

CAISE Convening on Sustainability Science and Informal Science Education
February 6th & 7th, Washington, DC

Project Abstracts

Project Name: Crowd ID: Collaborative Tools Connecting People to Biodiversity through Social Networks and Machine Learning

Award Number: 1010818

PI Name: Miyoko Chu

Evaluator: Tina Phillips

Abstract: The Cornell Lab of Ornithology (CLO) is creating a new type of interactive, question-driven, online bird-identification tool called "Merlin," along with associated games, social networking tools, and other media. Unlike existing bird-identification guides, which are based on traditional taxonomic keys written by scientists, Merlin uses machine learning algorithms and crowd-sourced data (information provided by thousands of people) to identify birds and improve Merlin's performance with each interaction. The tool will help more than twelve million people a year identify birds and participate in a collective effort to help others. The Crowd ID project will make it easier for people to discover the names of birds, learn observation and identification skills, find more information, and appreciate Earth's biodiversity. The summative evaluation plan is measuring increases in participants' knowledge, engagement, and skills, as well as changes in behavior. Impacts on participants will be compared to a control group of users not using Merlin.

Crowd ID tools will be integrated into the CLO's citizen science and education projects, which reach more than 200,000 participants, schoolchildren, and educators across the nation. Merlin will be broadly adapted for use on other websites, social networking platforms, exhibits, mobile devices, curricula, and electronic field guides. Once developed, Merlin can be modified to identify plants, rocks, and other animals. Merlin will promote growth of citizen science projects which depend on the ability of participants to identify a wide range of organisms.

Project Name: Future Earth Initiative

Award Number: 0741760

PI Name: Patrick Hamilton

Evaluator: Molly Phipps

Abstract: The Science Museum of Minnesota, in collaboration with six NSF-funded Science and Technology Centers (STCs) around the country, are developing several deliverables around the theme of the Anthropocene epoch, i.e., the idea that the Earth is currently in a period of its history where humans are the dominant planetary agents of change.

Deliverables include: (1) a 3,500 square-foot exhibit at the museum; (2) a changing set of small exhibits on sustainability science and design that will be both at the museum and the University of Minnesota; (3) an Earth Buzz Web site equivalent in intent to the museum's very popular Science Buzz site on current science; (4) kiosks with Earth Buzz experiences in selected public venues where the STCs are; (5) Talking Circle discussion groups with decision makers on the implications of the exhibit topic for policy; and (6) youth programs and activities that engage them with the exhibit, Web site, and careers in STEM.

The exhibits and Web site will feature scientific visualizations and computational models adapted to public learning environments from the STCs' research. Twin Cities Public Television will produce several first-person narrative videos of scientists and their research that will be incorporated into the deliverables as well as be packaged as a program for public television.

The intended strategic impact on the field of informal STEM education is twofold: (1) to learn how to accelerate the dissemination of scientific research to public audiences; (2) to continue to explore ways science centers/museums can use exhibitions as educational frameworks for public policy dialogues.

Project Name: The Change

Award Number: 1114686

Co-PI Name: Seth Kramer

Evaluator: Joan Twohey-Jacobs

Abstract: The Change (working title) is a film project with supporting website and resource materials to document how climate change is impacting indigenous peoples in the most climate sensitive regions, and how anthropologists, environmental scientists, engineers, and others are working with these communities to help mitigate the effects. The documentary features Dr. Susie Crate, an NSF-funded anthropologist, and her bi-national teenage daughter Katie, whose father is from Siberia. The Viliui Sahka in Siberia, Alaska Natives in Nome, and South Pacific Islanders on Tuvalu are the communities portrayed in the film. The Change is a Full-Scale Development project produced by Ironbound Films. Outreach partners include the Center for Climate Change Communication (4C) at George Mason University, the Global Climate Adaptation Partnership (GCAP), the Society for Applied Anthropology (SfAA), the International Indian Treaty Council (IITC), and the Institute for Tribal Environmental Professionals (ITEP).

Ironbound Films has designed this project to build upon its successful prior documentary work, *The Linguists*. Deliverables include a documentary for limited theatrical release and television and Internet broadcast along with an interactive website, curriculum guide, a shorter classroom version of the film, and a robust outreach strategy in collaboration with project partners. One of the components of the outreach in conjunction with SfAA will be to create the first social networking site

around climate change adaptation. Another in conjunction with GCAP is to create a series of four virtual climate change tours for Google Maps and Earth applications. SmartStart Educational Consulting Services will conduct front-end, formative, and summative evaluations.

The real-life characters and communities featured in the film will illustrate how climate change is affecting people today in various parts of the world. The project gives voice to anthropologists who have been working to understand climate change as a cultural phenomenon, a perspective rarely showcased in the media.

Anthropologists have expressed the need for an effective means to share this work and its results with the public. The story is based on contemporary climate science and anthropology, but features the personal perspective of the bi-national teenage daughter, and is intended to appeal to an audience not typically drawn to a climate change documentary, especially the young or underserved. An aggressive, targeted marketing and outreach campaign reflects the film's innovative approach.

Project Name: The Nexus of Energy, Water, and Climate: From Understanding to Action

Award Number: 1011086

PI Name: Michael Mayhew

Abstract: The Nexus of Energy, Water, and Climate: From Understanding to Action (Café +) project will develop and test two interactive board game concepts focused on energy, water, and climate with youth and adults from four highly diverse communities in New Mexico. The four primary goals of the project are to: (a) develop, play test, and implement two board, card, or other non-electronic games grounded in energy, water, and climate content at four project sites, (b) identify the key characteristics of the games that maximize problem solving while stimulating interest, engagement, and learning, (c) explore the implications of game playing on dialog, learning, and Café+ satisfaction for youth and adult participants, and (d) evaluate the viability of this model for full scale implementation throughout the existing Café Scientifique program, from which this project is based. Los Alamos National Laboratory, Sandia National Laboratory, PNM Resources, Scott Balaban Games Design, the Los Alamos County Utilities Department, and a host of advisors and consultants from a broad range of organizations and institutions will collaborate to develop, test, and implement the Café+ games model. The primary deliverables include: (a) two non-electronic multiage commercial quality games focused on energy, water, and climate content, (b) a comprehensive pilot study examining the impact, effectiveness, and viability of the Café+ model with the target audiences, and (c) formative and summative evaluations of the games implementation model.

A significant outcome of Café+ is that New Mexico youth and adults, from diverse backgrounds, will learn relevant science content through the development and testing of engaging, innovative commercial quality games. Over 250 youth and adults will benefit directly from their participation in the pilot study. They will not only learn

important science content while working collaboratively in groups (youth only and youth/adult groups), but they will also participate in an authentic scientific process experience as playtesters. In this role, youth and adults will experience critical science concepts such as trial and error and refinement. Further, the games will be made publicly available and implemented across the entire Café Scientifique program (n=960 youth).

The evaluation study will employ a mixed methods approach to examine project implementation, effectiveness, and impacts. Focus groups, observations, and surveys will be employed to assess a number of variables such as (but not limited to): content knowledge and learning, interest, engagement, game features, game play processes, gaming obstacles and challenges, participant interactions, and motivation. Embedded assessment opportunities will also examine participants' decision making abilities, analytical skills, and ability to transfer knowledge gained to real world situations as they navigate through the games. Data collected at the youth-only pilot test sites will be used in a comparative analysis of similar variables tracked at the youth and adult sites. Formative approaches will provide iterative, ongoing opportunities for programmatic and game refinement and adjustments. The formative and summative evaluations will endeavor to document critical data and findings needed to assess the viability of Café+ as a full scale development project, with additional games and project sites across the country.

The Café+ project would add to the limited literature base on learning and science engagement of youth within Science Café settings in the 21st century. More critically, this pilot study could contribute to the dearth of current research on the impact of non-electronic game play can have on youth only groups and youth/adult groups working collaboratively to make important scientific decisions within Science Café settings. This comparative data could prove significant for other program models interested in implementing similar youth and adult game based program. Further, the relevance of the content could potentially spark youths' interest not only in pursuing courses and careers in STEM, but it could also motivate youth and adult participants to become more involved in civic engagement activities occurring within and beyond their local communities.

Project Name: Wild Research: A Whole-Zoo Exhibit and Inquiry Program

Award Number: 0610409

PI Name: Christopher Myers

Evaluator: Joe Heimlich

Abstract: Miami University - Ohio/Project Dragonfly is developing "Wild Research," a multi-faceted collaborative project with the Cincinnati Zoo & Botanical Garden and with a consortium of ten zoos and aquariums around the country, the American Zoo and Aquarium Association, the Society for Conservation Biology, and Conservation International. Project deliverables include a centrally-located 4,500 square-foot Wild Research Discovery Forest exhibit and six Wild Research Stations around the

Cincinnati Zoo, a Wild Research Consortium and Wild Research Leadership Workshops for zoo professionals, conservation scientists and educators, a Wild Research Web site with visitor password access to exhibit data they collected, and 90-second radio pieces for the 90-Second Naturalist program. Institute for Learning Innovation is conducting the formative and summative evaluations. The Ohio Assessment and Evaluation Center is conducting a separate evaluation focused on this extensive institutional collaboration process. The primary public impact is to explore new ways zoos and aquariums can incorporate inquiry-based activities on site and to help visitors understand the work of conservation scientists. The project also aims to improve the practice of zoo and aquarium professionals nationwide in inquiry-based experiences and communicating about conservation science.

Project Name: Saving Species: Socially-Networked Exhibits for Science Inquiry and Public Action

Award Number: 1010938

PI Name: Christopher Myers

Abstract: "Saving Species" will engage large and diverse public audiences in inquiry-based learning and environmental stewardship through a system of exhibits at zoos and other informal science education institutions throughout the U.S. The exhibit system will include more than 70 touch screen interactives and related technological infrastructure being created by Project Dragonfly at Miami University (Ohio). Project partners include the Cincinnati Zoo & Botanical Garden, Brookfield Zoo, Cleveland Metroparks Zoo, Columbus Zoo & Aquarium, Denver Zoo, Liberty Science Center, Louisville Zoological Garden, New York State Zoo, Oregon Zoo, Pittsburgh Zoo, Riverbanks Zoo, Santa Barbara Zoo, Shedd Aquarium, Toledo Zoo, The Wilds, Woodland Park Zoo, and Zoo Atlanta. Touch screen exhibit components will be designed for specific programs at partner zoos.

The partner institutions in this consortium are establishing exhibits nationwide linked to one of three Saving Species campaigns: 1) the Great Ape Campaign allows families to conduct research on captive ape populations and to help save wild apes by joining the work of experienced field researchers; 2) the Wild Cat Campaign focuses on endangered cat species and allows families to join in conservation efforts along with professionals; 3) the Sustaining Life Campaign builds on widespread interest and growing exhibitry in environmental stewardship, renewable energy, and climate change. The consortium includes a shared library of public inquiry and public-action tools (e.g., cell phone recycling), as well as remote monitoring capabilities that provide real-time measures of station success, facilitating the development of variations of exhibit interactives across the country. More than 500 staff from informal science institutions are participating in "Saving Species" professional development through workshops and graduate courses in major cities and conservation sites worldwide. The formal educational opportunities include two new Master's degree programs co-delivered by Miami University and informal science institutions: (1) the Advanced Inquiry Program, and (2) the Global Field Program.

Strategic partners include the Association of Zoos & Aquariums, public television, Conservation International, and the Society of Conservation Biology. Project evaluation by the Institute for Learning Innovation includes specific assessment protocols that are identifying patterns of engagement by gender, ethnicity, and socio-economic class so that disparities can be addressed across these demographics. A planning study and front-end evaluation will inform the future development of personalized, post-visit engagement opportunities on social networking platforms.

"Saving Species" will achieve broad impact nationally, reaching millions of visitors to the participating institutions annually during the funding period and beyond, fostering the relationship between science inquiry and public action, and building multi-institutional partnerships committed to sustaining life on our planet.

Project Name: Girls Energy Conservation Corps

Award Number: 0813434

PI Name: Gillian Puttick

Evaluator: Polly Hubbard

Abstract: TERC and the Girl Scouts of America are partnering to create an energy monitoring and conservation after school program for approximately 5,500 girls ages 8-11 in eastern Massachusetts. The goals of the Girls Energy Conservation Corps (GECCo) after school project are to involve girls in learning and applying science, using technology, developing leadership and communication skills, educating peers, saving energy, and addressing the global issue of climate change. The project is (1) developing activity-based Energy Detective Kits to help girls understand, monitor, and reduce energy use, (2) adapting devices for measuring home electricity consumption, and (3) developing guidelines for using new media (such as YouTube) to engage girls in science and helping them use new media to inform and communicate their experiences and findings to Girl Scouts nationally. Project participants are cumulatively reducing their energy consumption and adopting more sustainable lifestyles.

Project Name: 3D Visualization Tools for Enhancing Awareness, Understanding, and Stewardship of Freshwater Ecosystems

Award Number: 1114663

PI Name: S. Geoffrey Schladow

Evaluator: Steven Yalowitz

Abstract: The University of California, Davis, Tahoe Environmental Research Center (TERC), UC Davis W.M. Keck Center for Active Visualization in the Earth Sciences (KeckCAVES), ECHO Lake Aquarium and Science Center (ECHO), UC Berkeley Lawrence Hall of Science (LHS), and the Institute for Learning Innovation (ILI) will study how 3-D visualizations can most effectively be used to improve general public understanding of freshwater lake ecosystems and Earth science processes through the use of immersive three-dimensional (3-D) visualizations of lake and watershed processes, supplemented

by tabletop science activity stations. Two iconic lakes will be the focus of this study: Lake Tahoe in California and Nevada, and Lake Champlain in Vermont and New York, with products readily transferable to other freshwater systems and education venues.

The PI will aggregate and share knowledge about how to effectively utilize 3-D technologies and scientific data to support learning from immersive 3-D visualizations, and how other hands-on materials can be combined to most effectively support visitor learning about physical, biological and geochemical processes and systems. The project will be structured to iteratively test, design, and implement 3-D visualizations in both concurrent and staggered development. The public will be engaged in the science behind water quality and ecosystem health; lake formation; lake foodwebs; weather and climate; and the role and impact of people on the ecosystem. A suite of publicly available learning resources will be designed and developed on freshwater ecosystems, including immersive 3-D visualizations; portable science stations with multimedia; a facilitator's guide for docent training; and a Developer's Manual to allow future informal science education venues.

Project partners are organized into five teams: 1) Content Preparation and Review: prepare and author content including writing of storyboards, narratives, and activities; 2) 3-D Scientific Visualizations: create visualization products using spatial data; 3) Science Station: plan, design, and produce hands-on materials; 4) Website and Multimedia: produce a dissemination strategy for professional and public audiences; 4) Evaluation: conduct front-end, formative, and summative evaluation of both the 3-D visualizations and science activity stations. The summative evaluation will utilize a mixed methods approach, using both qualitative and quantitative methods, and will include focus groups, semi-structured interviews, web surveys, and in-depth interviews. Leveraging 3-D tools, high-quality visual displays, hands-on activities, and multimedia resources, university-based scientists will work collaboratively with informal science education professionals to extend the project's reach and impact to an audience of 400,000 visitors, including families, youth, school field trip groups, and tourists.

The project will implement, evaluate, and disseminate knowledge of how 3-D visualizations and technologies can be designed and configured to effectively support visitor engagement and learning about physical, biological and geochemical processes and systems, and will evaluate how these technologies can be transferred more broadly to other informal science venues and schools for future career and workforce development in these critical STEM areas.

Project Name: Water's Journey through the Everglades
Award Number: 0638977
PI Name: Eileen Smith
Evaluator: Karla Saari Kitalong

Abstract: The University of Central Florida is conducting a 48-month project with the Museum of Discovery and Science (MODS) in Ft. Lauderdale and with Simiosys, Inc. to develop augmented reality (AR) "scientific virtualizations" for the museum's 27,000 square-foot EcoDiscovery Center expansion. The new wing has a science content focus on the Everglades, with experiences that allow visitors to explore questions about this ecosystem across the major variables of space, time, and scale. A Web portal site is also being developed that includes science-related games and contests. A key audience for the deliverables is adolescents. They are part of the project's advisory committee and are being enlisted to assist with the project's formative evaluation processes and to recruit their peers to the exhibit and Web portal. The project is positioned as a model for other museums on the use of embedded augmented reality simulations, and a component of the evaluation plan is to ascertain the feasibility of diffusing the model to other institutions. The Orlando Science Center is participating as a prototype center in the earlier stages of the project. Evaluation faculty at UCF are overseeing formative evaluation. The Institute for Learning Innovation will carry out the summative evaluation.

Project Name: Sustainability: Promoting Sustainable Decision Making in Informal Education

Award Number: 0917595

PI Name: Raymond Vandiver

Evaluator: Marcie Benne

Abstract: The Oregon Museum of Science and Industry (OMSI) will partner with the City of Portland's Office of Sustainable Development, Metro Regional Government, Portland Community College, Verde, and the Coalition for a Livable Future, to create a series of informal science education experiences on the theme of Sustainability. For this project, sustainability is defined in terms of a triple bottom line of economic, social, and environmental needs. The project responds to calls for broad environmental education of the public in response to environmental crises (such as climate change), and specific research suggesting that even museums that do provide information about such issues rarely help their visitors learn to make the comparisons necessary to make more sustainable choices.

For the public audience, the project team will create a 1,500 sq. ft. bilingual (Spanish/English) exhibition to encourage the public to develop skills in making personal choices that affect the sustainability of their community. They will also create 25-40 bilingual cell phone tags that will provide listeners who dial the phone numbers with information, personal perspectives, current STEM research, invitations to contribute ideas or vote on issues, interactive phone-based activities, and links to websites, all in service of helping them make intentional and informed personal decisions on sustainability. The cell phone tags will be located at approximately 100 locations in the Portland area, including predominantly Hispanic neighborhoods, public transit locations, public works, and community projects. The team will also create a bilingual website and will offer quarterly bilingual events at the museum on

the topic of sustainable living.

For the professional audience, the team will create a set of tools and indicators for assessing the sustainability of exhibit-development processes, using the triple bottom line of financial, environmental, and social impacts. For example, a Green Exhibit Guide will provide resources and a checklist for exhibit development projects, and will propose field-wide standards analogous to the LEED (Leadership in Energy and Environmental Design) rating system for green buildings. Regional workshops will engage exhibit developers, designers, fabricators, and administrators in using the tools in their own institutions.

The project will create a coordinated set of resources to inform the public about the science of sustainability and to engage them in making informed choices in their daily lives, both in the museum and beyond. The topic of sustainability is timely and important, and the use of cell phones as a mobile technology linked to web resources and an exhibition constitute an innovative synergy of media to create impacts on a city-wide scale. The project serves underrepresented Hispanic audiences through its creation of bilingual materials, placement of cell phone tags, and community involvement in the development process. Finally, the project advances the ISE field in proposing and broadly disseminating a set of standards for green exhibit design, along with developing resources and tools for assessing sustainability. Created in collaboration with other organizations, this work has the potential to reduce the environmental impact of museums while providing highly visible examples of sustainable practices for visitors.

Project Name: The Energy Project

Award Number: 0917640

PI Name: Barinetta Scott

Evaluator: Saul Rockman

Abstract: The purpose of this integrated cross media project is to build public knowledge and curiosity about energy science and policy, to encourage audience confidence in its abilities to understand energy related science, and to stimulate exchange between community-based experts. The deliverables include five hour-long radio programs focusing on the interconnected nature of waterways, climate systems, and energy sources; a digital journalism and social network site focusing on energy topics; partner-driven outreach with universities and local public radio stations; and a training workshop for ethnic media partners. The project targets public radio listeners, ethnic media readers, local urban and rural communities, and Internet users. Partner organizations include New American Media, a consortium of ethnic media producers, the University of Texas at Austin (which will provide content expertise as well as outreach assistance), local public radio stations, and scientific organizations.

Intended impacts on the general audience include building their knowledge and

interest in energy science and policy, and influencing their confidence in understanding energy science, technology and engineering, as well as empowering them to voice their opinions in energy policy discussions and to make changes in their lives that will support a sustainable energy future. It is estimated that five million people will access the radio programs and web content over the sustained life of the project. Professional audience impacts include building science journalism capacity and reciprocal relationships between general and ethnic news media, as well as stimulating exchange between subject experts (e.g., water engineers and geoscientists) and community experts (e.g., community organizers and backyard gardeners) who can inform energy reporting and open new areas of discussion in the energy debate. The evaluation plan uses both quantitative and qualitative data collection and quasi-experimental designs to examine the impact of this project on both public and professional audiences.

Project Name: LOOP Production Season 1

Award Number: 1114515

PI Name: Marisa Wolsky

Evaluator: Christine Andrews Paulsen

Abstract: LOOP is a new multiplatform, environmental project designed to help young children, ages 6-8, explore ecosystems and understand the science and systems of the natural world. Built upon a curriculum that moves beyond the 3Rs (reduce, reuse, recycle), the goal is to help lay the foundation for a lifelong interest in the science of sustainability. Deliverables include: a 20-episode television series with animated stories and live-action segments which feature families and children; an online game to immerse players in the same ecosystems seen on television; Loop Live Missions (outdoor science activities); and an afterschool/camp curriculum designed to get children and families outside to explore natural systems. Promotion of LOOP's educational resources will be undertaken through a partner network including the U.S. Forest Service, Children & Nature Network, National Recreation and Park Association, American Camp Association, National Summer Learning Association, Girl Scouts of the USA, and the Boys & Girls Clubs of America.

LOOP is produced by WGBH in Boston and intended for national distribution on PBS. The project design creates an "interactive learning loop" which cycles between the television series, the Website, and outdoor science activities. The intended impacts are to: (1) deliver educational media to the target audience that increases their understanding of science and sustainability issues; (2) model and teach science concepts and scientific habits of mind; and (3) connect children and their families to the natural world.

Concord Evaluation Group will be responsible for conducting formative and summative evaluation of the project. The summative evaluation is designed to measure project impacts with respect to change in behavior and attitudes, as well as science learning. The results of the evaluation will inform the curriculum for the current and future

seasons of LOOP and contribute to the growing knowledge base of how media can effectively promote and teach substantive science to the young.

Project Name: Communicating Climate Change (C3)

Award Number: 0813135

PI Name: Walter Staveloz (Kate Crawford attending)

Abstract: The Association of Science-Technology Centers (ASTC), in collaboration with the Yale Project on Climate Change and the Cornell Laboratory of Ornithology, is conducting a three-year project whose goal is to build the capacity of twelve science centers as well as of twelve NSF-funded Long-term Ecological Research Centers (LTER) for the purpose of engaging the public in climate change science. The twelve sites span the USA from the east coast to Hawaii. The goal of these simultaneous projects is to illustrate local indicators of global change. Additional partners include ScienCentral, Inc. (TV media producers), the University Corporation for Atmospheric Research, the American Geophysical Union, NOAA, Natural History magazine, and a national board of advisors.

Deliverables include: (1) twelve local demonstration projects with launch programs, exhibits/programs, TV spots, citizen science activities, and an interactive map illustrating the work of the twelve sites, (2) professional development for informal STEM education professionals and LTER research faculty, (3) a national survey to assess the USA population's climate literacy, and (4) a culminating workshop for the ISE field, a permanent resource database, and a final publication. Evaluation processes are being conducted by David Heil & Associates.
