co-production of a working definition of E-W Systems Literacy that will be consequential for both research and practice. We are poised to begin the process of probing the context of E-W Systems within and among I-CREWS project teams, a first step toward framing literacy as it applies to the proposed outcomes of the I-CREWS project.

Ebener's new role within I-CREWS is no small task, however, his understanding of the PUI community provides a strong foundation for his work. He states, "I view PUI's as a nexus for science and community. The connection of the community with E-W Systems is integral to the I-CREWS project. I'm excited to be a part of this vital communication linkage. Of personal interest will be exploration of how E-W Systems models map onto real-world communities."

I-CREWS Hires

Georgia Hart-Fredeluces

Georgia Hart-Fredeluces is an ethnoecologist with training mostly at the interface of environmental social sciences and ecological sciences. She was recently hired as a new assistant professor in the Department of Anthropology and Languages at Idaho State University in Pocatello, Idaho. Previous to this position, she served as a U.S. Fulbright Scholar and visiting professor at Sorsogon State University in the Philippines where her teaching and research focused on ethnobotany and more-than-human qualitative methods. Hart-Fredeluces focused her work in the Philippines on the relationship of smallholder farmers to the endemic pili nut tree (Canarium ovatum). She was also formerly a Conservation Biologist for the U.S. Fish and Wildlife Service where she focused on weaving Indigenous Knowledges and climate change adaptation into federal conservation work.

Hart-Fredeluces current research is focused on the relationship of Indigenous and place-based peoples to the environment with an emphasis on wild plant caretaking. Dr. Kyle Whyte describes Indigenous Ecologies as moral relationships of Indigenous People to each other and to the environment based on respect, reciprocity and responsibility. Such ways of being with the environment are often pointed to as a guide for broader society in attaining equity and sustainability goals because Indigenous Ecologies reinforce human behaviors like sharing, not taking more than you need, or giving back, that promote the thriving of humans and non-humans alike. In addition to these broader applications of Indigenous and place-based caretaking, knowing and supporting Indigenous Ecologies helps to open additional spaces for Indigenous scholars and practitioners to reclaim and embody those connections and customs in the ways they choose.

As such, her work focuses on the resilience of Indigenous Ecologies, as well as the work of becoming an ally and doing work responsive to Indigenous Peoples' needs. She stated having the privilege of focusing some of her work on the resilience of Indigenous camas (Camassia quamash) ecologies in southern Idaho including learning more about cultural practices, governance, as well as impacts of ecological and climatic change on camas and camas caretaking by the Shoshone-Bannock Tribal citizens. Camas is a traditional food plant that is gathered by Indigenous Peoples across large parts of western North America and the Camas Prairie area in southern Idaho is of particular cultural significance to the Shoshone-Bannock Tribes.

As a new faculty within the I-CREWS project, Hart-Fredeluces will be working to understand and appreciate the talents and interests of other team members and collaborators and to find ways to connect those talents and interests to meet Tribal priorities for research. She will be involved with the Alternative Futures team that will work to envision possible E-W resilience futures with community members and non-academic collaborators in Idaho with an emphasis on the Shoshone-Bannock Tribes, the Coeur D'Alene Tribe, and the Treasure Valley. She will also be supporting a workshop training series on ethical and responsible research engagement with Indigenous Peoples.

Georgia Hart-Fredeluces, assistant professor in the Department of Anthropology and Languages at Idaho State University.

"I am so grateful for where I am today. I first dreamed of being an ethnobotanist when I was in a place of a lot of uncertainty in the direction my life would take. This dream, underneath, was probably about my passion for understanding and celebrating the beauty and deep value of long-established moral, emotional, and spiritual relationships of people to the environment coupled with my love of plants. After training as an ethnoecologist and conducting several research projects in this field, my subsequent dream was to work with wild-gathered food plants and with students, which, I think, brought me to work on camas and some associated projects during my postdoc. Looking forward, my next dream is to build relationships and collaborations in research around camas or other plants with individuals and/or departments within the Shoshone-Bannock Tribes or other Tribes in Idaho that meet the tribal priorities."

~Georgia Hart-Fredeluces

Angel Monsalve

Angel Monsalve is a Civil Engineer specializing in Hydraulics Engineering, Sediment Transport, and Computational Fluid Dynamics. Monsalve earned his bachelor's and master's degrees in Civil Engineering from the Universidad de Concepción, Chile. In 2016, he completed his Ph.D. in Civil Engineering at the University of Idaho.

Monsalve recently joined the Civil and Environmental Engineering Department as an assistant professor and is part of the Modeling team with the I-CREWS initiative. For the past four years, Monsalve was a postdoctoral fellow with the Center for Ecohydraulics Research, which is part of the University of Idaho, Boise Campus.

His current research covers a wide variety of topics, ranging from very detailed, fine spatial scale processes at the sub-millimeter level to whole watershed problems. He studies how river bathymetry and rough elements, such as individual gravel grains and large boulders, control flow dynamics in surface and subsurface flow. He is particularly interested in understanding how these natural features modify the ability of surface flow to enter the river sediment bed and exchange water and nutrients.

In collaboration with other members of the University of Idaho, Monsalve uses state-of-the-art measuring devices to measure, characterize, and analyze at a very detailed scale how water flow interacts with rough elements. He is also interested in understanding flow dynamics through salmon redds, the effects of vegetation on flow hydraulics and sediment transport, and the general feedback between flow, river beds, and sediment transport.

In his work, Monsalve combines advanced Computational Fluid Dynamics models to obtain detailed characteristics of flow properties. Even before taking formal courses in fluid mechanics or hydraulics, rivers and mathematical modeling have always been major interests of Monsalve.

He states, "I feel very fortunate to be able to combine these two interests in what has been my research for more than a decade. Rivers are inspiring, diverse, connecting places that provide water, habitat, and resources." Monsalve continues, "On the other hand, mathematical modeling turned into a passion for Computational Fluid Dynamics, which allows us to explore what we can't see directly and complement what we can't measure."

As part of the Modeling team, Monsalve will be contributing by generating spatial descriptions of river properties such as flooding maps, water depths, and velocities. He will also be characterizing hydraulic properties in different rivers and conceptualizing these properties to be used as part of training datasets for machine learning procedures. These models will be able to predict river behavior for multiple and varied social and climatic scenarios in very short timeframes.

According to Monsalve, "I am very excited about the opportunity to take an active role in the project and contribute my expertise. The project aligns perfectly with my interests, and there is so much we can explore, especially considering the range of experts involved and the level of coordination I've observed. I'm looking forward to opening doors for new students and other interested individuals to be part of this initiative."

Angel Monsalve, assistant professor in the Civil and Environmental Engineering Department at University of Idaho

"I feel incredibly fortunate to have progressed through all the different stages of my scientific career as part of the University of Idaho. Starting as a Ph.D. student, then becoming a collaborator, following that as a postdoctoral fellow, and now as a faculty member, it has been more than a decade of being part of the University and especially the Center for Ecohydraulics Research. This journey has provided me with a unique perspective and deep connection to the institution and its research community."

~ Angel Monsalve

Students Translate Science Materials, Empower Hispanic Communities

by Zenaida De La Cruz

In the United States, Spanish is the second most spoken language, and today, Spanish speaking communities are increasingly empowered in their use of language. In an interconnected world, effective communication is essential, making bilingualism and cultural sensitivity more important than ever.

Boise State's Vertically Integrated Project, Project Scientia (pronounced 'ski-ent-ee-ah'), is supporting the empowerment of Spanish speaking communities across the state. Taking its name from the Latin word for "science," Project Scientia aims to make research and creative activities accessible to these communities by leveraging the skills and talents of undergraduate and graduate students and faculty.

Student team members are tasked with translating science materials – not just into a different language but for a different purpose, as program director and professor Carolina Viera emphasizes. Students work directly with researchers, nonprofits and educators to disseminate materials to the Spanish speaking community, inviting participation from students of all backgrounds and majors.

By leveraging their language skills, Boise State University's Project Scientia students are paving the way for future generations to advocate for themselves and their communities to combat a history of discrimination targeted at the Spanish language. Devoted to making science accessible, the group aims to ensure that everyone has the opportunity to engage with the critical issues that impact their lives.

Second year engineering doctoral student Juan Rengifo Guzman is the graduate lead on Project Scientia. Originally from Colombia, Rengifo Guzman is passionate about utilizing his language skills to make science more accessible to Spanish-speaking communities.

With experience translating materials between Spanish, English and German, he notes, "Having translated stuff and being able to speak more than one language gives me a more open mind at the time of tackling logic problems, because I have a way to see things differently." As the graduate lead of the project, he hopes to help students grow their skills and confidence in Spanish communication.

"The only milestone [I have] is that students feel comfortable with their Spanish and science communication," Rengifo Guzman said. "I just met one of the students…and she's a little bit shy about her Spanish because she has just spoken it at home. I think one of the milestones is to help her empower herself."

Carolina Viera (faculty lead) and Juan Rengifo Guzman (graduate student lead) of Project Scientia

Students involved in Project Scientia come with varying levels of fluency in Spanish. Through the project, they gain valuable science and professional communication abilities while increasing their multicultural awareness, as the group comprises students from diverse backgrounds, fostering teamwork and communication skills.

Beyond enhancing communication skills, students emphasize the meaningful impact of their experience on community activism and professional development.

“Before I came to the U.S. and I met Carolina and worked on the project…I never saw my language skills as a way that would get me more job opportunities and more education opportunities,” said Josie Baeza, a senior majoring in Spanish and health sciences and an aspiring lawyer. “After I was able to participate in Project Scientia, I saw other opportunities that I had as a Spanish speaker.”

Junior Joselyn Gutierrez, who is studying materials science and engineering, highlights the intersection of communication and community engagement.

“When you’re doing this project, you’re helping others so it combines a lot of great things from speaking Spanish to improving science communication or just being able to connect with the Hispanic community,” Gutierrez said.

Participants have engaged in the community at local and national levels. Boise State graduate and former Project Scientia participant Julián Arreguin Vega discussed the project on KTVB, Idaho’s largest media organization.

Senior Jada Alcantara also shared her experiences on Public News Service, a national newswire, emphasizing the importance of science communication in Spanish. Alcantara, studying health studies and Spanish, recalls her work with Idaho farmers to raise awareness about the risks associated with pesticide exposure.

She expresses her gratitude for the opportunity to use her Spanish speaking skills to positively impact the community. Alcantara says that her involvement in the project has also exposed her to new cultural knowledge and experiences. While she does not consider herself a part of the community, she is committed to advocating with the Hispanic and Latino community in pursuit of a more accessible world.

The team actively participates in the National Science Foundation’s Established Program to Stimulate Competitive Research projects GEM3 and I-CREWS to create educational materials in Spanish. They recognize that research on energy and water benefits society as a whole, and should be as accessible to all. Project Scientia also collaborates with the Nature Conservatory of Idaho to discuss the effects of climate change in Idaho and collaborates with a multidisciplinary team to enhance public health for farmers in the Latinx community in Idaho.

As the students continue to utilize their languages for the purpose of science communication, they hope to inspire others to join the cause.

Rengifo Guzman says it is powerful for Spanish speakers to “Acknowledge the importance of having this second language.”

Baeza adds, “It’s really important to use those skills to help our parents, to help the people in our community, to see what’s happening and to communicate…”

Gutierrez acknowledges that it can be intimidating to try new things, especially in Spanish translation and interpretation.

“For someone who is in a similar position as me where we’re not as confident with speaking Spanish, I would say do it anyway because the whole process is how we’ll be able to improve,” said Gutierrez.

As the students of Project Scientia continue their important work, they not only develop their own skills, but also help create a more inclusive and informed community. Their commitment highlights the role language has in community empowerment, bridging divides in science and raising awareness of pressing issues.

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Representatives from Idaho State University, Shoshone-Bannock Tribes, and University of Idaho tour southern Coeur d'Alene Lake with Tribal Limnologist, Dr. Dale Chess (driving the boat).