

CAISE Convening on Professional Development in Informal Science Education  
February 2<sup>nd</sup> & 3<sup>rd</sup>, Washington, DC

Project Abstracts

**Project Name:** Terrascope Youth Radio

**Award Number:** 0714655

**PI Name:** Ari Epstein

**Evaluator:** Beverly Mire

**Abstract:** This project proposes creating a program in which urban teens will develop, report, write, produce and host a regularly broadcast radio program on environmental and Earth-system science. A goal of the project is to reach other urban teens with STEM information in a format that they see as relevant, interesting, and exciting to instill in them a sense of empowerment and knowledge about environmental and Earth system science. The project would create a model for how universities can become engaged in local youth communities broadening the impact of work done by their own researchers. The project brings together a unique set of partnerships including a research university (MIT), city-sponsored youth programs (Cambridge, MA); a local public school system; a national radio network; an established youth radio organization; a nationally-broadcast science news/talk radio program (Science Friday); a web-based organization specializing in the distribution of independent radio programming, and experienced evaluators of informal-learning programs (Goodman Research Group). Guidance in understanding complex environmental issues will be provided by faculty, staff and students of the pre-existing MIT Terrascope program. Participants will see their work distributed nationally, both on air and as podcasts delivered via the Science Friday media site.

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**Project Name:** Taking NPASS to Scale (NPASS2): Creating State-based Professional Development Networks for Out-of-School Time Science

**Award Number:** 0917576

**PI Name:** Charles Hutchison

**Evaluator:** Pamela Stazesky

**Abstract:** Taking NPASS (National Partnerships for Afterschool Science) to Scale builds on a previously funded effort (DRL 0515549) designed to provide professional development for out-of-school time (OST) science trainers, administrators, and frontline staff. Education Development Center, Inc. (EDC), in partnership with the Boston Children's Museum, utilizes a tiered-training approach to increase understanding of the nature and value of informal science programming and improve program development and presentation skills. The professional development content is aligned with state standards in earth, life, and physical sciences for grades K-8 and emphasizes science inquiry and process skills. In addition to disseminating the NPASS

model to eight states (CA, GA, MD, MN, MO, NH, NJ, OH), this project examines the factors that contribute to success at the local and statewide levels. Collaborating NPASS Leadership Teams are located at the California School-Age Consortium, the Georgia Afterschool Investment Council, The After-School Institute, Minnesota School Age Child Care Alliance, University of Missouri-Columbia, University of New Hampshire, and the Ohio Child Care Resource and Referral Association. Rutgers University-New Brunswick and the National Institute on Out of School Time (NIOST) assist with recruitment and training.

The primary target audience for this effort is OST science trainers, administrators of statewide OST networks and local programs, and frontline staff. The secondary audience is youth participating in afterschool programs, most of whom are from traditionally underserved and economically challenged groups. Deliverables include three-day, semi-annual train-the-trainer institutes; annual seminars for NPASS leaders; professional development tools; science kits; and the NPASS website. The project design consists of four levels of management and delivery. At Level 1, the NPASS2 primary partners, EDC and the Boston Children's Museum, provide three-day state-based OST Science Trainer Institutes on a semi-annual basis. The Science Trainer Institutes combine hands-on experience with pedagogical training in informal science learning, youth development, and the logistics of working with OST sites. During Level 2, the eight State Leadership Teams recruit two cohorts of OST practitioners to attend Science Trainer Institutes. The new Science Trainers then identify OST sites to attend a series of half-day science trainings in Level 3. Each session introduces and models new science projects for use in afterschool settings, including the NSF-funded Design It! or Explore It! materials. Finally, at Level 4, OST sites serving children from predominantly underserved and underrepresented populations are invited to join the NPASS2 initiative. OST sites receive a materials kit and guide for the activities at each training session, while support and scaffolding such as mentoring, a helpline, FAQ archive, bi-monthly newsletter, and social networking site are available throughout the program. It is estimated that as many as 30 OST state leaders, 300 managers, and 100 science trainers will be reached at 750 community sites serving 22,000 youth. The combined intervention has the potential to change the OST landscape.

The project evaluation to be conducted by the Goodman Research Group (GRG) employs a longitudinal design to determine participants' growth over time and the magnitude of change among the variables. The formative evaluation is designed to assess the development of the project's deliverables while the summative evaluation focuses on professional audience impacts. The NPASS2 summative evaluation examines the OST science trainers, OST state network administrators, youth workers, and site administrators through a baseline survey, in addition to annual questionnaires and interviews of network administrators and OST site administrators. The pre-post design measures changes in trainers' understanding, attitudes, behavior, and skills related to informal STEM education research or practice. To maximize the efficiency and authenticity of the evaluation, GRG will use the SET/STEM Leader Competencies

Rubric currently being developed jointly by EDC in collaboration with the National 4-H Council's SET PD Committee.

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**Project Name:** Fusion Science Theater National Training and Dissemination Program

**Award Number:** 1114568

**PI Name:** Holly Kerby

**Evaluator:** Joann Cantor

**Abstract:** The Fusion Science Theater National Training and Dissemination Program builds on the success of the Fusion Science Theater (FST) planning grant (DRL 07-32142). Madison Area Technical College, in collaboration with the Institute for Chemical Education at the University of Wisconsin-Madison, the American Chemical Society (ACS) and area science centers and museums will create a national program to disseminate the FST model which directly engages children in playful, participatory, and inquiry-based science learning of chemistry and physics topics. The primary target audience is children aged 4-11, while undergraduate chemistry students, faculty, and formal and informal educators comprise the secondary professional audience. The project will result in the development of a robust, creative, and highly visible national dissemination program.

The National Training and Dissemination Program includes three deliverables. First, a Distance Performance Training Program will be developed to teach groups of undergraduate students, faculty, and educators how to perform FST Science Investigation (SI) Shows. The Training Program includes a Performance Training Package and a 3-day Performance Training Workshop. The Performance Training Package will be comprised of training videos, performances videos, scripts, rehearsal schedules, and training exercises. These materials will be pilot tested while training representatives of five groups from around the country to perform SI Shows during the Performance Training Workshop at Madison Area Technical College in summer 2012. Participants will be selected from ACS undergraduate groups, outreach specialists, and museum professionals. Workshop participants then return to their home institutions and lead their groups through the improved Performance Training Package delivered via Moodle, with support from FST team members and social networking tools. The second deliverable is the FST Methods Workshop. The Methods Workshop is designed to teach formal and informal educators to use selected methods (Investigation Question, Embedded Assessment, and Act-It-Out) in their outreach efforts and classroom teaching. Four workshops will be presented at national meetings and at the invitation of colleges, universities, and science centers. Follow-up with workshop participants will be mediated through an online forum to encourage experimentation, modification, and dissemination of a second generation of FST activities. The final project deliverable is the development and implementation of a Promotion and Recruitment Plan to connect professional audiences with FST. The Distance Performance Training Program and workshops will be evaluated using mixed methods, while embedded assessment will be utilized to measure the impact on youth participants attending SI shows to determine the overall effectiveness the Distance

## Performance Training.

This project is designed to have important impacts on STEM education and society. The proposed dissemination program brings innovative models and methods into the hands of informal science education practitioners who can use them to engage local audiences and enhance their own teaching and communication practices. Finally the project offers likely benefits for society through the creation and dissemination of innovative practices to combat science illiteracy, diminishing pools of scientists and engineers, lack of understanding about the nature of science, and the achievement gap that exacerbates these problems. This project could be transformative in informal science education as SI Shows use theater to engage audiences in multiple aspects of science learning. It is anticipated that this project will reach up to 2,500 individuals in public and professional audiences.

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**Project Name:** Inquiry in the Community: Building Science Capacity in Volunteer Leaders

**Award Number:** 0813464

**PI Name:** Stephanie Lingwood

**Evaluator:** Ginger Fitzhugh

**Abstract:** Girl Scouts of Western Washington (GSWW) is collaborating with Seattle University to develop an innovative new model for science learning in youth programs. The project is designed to increase the use of science inquiry among adult Girl Scout Leaders, facilitate learner-centered inquiry, change the culture of program delivery, and enhance science literacy. New parent volunteers, who are Girl Scout troop leaders, will be trained to deliver inquiry-based science to girls ages K-3 in environmental science, wildlife biology, ecology, and botany in a manner which makes scientific questioning and exploration integral to the girls' experiences. Deliverables include a training curriculum adapted from the NSF-funded Fundamentals of Inquiry, quarterly training workshops for adult volunteers in inquiry-based science methodologies and content, an enhanced volunteer support system (including online and peer networks, science activities, and resources), and a replicable model for incorporating science into community youth programs. The inquiry activities will be modified for use in an informal learning setting and may be easily integrated into the existing science activities for Brownie Girl Scouts such as community service, camping, cookies, and "Try It" events. Potential strategic impact includes the advancement of a new model for volunteer training which secondarily changes the organizational culture and expands the current understanding of how science learning occurs in community contexts. The proposal includes a comprehensive, mixed methods evaluation to be conducted by the Puget Sound Center for Teaching, Learning, and Technology. It is anticipated that this project will reach 360 women and over 1,600 girls in disadvantaged urban and rural communities in western Washington.

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**Project Name:** Full-Scale Development: Science STARS-Nurturing Urban Girls' Identities Through Inquiry-Based Science

**Award Number:** 1114481

**PI Name:** April Luehmann

**Abstract:** Science STARS (Stars Tackling Authentic & Relevant Science) is an after-school program that will engage approximately 400 urban middle school girls in authentic inquiry-based scientific investigations and the creation of a science documentary that extends their research and situates their findings. The project has been piloted in Rochester, NY and will be expanded to sites in Lansing, MI and Seattle, WA. New elements have been added to enhance the project experience including the documentary video component, partnerships with local community outreach organizations, mentoring by local female scientists, leveraging embedded assessments to enhance the measurement of learning, and a conference and presentations to local stakeholders to showcase the work of the participants.

Participants will meet during the school year plus three intensive weeks during the summer for a total of about 65 hours per year. A unique feature of this project is the use of pre-service teachers from local teacher preparation programs to facilitate the investigations. This in turn develops the capacity of pre-service teachers to implement and leverage inquiry-based learning in their practice. Project-level research will address questions of how models such as this encourage the development of positive science identities in girls and how situating science investigations in their community affects their understanding of science and local issues. The project evaluation will be conducted by Horizon Research and will focus on the quality of project activities, the quality of the project's research plan, and the impact on participants and pre-service teachers.

Science STARS thoughtfully bridges formal and informal learning environments. While Science STARS largely situates its home base in schools in order to increase access to those who may not self-identify with science, the program is designed to capitalize on the unique affordances of informal settings and contribute to understanding how informal science education can be used to nurture positive science identities for urban middle school girls.

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**Project Name:** Astronomy From the Ground Up: Building Capacity in Smaller Informal Science Education Institutions

**Award Number:** 0451933

**PI Name:** James Manning

**Evaluator:** Kate Haley Goldman

**Abstract:** The Astronomical Society of the Pacific (ASP) will develop and test a new model of informal science education professional development to help small museums increase the public's knowledge and interest in astronomy. The lead collaborators in addition to ASP are the National Optical Astronomy Observatory (NOAO) and the Association of Science Technology Centers (ASTC). The project deliverables include 1)

workshops for approximately 240 informal science education (ISE) practitioners in 180 small ISE institutions delivered both on-site and through distance learning 2) hands-on astronomy activity toolkits and 3) an on-going "community of practice" network. The project development team includes representatives from small ISE institutions (Randall Museum, CA; Lakeview Museum of Arts and Science, IL; Stamford Museum & Nature Center, CT) as well as others. This project has the potential for making a strategic impact on the ISE field with its research on the use of distance learning compared to on-site professional development workshops.

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**Project Name:** Collaborative Research: Full Scale Development: Native Universe - Indigenous Voice in Science Museums

**Award Number:** 1114467

**PI Name:** Nancy Maryboy

**Evaluator:** Jill Stein & Shelly Valdez

**Abstract:** Native Universe: Indigenous Voice in Museums, a collaboration between the Indigenous Education Institute, University of California-Berkeley, and the University of Hawaii at Hilo, builds on the successful NSF-funded Cosmic Serpent collaborative (DRL 07-14631/DRL 07-14629). The Cosmic Serpent professional development project explores commonalities between native and western science, enabling participants to use STEM as an entry point for museum programs and exhibits. Native Universe endeavors to move to the next level by creating a professional development program which fosters systemic institutional change through the infusion of indigenous voice in programs and exhibits focusing on environmental change. Topics to be explored include species distribution, environmental vulnerability, adaptation of human systems, and science and policy issues on the local, regional, and global levels. This project is designed to assess how cultural background and exposure to indigenous knowledge systems integrated with western science influence these perspectives; develop sustainable institutional competence in presenting multiple perspectives on environmental change; and create models for inclusion while building an enduring community of practice.

The project design relies upon a conceptual framework grounded in the literature on indigenous voice and traditional ecological knowledge, as well as current models for institutional change. Front-end, summative, and process evaluation will address questions related to how science museums facilitate engagement and inclusion of indigenous voice in the presentation of environmental change content, stages of readiness, and the emergence of models for this process. Methods for data collection include reflective logs, pre-post questionnaires, and semi-structured interviews at multiple points to measure the degree and nature of change within museums, as well as how change was initiated, supported, and sustained by staff. Project deliverables include three museum case studies developed during 9-month residencies, public experiences for visitors, a culminating virtual conference, and a dynamic community of practice among museums committed to indigenous voice in informal science education. The museum residencies will take place at the Oregon Museum of Science

and Industry, the Arizona-Sonora Desert Museum, and the Museum of the North in Alaska. Intensive case studies will be conducted at each site following the Diné Strategic Planning Process (consisting of initiation, growth, implementation, and renewal) and featuring the Imiloo Astronomy Institute as a model for institutional change. Exhibits and programs have been identified at each site that will be developed or expanded to integrate environmental change content and native perspectives. Dissemination of the project findings will be accomplished through publications, conference presentations, videos, webinars (four per year), and the virtual conference.

It is anticipated that this project will impact over 1.2 million visitors at the collaborating institutions, in addition to the professional audience of museum staff. Native Universe may provide valuable interpretive tools for the field to understand and address the challenges associated with integrating cultural perspectives and science content. The museum case studies will contribute knowledge about the cultural process of science learning, and may transform the way science is presented in museums by leveraging indigenous voice to enhance public awareness and understanding of environmental change from a culturally-grounded perspective. The overall benefit is increased participation of indigenous individuals in STEM and increased public science literacy in the area of environmental change.

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**Project Name:** STEPS - ScienceTheater Education Programming System: A Vehicle for Professional Development, Enhancing Professional Identity, and Communicating Science

**Award Number:** 1043060

**PI Name:** Brad McClain

**Evaluator:** Jess Koepfler

**Abstract:** The Space Science Institute is establishing a museum educator/theater network of eight museums around the country, pairing larger with smaller institutions. The Association of Science-Technology Centers and the Astronomical Society of the Pacific also are collaborators. The primary audience is informal science education museum educators; secondary audiences are museum visitors experiencing the to-be-developed programs.

The Science Theater Education Programming System (STEPS) is a technology that has been developed by the PI and others. The team will be continuing to expand the capability of the system for this project, and the partnering museums are collaboratively creating an initial set of theater programs on astrobiology, along with a suite of training programs and communication formats for educators. The STEPS technology allows these programs to be delivered both on site and via outreach, depending on the goals of each organization. The intent is to form the core of a community of practice that would enhance the professional capacity and identities of informal educators. The theater program format is positioned as a flexible, low-cost alternative to traveling exhibits, particularly for the smaller institutions. Deliverables

include: the establishment of the network, the STEPS system and programs, professional development tutorials and workshops, evaluation of the programs, and a research project and report examining the network as a community of practice and vehicle for strengthening the professional identities of museum educators.

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**Project Name:** Scientists for Tomorrow

**Award Number:** 1114165

**PI Name:** Constantin Rostineau (not attending)

**Co-PI Name(s):** Marcelo Caplan, K. Virginia Lehmkuhl-Dakhwe

**Evaluator:** N/A

**Abstract:** Through the Scientists for Tomorrow pathways project, The Science Institute at Columbia College in Chicago will test a model for preparing non-science major, pre-service elementary school teachers to deliver three ten-week informal science education modules to youth in after school programs. The initiative will bring engineering concepts, environmental science, and technology to approximately 240 urban Chicago youth (ages 10-14 years old) and their families. The Science Institute will partner with eight minority serving community based organizations and the Museum of Science and Industry, the Field Museum, and the Garfield Park Conservatory Alliance to develop and implement all aspects of the program. The goals of the program are two-fold. First, the project will develop and implement a high-quality STEM based afterschool program for under-represented youth in STEM. Second, the professional development and experience implementing the curriculum with youth in the local communities and within informal science education (ISE) institutions will extend and enrich the pre-service teachers' STEM content and pedagogical knowledge base and better prepare them to teach science in formal and informal settings.

Thirty teachers will receive specialized professional development through a seminar, course, and other support mechanisms in order to best support the implementation of the modules, while building their STEM content expertise, confidence, and pedagogical knowledge. Each module has a different STEM content focus: alternative energy (fall), the physics and mathematics of sound and music (winter), and environmental science (spring). At the end of each module, a culminating youth-led presentation will be held at one of the partnering Chicago museums. Youth will be encouraged to participate in all three modules. The formative evaluation will be conducted by the Co-Principal Investigators. Pre and post assessments, artifact reviews, and interviews will be used for the summative evaluation, which will be conducted by an external evaluator at the Illinois Institute of Technology.

The project deliverables include: (a) a teacher training program, (b) an after school curriculum, and (c) media tools - DVDs, website. Over the grant period, the project intends to reach 120 youth each year, over 100 family and community members, and 30 teachers. The larger impact of this project will be the development of a scalable model for bringing relevant STEM content and experiences to youth, their families, and non-science major pre-service teachers. As a result of this project, a cadre of



pre-service teachers will have: (a) increased their STEM content knowledge, (b) gained experience presenting STEM content in informal settings, (c) learned effective approaches to deliver hands-on STEM content, and (d) learned to use museum and other ISE resources in their teaching. In fact, after the grant period nearly half of the teachers will continue to work at the centers as part-time instructors, fully supported by the partnering community centers.

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**Project Name:** Pushing the Limits: Building Capacity to Enhance Public Understanding of Math and Science Through Rural Libraries

**Award Number:** 1010577

**PI Name:** Daniel Rockmore

**Evaluator:** Karen Gareis

**Abstract:** This project is intended to develop a model for STEM education through local libraries. There are several unique features in this endeavor. The model is being aimed at rural libraries and adult residents that are geographically remote from typical venues such as museums, zoos, and science centers. According to the 2000 census, there are 50 million individuals in this designation and the size of the group is increasing and becoming more diverse. Efforts to impact diverse audiences who are economically disadvantaged will be part of the plan. In many rural locations there are few community venues, but libraries are often present. The American Library Association and the Association Rural and Small Libraries have begun the reinvention of these libraries so they can become more attuned to the communities in which they are apart. Thus, this project is an effort to find new ways of communicating STEM concepts to a reasonably large underserved group.

The design is to derive a "unit of knowledge enhancement" (some portion of Climate Change, for example) through a hybrid combination of book-club and scientific café further augmented with videos and web materials. Another part of the design is to enhance the base STEM knowledge of library staff and to associate the knowledge unit with an individual who has the specific STEM topic knowledge for a specific unit. Considerable effort shall be expended in developing the models for staff knowledge enhancement with a progressive number of librarians in training from 8 to 20 to 135. To build the content library model, five units of knowledge will be devised and circulated to participating libraries. Evaluation of the project includes front end, formative and summative by the Goodman Research Group.

In addition to the "units of knowledge enhancement," the major results will be the model on how best to relate and educate citizens in rural environments and how to educate the library staff. Publications and presentations will be the major mechanism for elaboration of the results and encouragement for others to take up the model and adapt it for their own circumstances.

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**Project Name:** Portal to the Public

**Award Number:** 0639021

**PI Name:** Meena Selvakumar

**Evaluator:** Angie Ong

**Abstract:** The Pacific Science Center (WA), in collaboration with Explora (NM), the North Museum of Natural History and Science (PA) and the Institute for Learning Innovation (MD), will develop, implement, research and evaluate a delivery model for effectively communicating current science to the public at informal science education organizations. Project deliverables will include cost-effective delivery mechanisms, development and testing of professional development workshops for scientists, in-depth research into the factors affecting implementation of the model and a guide to implementation of the model workshops.

The project will reach museum professionals at 28 institutions, 275 scientists and 25,000 visitors over three years. It has significant potential for long-term impact on science museums across the nation based on the development, testing and dissemination of a flexible educational program approach that involves partnering with practicing scientists and engineers in their communities. In so doing, it will enhance their capacities to communicate current science and technology to their audiences.

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**Project Name:** Playful Invention and Exploration (PIE) Institute: Professional Development Opportunities for Informal Educators

**Award Number:** 0452567

**PI Name:** Mike Petrich, Karen Wilkinson (co-PI)

**Evaluator:** N/A

**Abstract:** The "Playful Invention and Exploration (PIE) Institute" is a three-year project to increase the capacity of museum educators and exhibitors to design and implement technology-integrated inquiry activities for the public. The collaborators include the Exploratorium, MIT Media Lab, Science Museum of Minnesota, Fort Worth Museum of Science and History, Explora Science Center and the Children's Museum of Albuquerque. The deliverables include a portfolio of technology-rich activities, professional development institutes, online educator resources and a handbook of pedagogical design principles for museum educators. This project builds upon prior NSF supported work that developed the PIE Network, which among other things developed the "cricket," an inexpensive computer that makes informal learning inquiry activities more compelling. This project has the potential to impact both the theory and practice of informal science education in museums. It will implement new theories and tools that represent a new approach to engaging and supporting visitors' learning experiences using play and experimentation that mirrors the processes of laboratory investigation. It also provides an innovative model of collaboration that develops and implements a major complex project by bringing together science centers with unique and complementary expertise.

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