STEM Guides

Building Coherent Infrastructure in Rural Communities

The Audiences

We are working with 10-18 year old youth and families in rural communities in areas where the median household income is below Maine's median income of $48,000. **Rural youth make up 25% of the US population and are an underserved and often overlooked group.** Rural youth are only half as likely to participate in STEM programs outside of school as their urban counterparts, even when socioeconomic factors are controlled. Only about 14% of rural middle and 11% of rural high school students have participated in even a single STEM program outside of school in the last six months.

Rural audiences have significant assets, including . . .

- Close-knit communities where adults, including "STEM people," are known
- Many natural resources and outdoor opportunities
- Increasingly sophisticated technology associated with familiar activities such as fishing, farming, and forestry
- STEM grassroots organizations, many of which are ecologically focused
- Access to laptops (in Maine) and to burgeoning virtual STEM resources (e.g., SciStarter, How to Smile)

We are currently working in two rural STEM Hubs, one in a downeast coastal area of the state, and the other in a rural agricultural area of central Maine. Each Hub is served by a Lead STEM Guide and two additional part-time Guides. The project is beginning to work in a third Hub and will grow to five Hubs.

Farmers Market Math is based on Math in the Garden and reaches youth and families where they are.

Overview

This five-year project address two critical needs: 1) the need for a coherent informal STEM infrastructure rather than a set of fragments; and 2) the need for creative models to support STEM learning in underserved rural communities that lack traditional infrastructure such as science centers. The project creates and studies an innovative model of capacity-building: small networks of STEM Guides. Guides are tasked with identifying a range of existing STEM resources available in their regions, and connecting STEM-interested youth with them in creative ways. The Guides leverage existing resources, emphasizing local resources, which we are putting together into a searchable OST Maine STEM database (see www.steminme.org). Resources for STEM Guides also include out-of-school STEM projects funded by NSF such as Teen Science Café, Math in the Garden, and the Boston Museum of Science's Engineering Everywhere.

The project implements and studies STEM Guide networks in a staggered series of five low-income rural regions, providing startup resources and professional development, and will sustain the work through local funding after three years. The project will vastly increase the frequency and depth of out-of-school STEM experiences for 3,000 youth aged 10-18 at a relatively low cost, creating a model for STEM capacity-building, especially in rural areas.

The Project's Questions

- What are the available STEM resources in a rural community, and what constitutes a critical mass of these resources?
- What enables us to leverage STEM resources effectively and efficiently? How do we get everyone on the same page?
- Given a menu of STEM experiences, what do rural youth and their families gravitate to as "toe dipping" experiences?
- How do STEM Guides (and the project more generally) make it possible for rural youth to get more involved in STEM at deeper levels, and what characterizes this involvement?
- What are the characteristics of effective STEM Guides? What makes it possible for them to be effective "connection catalysts?"
- How do we scale the elements of the model that are found to be effective?

Challenges

Rural youth are challenged by . . .

- Lack of transportation, even transportation for afterschool activities. Families pay around 40% of their budget for transportation. Mostly, we need to stay local!
- Lack of infrastructure: No science centers, few afterschool programs, few accessible clubs in schools.
- Low-income means working parents, sibling care, lack of time.
- Some parents don't want higher education for their children, especially because it often means going away from home
- Territoriality of programs, people, and data.
- Lack of familiarity with STEM and what it "buys" you in the future.
- Dearth of data infrastructure.
- Dilution of effort (leading to the need to look for small exportable experiences).

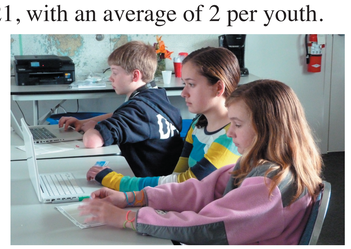
Joining the Teen Science Cafe Network was a great success. The first of three Teen Science Cafes held in Hub #1 in spring 2014 is shown. The Science Cafes will resume in the fall.

Findings from the First Year

109 youth have participated directly in the STEM Guides program:

- 75 in Hub #1 and 34 in Hub #2
- 50 (46%) female; 59 (54%) male
- 24 (22%) high school; 85 (78%) middle school

These youth had 434 separate STEM experiences as a result of their participation. The number of STEM experiences ranges from 1 to 21, with an average of 2 per youth.



In Hub #2, a local expert led a workshop on eelglass mapping. In addition to learning GIS, students got to know local ecosystems.

Both Hubs participated in Engineering Everywhere, piloting new kits from the Boston Museum of Science on "Plants to Plastics" and "Engineering a Pandemic Response." These free programs engaged youth over multiple sessions during the summer.

Who's Involved?

The STEM Guides project involves several institutional partnerships.

Lead Organization

Maine MATHEMATICS and SCIENCE Alliance

MMSA Cast of Characters:
Dr. Jan Mokros, PI; Dr. Sue Allen, co-PI; Dr. Tom Keller, Project Director; Jo Gates, IT Specialist; Lead STEM Guides: Alyson Saunders, Judy Mathewson, Lynn Farrin; STEM Guides: Becca Meyers, Clare Thomas, Marcia Schatz, Veronica Young

Evaluation

EDC Learning transforms lives.

EDC's Dr. Leslie Goodyear directs evaluation.

Program Partners

THE UNIVERSITY OF MAINE Cooperative Extension

4-H Cooperative Extension (Dr. Lisa Phelps) provides people and material resources, such as 4-H staff, kits, and templates for clubs.

Cornerstones of Science connecting libraries with science

Cornerstones for Science (Cindy Randall) connects the project with libraries.

Maine Maritime Academy (Dr. Paul Wlodkowski) connects the project with the leading public STEM university in Maine.

In addition, we are establishing research internships with students from Bates College.

Strategies for Research

- We conducted a baseline survey to characterize youth's attitudes and engagement with STEM, so we can see if it doubles (one goal of the project). We also assess their level of explicit awareness of the STEM Guides program, as a marker of community impact.
- Formative studies include talking with youth and parents about their STEM interests, behaviors, and awareness of resources in their region.
- We conduct regular in-depth interviews with STEM Guides about their activities, decisions, insights, and challenges, to inform the project and create a rich record of the development process.
- A major innovation of the project is "data quilting," an ambitious attempt to link together data from a broad range of STEM activities so that we can identify individual youth trajectories of engagement over time and also characterize program impacts.