STEM AMBASSADOR PROGRAM

BRIDGING SCIENCE & SOCIETY

April 30, 2019

NABI Workshop

www.stemap.org

THE UNIVERSITY OF UTAH

Stanford GRADUATE SCHOOL OF EDUCATION

PACIFIC SCIENCE CENTER

NATURAL HISTORY MUSEUM OF UTAH

Inverness Research

NSF

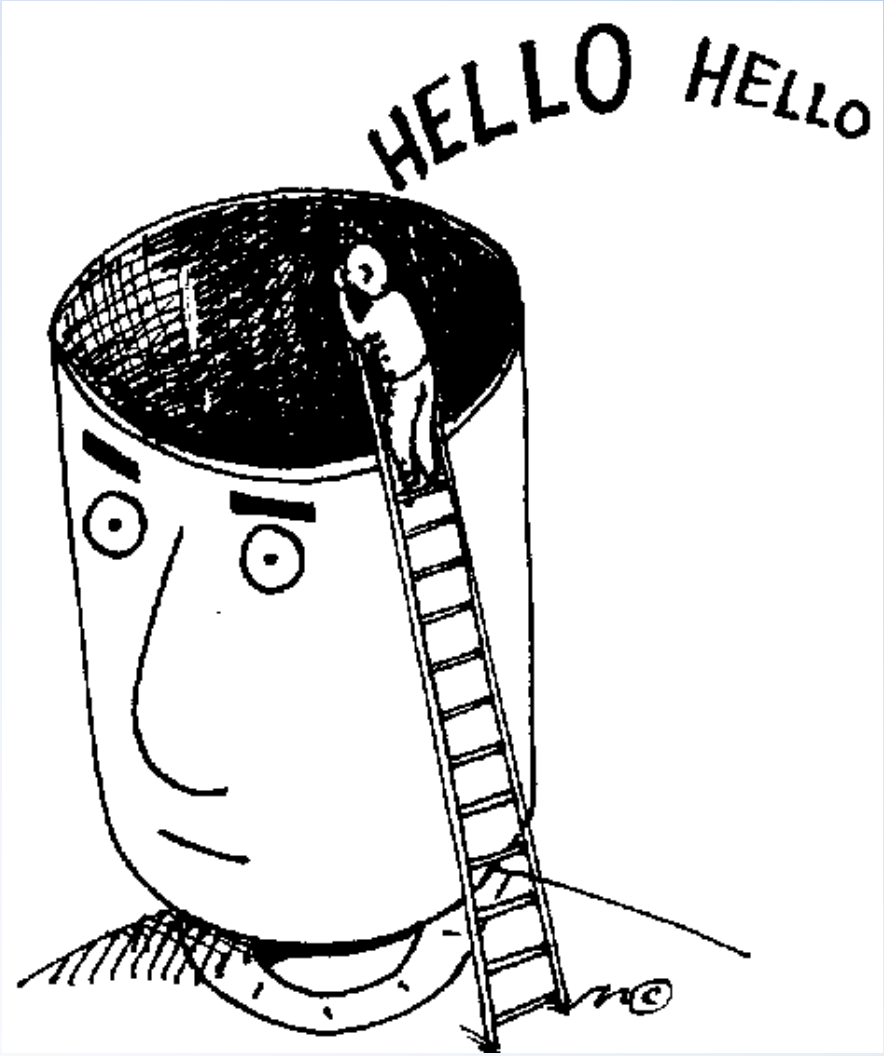
Science and Society

Broader Impacts

- **Broaden participation**
- **STEM education**
- **Public engagement with science**
- **Societal well-being**
- National security
- Economic competitiveness
- Infrastructure for research and education

The Deficit Model

People are empty vessels into which we can pour scientific information.

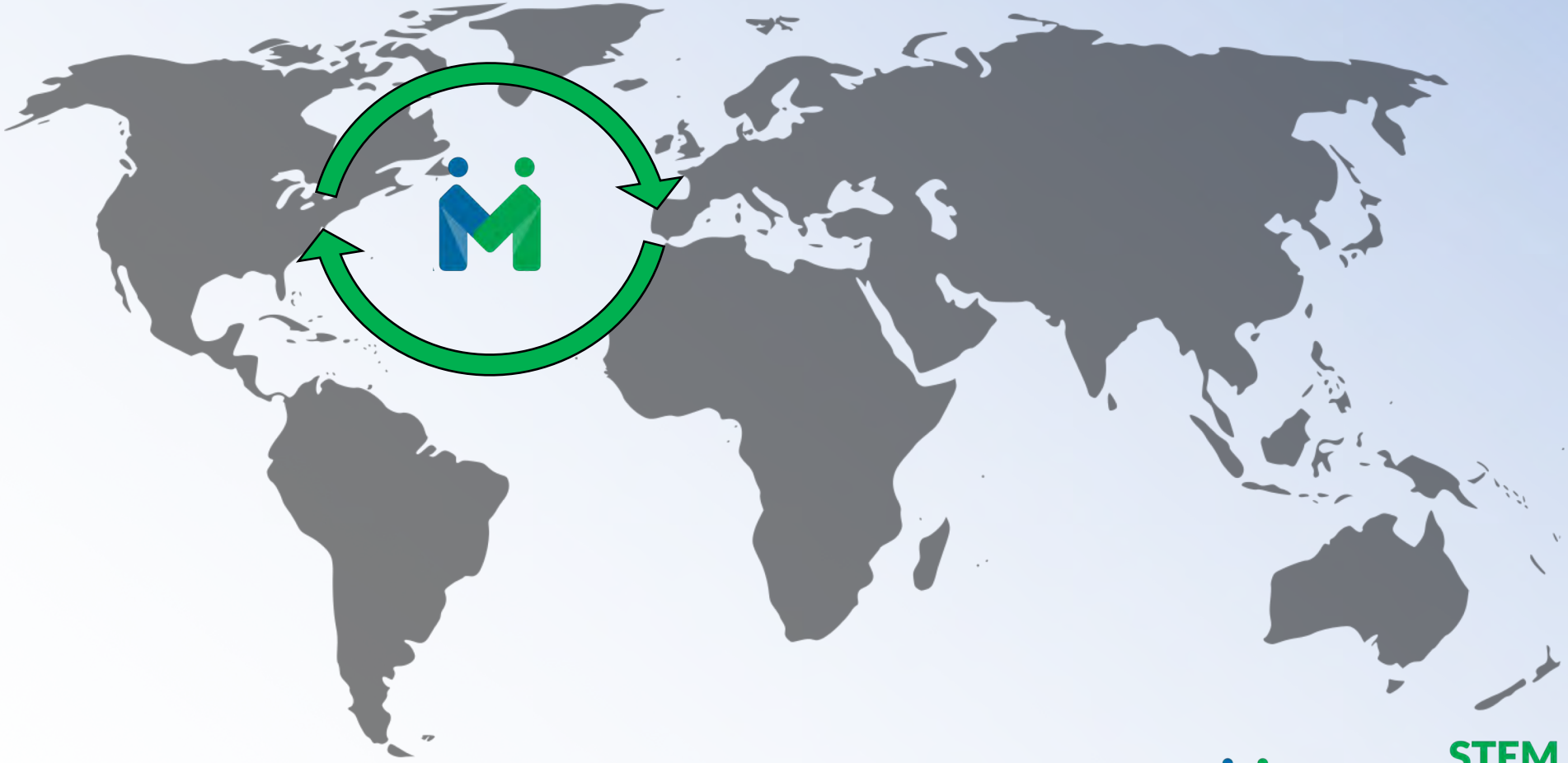


Shifting Goals in Public Engagement

Public Outreach
Increase science literacy

Public Engagement
Facilitate dialogue

"…Fostering relationships for open-minded exchange between scientists and the public, with an emphasis on reaching those who cannot or do not engage with science in conventional ways…"



STEM AMBASSADOR PROGRAM
BRIDGING SCIENCE & SOCIETY

Traditional venues

Venues that Improve Accessibility

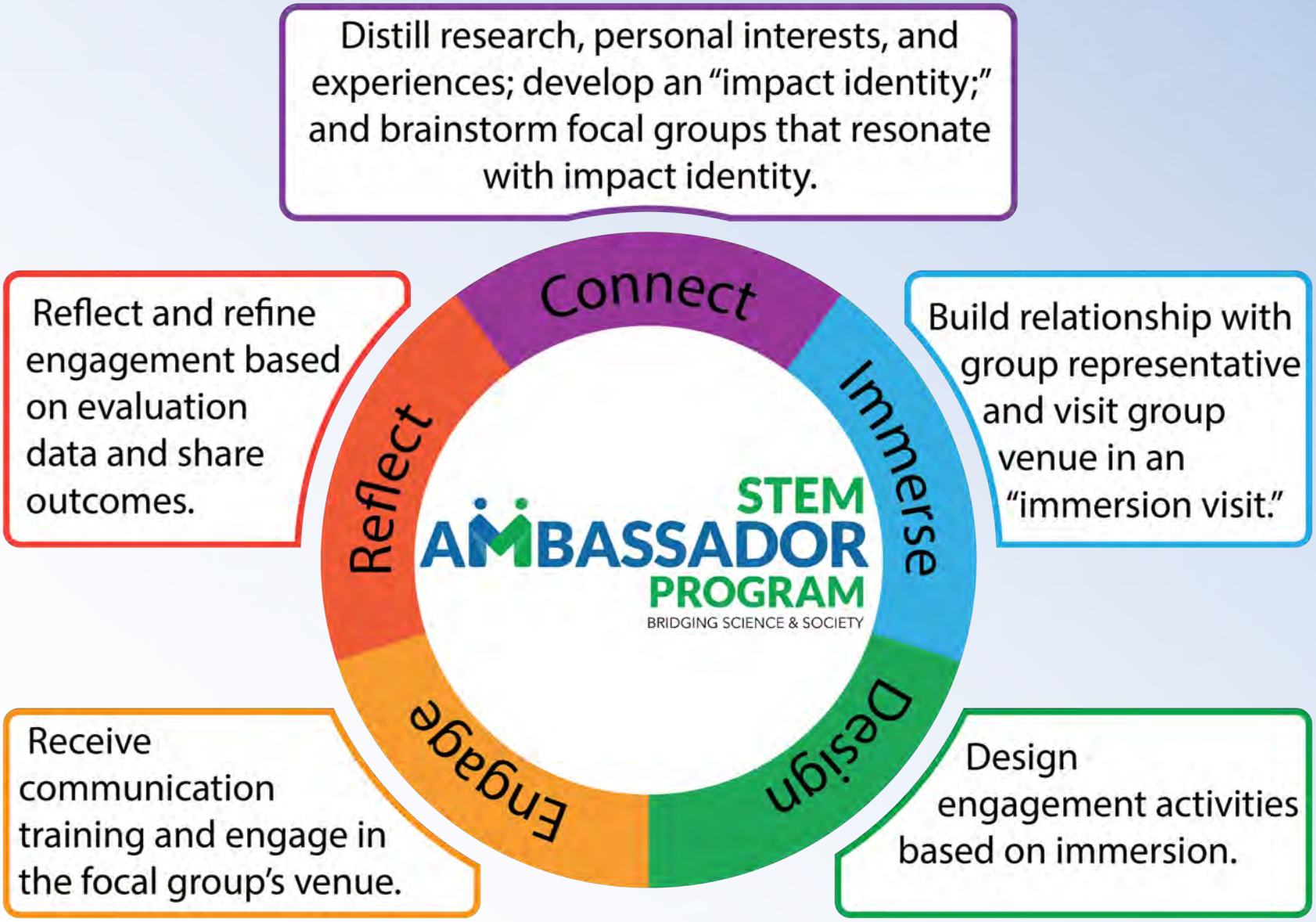
Correctional facilities

Bars and Cafes

Senior Centers

Nonprofit organizations

Training Process



Formats

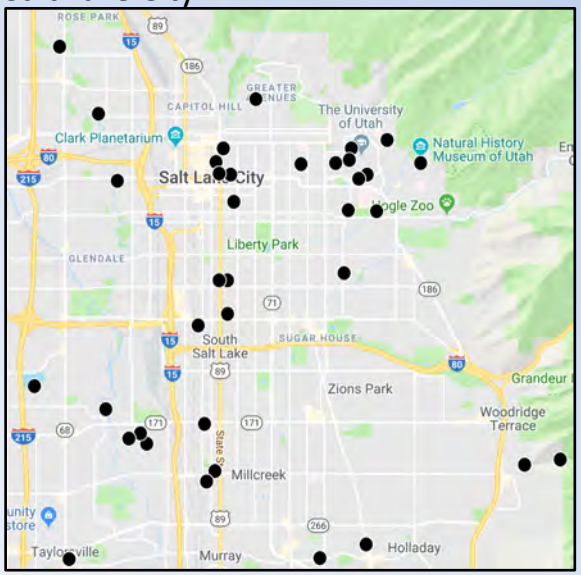
Current

- In person cohorts
- Online training
- BI support
- Professional society workshops

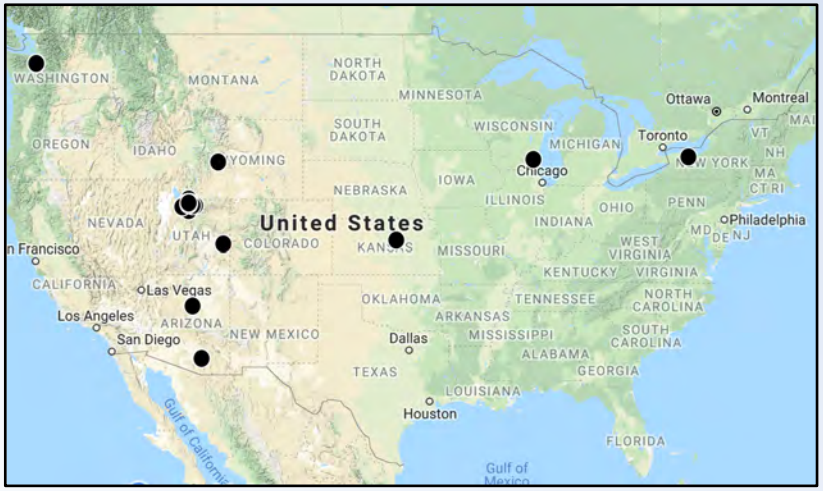
In the future

- Train the trainer

Salt Lake City



Nationwide



Ornithology and Music

Microbiology and Cooking

Water Conservation and Inmate Job Training

Outcomes

- 65 scientists trained
- 2000+ people in 45 unique venues
- 95% of Ambassadors: experience valuable/highly valuable
- 95% of focal group members: Ambassadors communicated well
- Participants open to science in non-traditional venues

Outcomes published in BioScience 2019 and on informalscience.org

Broader Impacts Applications

UU Center for Chemical Innovation

- Generating ideas & writing
- Training in science communication
- Implementation support
- Evaluation tools

Training Overview

Connect Overview

1. Interview
   - Research
   - Personal statement
   - Motivations
2. Generate Keywords
3. Brainstorm

Connect Example

Skiing	Birding	Running	Outdoor enthusiast	Cat owner
Stop over sites	Conservation	Migration	Birds	Habitat Loss

Focal Group	Connection
Gardeners	Gardeners like to attract **birds** to their yards. They can also help improve bird **habitat**
Truck drivers	Truck drivers travel long distances as do **migratory birds,** and value **stop over sites**.
Outdoor guides	**Outdoor enthusiasts** might be interested in knowing about the **birds** they see and could contribute to birding databases

Connect Interview

- Two roles
  1. Interviewer
  2. Ambassador
- Interviewer ask questions
- Ambassador respond (use bio)
- List keywords

Connect Brainstorm

Brainstorm focal groups based on keywords

Don’t worry about specifics or logistics

Wildlife Biology

Outdoor Trails

Personal/Professional Benefit

Connections
Forest Ecologist

Inmates

Woodworkers/artists

Farmers

Hikers/backpackers

Religious groups

Climbers

Connections
Astronomy

Youth shelters

Solar energy users

Electricians

Parks/ Star gazers

Homeowners, gutter installers

Night sky photographers

Immersion

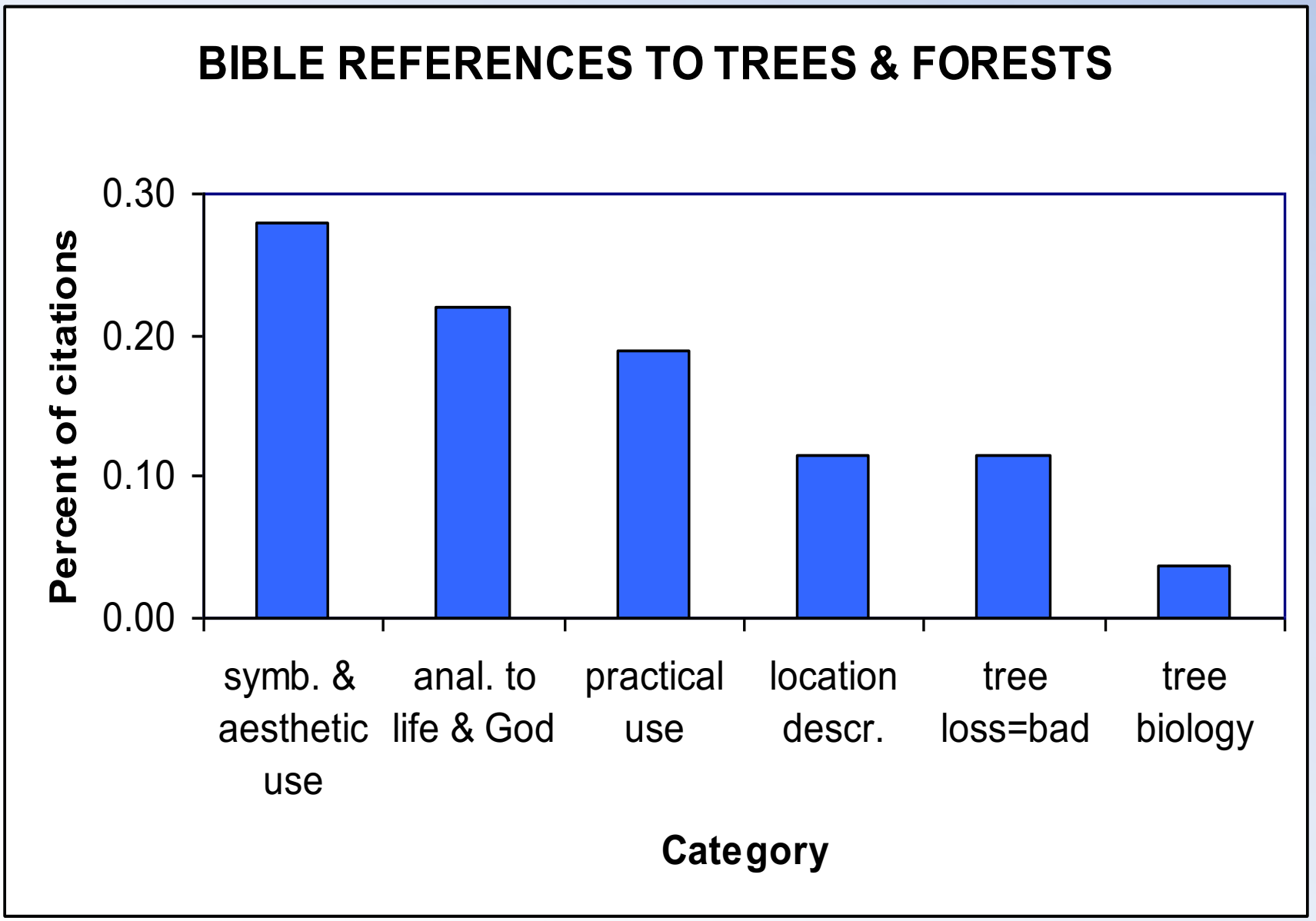
- Engage with new people
- Learn customs of group
- Demonstrate respect for group's way of knowing
- Form authentic connections
- Inform engagement design

Immersion Steps

Identify Venues & Contacts → Prepare Intro → Contact Group Reps

Prepare Questions → Conduct Immersion → Reflect

Trees as Spiritual Symbols and Metaphors


BIBLE REFERENCES TO TREES & FORESTS
Percent of citations
0.30
0.20
0.10
0.00
symb. & aesthetic use
anal. to life & God
practical use
location descr.
tree loss=bad
tree biology
Category

Venue

Introduction

As as child I climbed trees, and now study tropical rainforests.

I am aware that trees are important as religious symbols. I read the Bible, and found 328 references to trees.

I wish to share my interest in trees with faith-based groups, and learn about how trees are perceived by your church.

Contacts

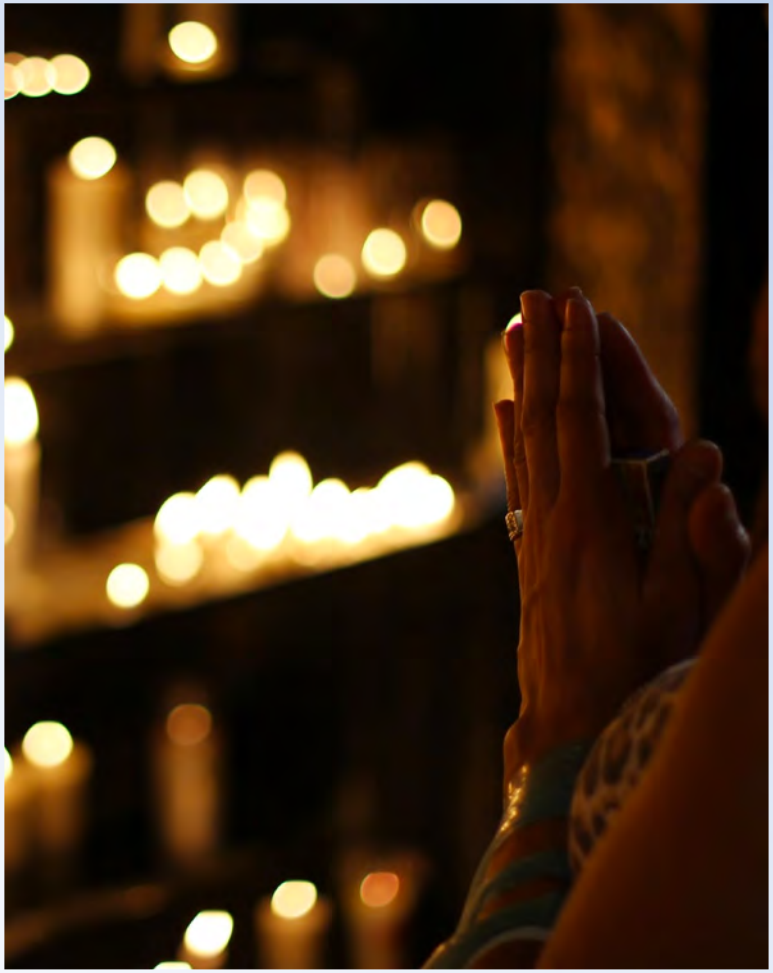
Google/ call/e-mail

Scientists' Own Social Networks

Recommendations from others

Questions

- Who visits this venue?
- Why do people visit?
- What do they value?
- What are their traditions?
- How do they communicate?
- What are the constraints?



Site Visit

Reflection

Observations	**Interpretations/ Insights**
• Sermons delivered from pulpit on Sundays (~20 min), two sermons/morning • People gather for coffee after • People of all ages visit venue • Spirituality and sense of community are valued	• Coffee gatherings provide opportunity to engage • Classroom lecture format is inappropriate • Engagement via sermon should last no more than 20 mins, show emotion, repetition, no notes • Activity should appeal to all ages and incorporate spirituality and community

Engagement

The Salt Lake Tribune

U. prof explores the roots of religion in trees

University of Utah professor touring the sacred grounds that surround Utah churches.

By Lisa Schencker
The Salt Lake Tribune
Published: July 20, 2012 04:17PM
Updated: July 20, 2012 06:31PM

Whether churchgoers realize it or not, the trees in their churchyards have religious roots.

Those tall, thin-branched trees on the corner of the Episcopal Church Center of Utah, Purple Robe Black Locusts, were probably named after a biblical reference to John the Baptist eating locusts and honey.

The crab apple tree just outside the Episcopal Cathedral Church of St. Mark produces a small, sour fruit used by 15th-century monks to treat diarrhea, dysentery and gallstones.

And the flowers of a nearby dogwood tend to bloom around Easter.

Paul Fraughton | Salt Lake Tribune University of Utah scientist, Nalini Nadkarni, directs a tour of the trees at the Cathedral Church of Saint Mark using a guide book which she gave to people attending her lecture, pointing

Conservation Biology

Conservation Education

Not Preaching to the Choir: Communicating the Importance of Forest Conservation to Nontraditional Audiences

Introduction

Recognition of the critical links between humans and nature based on scientifically sound information is key to effective conservation. However, with the increasing dominance of technology, more virtual rather than actual experiences, and the media's increasing representation of nature solely as entertainment, humans are rapidly losing their sense of connection to nature and to the science and scientists who seek to understand those links (Shamos 1995). A survey of public attitudes toward science documented that Americans are highly supportive of the study of

cate their research findings to other scientists in language that is targeted almost exclusively toward their peers. Communication of science to the general public—either individually or via the mass media—is only minimally valued within the reward system recognized by scholars. Despite some high-level approval of the scientific community, efforts at popular communication are viewed at best as a distraction from the "real work" of academics, such as writing grant proposals and producing scholarly articles for scientific audiences. At worst, these efforts have been met with apathy or jealousy (Bodmer 1986).

Traditionally, the media rather than

gardens, readers of natural history magazines). Communication with societal segments that already grasp the value of what might be considered esoteric research appears to make the most efficient use of scientists' limited time to disseminate research to nonscientists.

However, these efforts do relatively little to change the minds of people who are not already convinced of the importance of conservation and sustainability. Thus, ecologists and conservation biologists have been exhorted to expand their communication spheres and to go "beyond preaching to the choir" (Brewer 2001).

Immersion Resources & Training

- Reading packet
- Role play exercise
- Tips
  1. Track contacts
  2. Prepare “insightful” not “vague” questions
  3. Refer engagement requests to STEMAP
  4. Approach as a *collaboration*

Design

Transform immersion notes into engagement activity

Observations	Interpretations/ Insights
• Sermons delivered from pulpit on Sundays (~20 min in length), two sermons/morning • People gather for coffee after • People of all ages visit venue Two services, same material • Spirituality and sense of community are valued	• Sermon and coffee gatherings provide opportunity to engage • Lecture format is inappropriate • Engagement via sermon should last no more than 20 mins, show emotion, repetition • Activity should appeal to all ages and incorporate spirituality and community

Process

Reflect on immersion → Select Objectives → Generate Insight Statement → Brainstorm → Draft Proposal

Knowledge Objectives

- Increase excitement about science to communicate content
- Convey science knowledge content

Ambassador Objectives

- Highlight shared values
- Reveal that scientists have “identities” outside of science and open door to sharing in a common identity
- Show that scientists care about the community’s well-being and opinions
- Demonstrate scientists’ desire to *learn from* and *with* others (not just teach)
- Increase accessibility of scientists to community and community to scientists

Modified from Besley et al, 2017

Insight Statement

How might I engage with (description of group)…to…(objective)?

- Describe group (who are they, what do they value?)
- Mention constraints (security rules, time limits)
- Include your objective(s)

Define

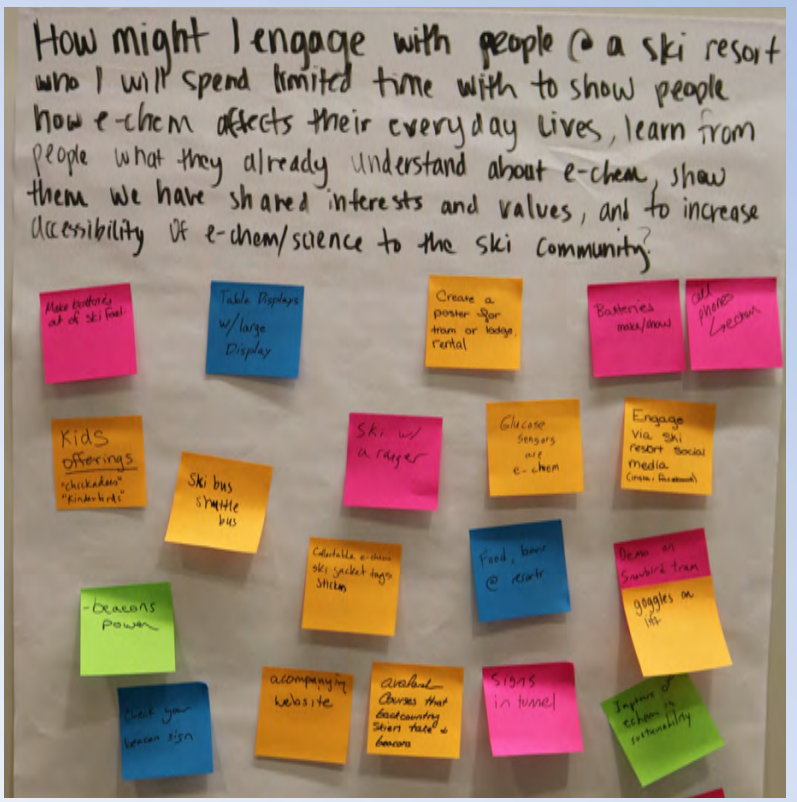
How might I engage with citizens at a community council meeting who have offered me 10 minutes to speak and are concerned with quality of life in Salt Lake City to better understand perception of air quality issues, increase accessibility of air quality research, and recruit participants for citizen science projects?

Define

How might I engage with school-aged children on an adaptive climbing trip in the Cottonwoods, with limited group time and technology, to increase excitement about science, convey that the Cottonwoods are an important source of water, and demonstrate that we share values and interests?

Brainstorm

- Reference insight statement
- Say each idea out loud
- Avoid spending too much time on any one idea
- No bad ideas!



Evidence-based Science Communication

- Building a common vision
- Questioning strategies
- Jargon
- Narrative

PORTAL to the Public

Common Vision

Questions to Facilitate Inquiry and Understand Preconceptions

1. Opening

- Invite participation
- Get to know someone

2. Exploration

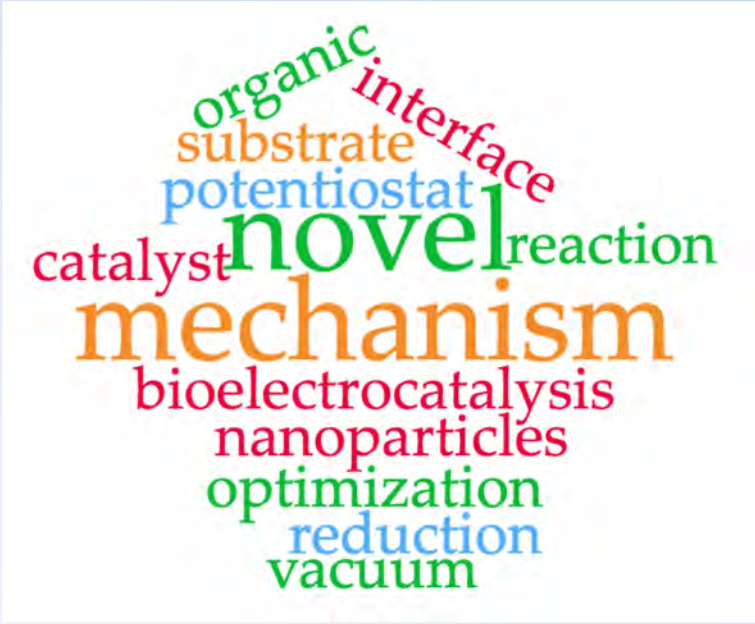
- Encourage discovery and thoughtfulness

3. Making-meaning

- Encourage reflection
- Support inference

Jargon

- Technical terms (electrochemistry)
  - Avoid *or* define
- Multiple definitions (organic)
  - Avoid *or* define
- $100 words (mechanism)
  - Avoid
- Buzzwords (novel)
  - Avoid



Narrative

- Relatable stories
  - Your path to science
  - Challenges faced
  - Funny anecdotes
  - Excitement of making a new discovery
  - Mystery
  - Historical

National Geographic March 2018

Engage

Informed by focal group and delivered in group venue

Argentinian café

Youth center

Outdoor guide training

Reflect

Read more about this Fall's activities in STEMAP! View this email in your browser

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Sarah Apple at Riverton and Liberty Senior Centers

Ambassador Sarah Apple poses beside a poster for her talk at Riverton Senior Center.

This summer I have had the opportunity to visit two senior centers in Salt Lake County and discuss the current status of Ebola virus and how we use mirror images in chemistry to design drugs to treat and prevent Ebola virus infection. I

Newsletter

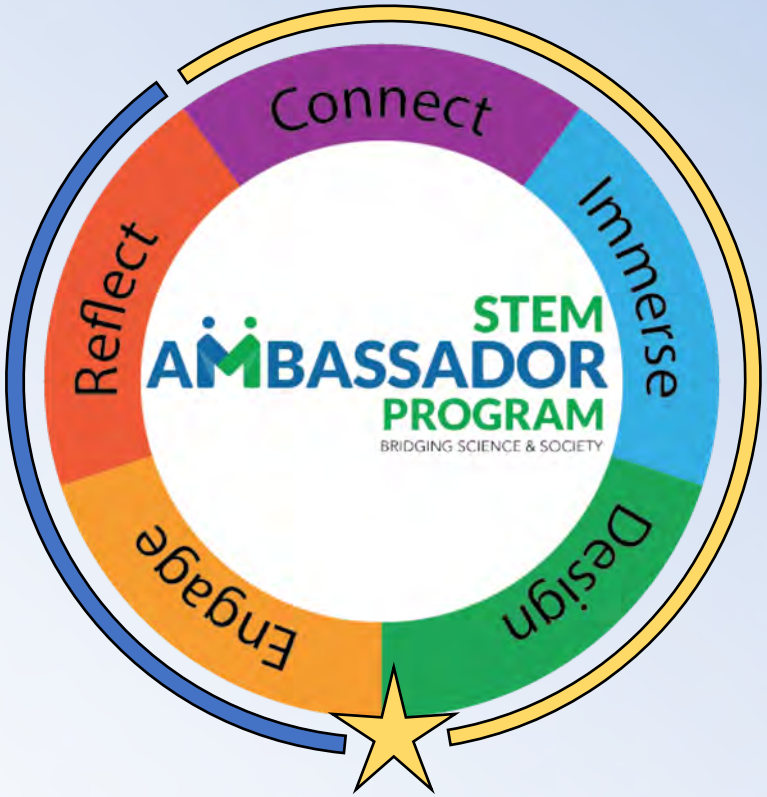
Surveys

BI Formats

1. Connection interview to identify focal group; write in training to contact and implement

BI Formats

1. Connection interview to identify focal group; write in training to contact and implement
2. Connect and immersion training to identify and make contact with focal group; write in group, design, and engage training



BI Formats

1. Connection interview to identify focal group; write in training to contact and implement
2. Connect and immersion training to identify and make contact with focal group; write in group, design, and engage training
3. Complete full training; write subsequent activities into BI with focal group

Discussion

- Would you use these materials? How?
- What resources would be most useful to you?
- What are other BI offerings STEMAP should provide?