

THE UNIVERSITY OF WASHINGTON
INSTITUTE FOR SCIENCE AND MATHEMATICS EDUCATION

The University of Washington Institute for Science and Mathematics Education creates partnerships to envision, cultivate and study equity-oriented educational practices in areas of science, technology, engineering and mathematics (STEM).

Institute projects build upon three core commitments:

- (1) We build educational practice upon the strongest research-based accounts of STEM learning and teaching as it occurs in formal and informal environments.
- (2) We create and maintain deep, mutually-beneficial collaborations with STEM educators and disciplinary experts.
- (3) We challenge ourselves, our partners, and the STEM education communities to transcend long-standing patterns of inequity in STEM learning.

Our partners include schools, informal educational organizations (museums, science centers, after school providers), and numerous individuals and organizations with rich STEM expertise across the university community and our region and state.

Institute Partners

University of Washington:

School of Aquatic and Fishery Sciences
College of Education
College of the Environment
Department of Computer Science & Engineering
Department of Genome Sciences
Learning in Informal & Formal Environments (LIFE) Center — a partnership of UW
Institute for Learning & Brain Sciences (I-LABS), UW College of Education,
Stanford University & SRI International
Department of Mathematics
School of Oceanography
Ocean and Coastal Interdisciplinary Science (OACIS) GK-12 Program
UW Chapter of the Society for Advancement of Hispanics/Chicanos and Native
Americans in Science (SACNAS)
And consulting relationships with many other UW units

Bellevue School District
Highline School District
Leadership and Assistance for Science Education Reform (LASER)
National Geographic Society
North Cascades Institute
Pacific Education Institute
Pacific Science Center
Process Oriented Guided Inquiry Learning (POGIL)
Passages Northwest
Seattle Informal Science Education Consortium (ISE)
Science Partnership Academy
Seattle Aquarium Society

Seattle Public Schools
YMCA (Boys Outdoor Leadership & Development program)

Current Projects

SoundCitizen Science Apprenticeship: Where Urban Communities and Academia Come Together

With support from the National Science Foundation, the Institute and partners in Ocean Sciences and community partner Passages Northwest have developed the SoundCitizen Science Apprenticeship (SCSA) program. SCSA provides middle and high school-aged youth from groups that are underrepresented in the sciences with rich opportunities to explore ocean sciences in an afterschool setting. The project builds upon [SoundCitizen](#), an ongoing participatory science effort housed in Rick Keil's (UW ocean sciences) lab through volunteers collect water samples to feed the lab's investigations. SCSA is an effort to bring this project to youth. SCSA participants engage with UW mentors to engage in studies of water quality and to design applied projects in their home communities.

Exploring Databases: Bridging Contemporary Science and Youth Culture

The Institute, in collaboration with the UW Department of Genome Sciences, has been awarded a National Science Foundation ITEST award to develop and study curriculum units focused on the use of a genome sciences database. The database and related materials will support secondary science students in investigation of genetic and environmental factors related to health-related behaviors. Both contemporary science and youth culture rely heavily on databases and related digital tools for knowledge construction and sharing. Yet, the digital tools that are common to both science and youth culture are rarely visible in K-12 science classrooms. The *Exploring Databases* project is an opportunity to bring together science and youth culture through database-centered research. Over the three years of the project, the Institute will carry out an iterative research and development process in secondary science classrooms in the Seattle metro area serving minority youth. In addition, a professional learning community for teachers who use *Exploring Databases* curriculum will contribute to design and research while honing their expertise in teaching the relevant subject matter. Ultimately the curriculum and database will be freely available online and will include a collaborative workspace and communication network.

Using Project-Based Learning as a Vehicle to Promote Learning and Equity in STEM Education

With support from Boeing, the Institute is collaborating with Highline public schools in an effort to build and expand equitable STEM curriculum, instruction, and assessment throughout district high schools. The current 18-month planning phase of this initiative is focused on developing small "kernels" of practice (e.g., project-based learning as a vehicle for STEM education focused on learning and equity that uses youth interests and out-of-school practices as design principles for curriculum and instruction). We also intend to carry out studies of teacher professional development and student learning to inform the broader expansion of the effort throughout the district (in subsequent phases). Aviation High School, the district's lighthouse regional magnet school serves as one powerful model of STEM school excellence. UW Institute staff are working closely with Aviation faculty and students to document central teaching and learning practices,

which will aid in the development process of a professional learning experience for STEM teachers throughout the district and beyond.

COSEE Ocean Learning Communities

The Institute is a partner in the Center for Ocean Science Education Excellence: Ocean Learning Communities (COSEE-OLC), a thematic center comprised of four units; the Seattle Aquarium Society, the Ocean inquiry Project, the College of Education and the School of Oceanography both at the University of Washington. COSEE-OLC fosters community development around ocean issues and engages communities in efforts to bring the latest scientific information about the ocean to the general public. COSEE-OLC works closely with the Puget Sound region's marine volunteer community, the scientific community, and the learning sciences community. COSEE-OLC's activities are multi-faceted and include public engagement, education of ocean scientists about learning and educational resources, and development of educational tools.

Washington Geographic Alliance

Effective October 2010, the Institute has signed on to become the coordinating organization of the Washington Geographic Alliance—a regional organization sponsored by the National Geographic Society (NGS). We will work with the NGS to explore strategies and tools to develop a national network of K-12 teachers, college geographers and educators, school administrators, education policymakers, and other external stakeholders dedicated to improving geography education. The Institute will both cultivate the interests and knowledge of Washington state educators and develop tools to support geographic literacy education throughout the national network. The Institute's foray into geographic literacy is an opportune moment to explore the intersections of the natural and social sciences and cultural diversity.

Agency in Sustained Problem-Based Inquiry: Learning Science *Through* and *As* Innovation

With support from the National Science Foundation Institute staff are working in partnership with collaborators in the Learning in Informal and Formal Environments (LIFE) Center, and district leaders, curriculum specialists, and teachers from the Bellevue School District (BSD) to conduct a research and development project to in elementary science teaching and learning. The project involves the iterative design, delivery and testing of science inquiry environments that offer diverse groups of 2nd and 5th grade students choice and agency to inquire about authentic, socially-consequential science problems. A major goal of our work is to improve ways to engage students and teachers in creative and productive aspects of scientific inquiry that many argue are often absent in classrooms. Institute staff contribute to the overall design of this project, to the development of innovative curriculum materials and related teacher training, and to the design and execution of research on student learning.

Institute Leadership

Philip Bell (Director of the Institute)

Andrew Shouse (Associate Director of the Institute) is an educational researcher whose interests include equitable science education in formal and informal settings, and communication of educational research to policy and practice audiences. Shouse joined the University of Washington in 2008 as Associate Director of the Institute for Science and Mathematics Education. He directs and/or contributes to a portfolio of externally funded research and

development partnerships focused on broadening participation in science, including: Exploring Databases (NSF) a collaboration with genome scientists to integrate digital scientific tools into the secondary curriculum; SoundCitizen Science Apprenticeship (NSF), a collaboration with ocean scientists to explore youth identity development in the context of community-relevant scientific research, and System STEM Development, an effort to expand project-based STEM learning throughout K12 schools in the Puget Sound region. Previously in his tenure with the National Research Council (NRC) Shouse directed two science education consensus studies and edited the reports: *Learning Science in Informal Environments: People, Places, and Pursuits* (NRC, 2009; with Philip Bell, Bruce Lewenstein, and Michael Feder) and *Taking Science to School: Learning and Teaching Science in Grades K-8* (NRC, 2007; with Rick Duschl and Heidi Schweingruber). Shouse authored (with Sarah Michaels and Schweingruber) *Ready, Set, Science! Putting Research to Work in K-8 Science Classrooms*, a 2008 Association of Educational Publishers Distinguished Book Award winner. Shouse serves on a number of advisory committees and boards of scientific and educational organizations, including: The National Association for Research in Science Teaching, The Pacific Science Center, Center for Inquiry Science of the Institute for Systems Biology, The Museum of Science and Industry (Chicago), and The NSF Center for Biophotonics Science and Technology at the University of California-Davis. Shouse completed his PhD in the Curriculum, Teaching, and Educational Policy with a focus on science teacher learning at Michigan State University in 2005.

Leah Bricker (Research Scientist) is a research scientist in the Institute for Science and Mathematics Education at the University of Washington. She holds a Ph.D. from the University of Washington in the Learning Sciences. In addition, she holds a M.S. in Interdisciplinary Biology from Indiana University-Purdue University, Indianapolis and a B.S. in Biology with a structured minor in Chemistry, Mathematics, and Physics from the University of Arizona. Bricker pursues research in two broad areas: (a) science education (e.g. young people's science learning in formal and informal settings; science teacher education; how people learn to become scientists), and (b) learning sciences (e.g., socio-cultural-historical theories of learning as applied to how people learn across settings and over time and as applied to how people develop expertise and identities). Bricker is also interested in youth participatory action research. Most recently, Bricker was an Assistant Professor of Education at Loyola University Chicago where she taught pre-service science teacher education courses. Prior to undertaking doctoral studies at University of Washington, Bricker worked in Washington, DC for the American Association for the Advancement of Science's Project 2061. While there, she managed a National Science Foundation grant focused on alignment between K-12 science standards and assessments. She also helped design and implement several professional development programs for K-12 science teachers. Bricker has also served as the Science Curriculum Program Coordinator for the Indiana Department of Education. In this capacity, she was project manager of the Indiana Academic Standards 2000—Science; project manager of the Indiana State Test of Educational Progress (ISTEP)—Science; Indiana Department of Education liaison to a number of education associations, informal science education institutions, and government agencies; and state coordinator for both the Presidential Awards for Excellence in Mathematics and Science Teaching program and the National Youth Science Camp program. Bricker's background also includes a fellowship in WestEd's National Science and Mathematics Education Leadership Academy, as well as five years as an award-winning middle school science teacher.

Carrie Tzou (Collaborating Faculty) is an assistant professor in science education at the University of Washington Bothell. She holds a PhD in Learning Sciences from Northwestern University and an M.S. in Teaching and Learning with a concentration in science education from Vanderbilt University. Tzou came to the University of Washington Seattle as a post-doctoral scholar working for two National Science Foundation funded centers: the Learning in Informal and Formal Environments Center (LIFE) and the Center for Ocean Sciences Education Excellence-Ocean Learning Communities (COSEE-OLC). Tzou now serves as co-PI of the COSEE-OLC center as it enters its next phase of work. Her research has three major components, all connected with an interest in addressing issues of equity and social justice in science and environmental science education: 1) ethnographic work to understand how youth and their communities are positioned through place-based education, 2) design-based research to design curricula to bring youths' out of school science and cultural practices into science and environmental science teaching, and 3) research and design of elementary and secondary preservice teacher education that explores how to orient preservice teachers to the sophisticated learning and identities that their students construct both in and out of school in order to make science more accessible to all of their students. Tzou recently received funding through the *Teaching and Scholarship Enhancement Project* at the University of Washington Bothell to develop take-home science backpack kits for students to engage with science learning with their families at home. Tzou's most recent publication, *The Role of Environmental Narratives and Social Positioning in how Place Gets Constructed for and by Youth*, appeared in *Equity and Excellence in Education* (Tzou, Scalone, & Bell, 2010). Tzou's work is also informed by her experiences as former a bench scientist and middle school science and health teacher.

Research & Program Staff

Hiroki Oura is a PhD student in the College of Education at the University of Washington. He came to Seattle from Japan in 2008. He is interested in how people learn and develop scientific understanding through problem solving and argumentation and in developing curricula and tools for facilitating such learning activities. Before coming to UW, he worked as a project researcher in The Center for Research and Development of Higher Education at the University of Tokyo and where he worked on educational software research and development. He graduated from Tokyo Institute of Technology with a Masters degree in Engineering with an emphasis on Educational Technology.

Nancy Price provides staff support for the broad range of Institute efforts.

Giovanna Scalone is a PhD student in the Learning Sciences at the College of Education. Her research interests include how the learning and teaching of science and ocean science in and out of school enrich, empower, and transform youth in their practice of science and ocean science; and how argumentation in science and ocean science education as well as in informal contexts is used to develop a critical stance towards the youths' enactment of science and their everyday lives. Giovanna's undergraduate background is in Applied Linguistics, Academic Support Programs, and T.E.S.O.L at the University of Johannesburg; and her graduate academic experience is in educational technology at the UW College of Education. Giovanna served as an English for Academic Purposes instructor as well as a Linguistics teaching assistant at the University of Johannesburg.

Déana Scipio is a second year PhD student in Learning Sciences with research interests in apprenticeship, science and literacy learning. Déana completed the first year of her M.Ed at IslandWood an environmental learning center on Bainbridge Island and finished her M.Ed at UW in 2009. She has been a children's book buyer, museum educator, after school program educator, and curriculum developer. She is currently the coordinator of the SoundCitizen Science Apprenticeship (SCSA) Program. In year one, SCSA worked with eight middle and high-school students from groups that are currently underrepresented in the geosciences. We are in the pilot phase of a project aimed at increasing diversity in the geosciences. Within the project Déana has focused on building relationships with youth participants, program partners, and research scientists. She is also building a research project to respond to the following preliminary research question: What pedagogical moves do educators involved in youth development make to create a space for mentorship and relationship building during transit times or other downtimes during programs?

Shelley Stromholt is a doctoral student in the College of Education at University of Washington. Her research interests include understanding how people become interested in and develop an identity in science through engagement in informal settings. Before pursuing a Ph.D., Shelley taught science and environmental education in informal settings. Most recently she spent several years on the education team at a residential outdoor learning center, where she supported graduate students in their teaching practice and coordinated the evaluation of student learning. As a graduate research assistant, Shelley's current work includes coordination of an afterschool apprenticeship program that brings youth and ocean scientists together to collaborate on research and a project that looks at how science learning occurs in early childhood settings. Shelley has completed a B.S. in Biology at Oregon State University, and a M.Ed. in Science Education at UW.

Katie Van Horne is a PhD student in the Learning Sciences program at the University of Washington College of Education. She focuses on science learning research, specifically genetics learning and is interested in understanding how to engage all students in the practices of scientists while taking into account their everyday and out of school scientific expertise. She works on two institute projects: Exploring Databases (NSF funded, a collaboration with genome scientists to create learning experiences for high school students around contemporary practices in the field of genome sciences, and System STEM Development, an effort to expand project-based STEM learning throughout K12 schools in the Puget Sound region. She has a B.S. in Biology with a minor in pre-genetic counseling from Washington State University and before beginning the program at UW, she worked as the project coordinator on an NSF Math Science Partnership grant at the American Society of Human Genetics. This project aimed to build long-term collaborations between educators and geneticists in a framework supported by a the geneticist's professional society.