# STEM Ambassador Program 2016-2017 Impact Report

## About STEMAP

The STEM Ambassador Program (STEMAP) is an innovative research and public engagement training program funded by the National Science Foundation[1] and directed by Dr. Nalini Nadkarni at the University of Utah. STEMAP guides scientists in sharing their work in non-traditional venues, outside academic institutions, museums, and science centers, with the goal of connecting science to those who may not be served by traditional learning venues.

Traditional science outreach typically serves audiences who seek out science by visiting a library, museum, science center or other learning venue, but this approach does not serve our entire population. Individuals with no social or family tradition of visiting museums are unlikely to frequent these institutions.[2]

STEMAP aims to reach those who do not or cannot regularly visit traditional learning venues by putting relevant science in places where it can be encountered in places where people live, work, recreate, or worship, such as in a correction facility, senior center, cooking school, or church.

STEMAP has supported cohorts of University of Utah scientists over a period of several months by providing workshops and one-on-one staff assistance. The program has also offered short workshops and consultations for those outside the cohort.

Scientists trained by STEMAP are referred to as 'STEM Ambassadors' because they represent the fields of science, technology, engineering, and math to communities outside academia.

Ambassadors are guided by STEMAP staff to think deeply about their research and personal characteristics and identify communities outside traditional learning venues that might share in one or more of these. Mutual interests, characteristics, and experiences serve as a bridge between the scientist and the community.

## Resources Offered

STEMAP offers a variety of public engagement resources to academic scientists including:

- assisting writing and fulfilling innovative National Science Foundation (NSF) Broader Impact activities;
- STEM Ambassador public engagement workshops and cohort training;
- an online database of public engagement activities, organized by field of study;
- an online database of over 100 University of Utah public engagement resources;
- community contacts; and
- staff support planning and implementing engagement activities.

1 Advancing Informal STEM Learning Award # 1514494

2 Falk, J.H, and L. D Dierking. 2012. The personal context: identity-related motivations. In: Museum Experience Revisited: pp 37-62. Taylor and Francis, Oxford.

## The Need for STEMAP Resources

In 2017, 36 University of Utah scientists applied for just 20 slots in the STEMAP cohort. This excess of applications indicates a strong interest in STEMAP training.

STEMAP partners with external evaluator Inverness Research and scientists at Stanford University to evaluate the program. Interviews with 2016 Ambassadors revealed that STEM Ambassadors shifted how they thought about themselves as science communicators. Ambassadors also reported that STEMAP staff played a key role in their success implementing public engagement activities.

Survey data showed that over 90% of scientists participating in STEMAP in 2016 and 2017 rated their time in the STEM Ambassador Program as valuable or very valuable and indicated that it increased their interest in offering science engagement programs to new audiences.

*STEM Ambassadors volunteer to share their work at the University of Utah SciComm Fair*

Public perception of STEMAP events have been overwhelmingly positive, with the majority of survey respondents indicating that they enjoyed or strongly enjoyed attending STEMAP events.

## Scientist Experience in the STEMAP Cohort

The focus of STEMAP has been on working with scientists in a 'STEM Ambassador cohort.' The following illustrates the training process and experience of those scientists.


*STEM Ambassadors at workshop*

1. **Identify Community Connections:** Scientist meets with STEMAP staff to summarize their research and personal interests and characteristics. Staff assists scientist in generating a list of communities gathered outside academia and traditional learning venues that might share in one or more of those interests or characteristics.
2. **Workshops:** Scientist receive public engagement training based on 3 NSF-supported education models.[1]
3. **Immersion:** Scientist learns about one of the communities identified in step 1 by visiting the community's gathering places and/or reading the community's publications. STEMAP staff assists scientist in making initial contact with the community and generating community 'buy-in.'
4. **Develop Engagement Activity:** Scientist uses information gathered in step 3 to develop an engagement plan tailored to that community. Scientist receives feedback and support from STEMAP staff and other Ambassadors.
5. **Engage and Evaluate:** STEM Ambassador engages with community group. Engagement is evaluated and documented through surveys and observational notes.
6. **Reflection:** Ambassador reflects on engagement event and refines for future events. Event is communicated to the STEMAP community via the STEMAP newsletter and website.

1 Portal to the Public, Design Thinking, and Research Ambassador Program

## STEM Ambassador Engagement Events

The STEM Ambassador Program provided intensive training to 2 cohorts of 20 University of Utah scientists. The following is an overview of 3 of the 85 events offered by those scientists.

- Microbiologist Julia McGonigle, whose hobbies include making homemade sauerkraut and kimchi, shared the microbiology behind fermentation cooking at a local cooking school.
- Virologist and Director of the Electron Microscopy Core Lab David Belnap partnered with an artist to design coloring pages based on images of virus structure. He shared a prototype of the book with youth at a residential treatment center and incorporated their input.
- Wildlife biologist Mark Chynoweth partnered with students in secure care facilities to carry out a citizen science project to identify web-based wildlife photos taken by camera traps.

## Broader Impacts Support

STEMAP was approached by several faculty members in the Biology, Engineering, Geology, and Chemistry Departments for assistance in developing and fulfilling innovative Broader Impacts activities. This assistance was requested by faculty who had participated in STEMAP or heard about the program. **These unsolicited requests suggest a need for additional resources to facilitate innovative BI activities.**

STEMAP assisted with drafting the following Broader Impacts sections. STEMAP was written into the several of these grants to support implementation.

**Broader Impacts Support provided by STEMAP**

| University of Utah Faculty PI | Department | NSF Grant | STEMAP Support |
|---|---|---|---|
| Dr. Fred Adler | Biology | Center for Mathematics of Complex Biological Systems | Establishing a network involving the research team and non-academic collaborators (e.g., grassroots organization, musicians, emergency response professionals) to investigate how systems function |
| Dr. Bill Anderegg | Biology | CAREER | Connecting research on climate change impacts on forests with hunters and anglers |
| Dr. Marc Calaf | Engineering | CAREER | Partnering with local outdoor recreation organizations and retailers to develop a mobile application crowdsourcing cloud data and providing information on weather conditions associated with particular clouds |
| Dr. Gabe Bowen | Geology | Atmospheric Chemistry | Connecting researchers with auto mechanics to share information on combustion engine systems to inform a study of combustion derived water vapor |
| Dr. Shelley Minteer | Chemistry | Center for Chemical Innovation | Providing STEMAP training and public engagement implementation support to research team |
| Dr. Masood Parvania | Engineering | CAREER | Providing public engagement training and connecting PI with Native American communities and youth in custody |

## Program Achievements

Since the program's first workshop in April 2016, STEMAP has:

- trained 2 cohorts of 20 University of Utah scientists (40 total) in public engagement;
- facilitated 85 public engagement programs in 40 venues;
- reached over 1,600 members of the public;
- provided public engagement training for approximately 130 Fulbright students from 55 countries;
- provided public engagement training for approximately 10 iUtah scientists and staff (Utah EPSCoR, NSF Award # 1208732);
- provided public engagement and STEMAP implementation training for 22 participants at the National Alliance for Broader Impacts 2017 annual summit;
- partnered with the Editor in Chief of *Frontiers in Ecology and the Environment*, a high-ranking ecology journal, to provide support to *Frontiers* authors in sharing their work with public audiences; and
- provided Broader Impacts support to 6 University of Utah faculty members applying for NSF funds (this service was specially requested, it was not advertised by STEMAP).


*STEM Ambassador shares her work with pigeons at a children's play group*

*STEM Ambassador works with local tattoo artists to leverage public interest in tattoos to generate an appreciation for science and science*

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