JSO JOURNAL of STEM OUTREACH

Vol. 3, Issue 1, August 2020

Informal STEM Learning for Rural Teens: Focusing on First Responders

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Keywords: Place-Based Learning, After School, Careers, Rural Education

Publication Date: August 4, 2020

DOI: https://doi.org/10.15695/jstem/v3i1.07

ABSTRACT: We describe the adaptation of an existing afterschool STEM program in order to make it more relevant and effective for rural teens. The award-winning Teen Science Café (TSC) program was modified to redirect focus away from traditional, academic STEM careers toward STEM in First Response, a field whose members are common and visible in rural areas. The program was implemented and organized by TSC Mentors, local adults who connect youth with out-of-school STEM resources and professionals. We found that attendance at multiple TSCs had a significant impact on how youth viewed First Response in their community, as well as STEM careers in general. This work demonstrates that it is possible to find professionals with robust and exciting STEM expertise in rural areas, to adapt existing STEM program models to connect these professionals to rural teens, and to use these adapted models to help teens become more aware of the STEM opportunities in their communities and increase their interest in STEM First Response careers.

INTRODUCTION

This paper describes our adaptation of an existing afterschool program, the Teen Science Café (TSC), in order to connect visible STEM role models to youth in rural Maine communities. Originally, TSCs were developed to bring scientists and youth together in order to "help them see scientists as real human beings leading interesting lives, and encourage them to consider science, technology, engineering, and math (STEM) careers" (NSTA, 2016, p. 1). These programs often focus on classic STEM professions such as scientist, computer programmer, physicist, or engineer, and are located in areas with easy access to experts in these fields either through universities or private-sector businesses.

Our work was based in Maine, which is classified as the most rural state in the U.S. (U.S. Census Bureau, 2012), and which has a relative dearth of these kinds of high-profile STEM careers. We recognized an opportunity to introduce rural youth to individuals in their own communities who utilize STEM every day but are not often thought of as traditional STEM professionals: First Responders. In Maine, First Response careers include police officers, EMTs, and firefighters, as well as residents in various fields who prepare for or avert the consequences of ice storms and blizzards, or who rescue victims of accidents in remote areas (hikers, hunters, snowmobilers, etc.). Recent research has shown that community safety is of considerable interest to youth, who can "move the needle of emergency preparedness" (Osborn, 2015). There is a great deal of STEM knowledge and skill (e.g. using and maintaining measurement and communications technologies, anticipating environmental and human impacts of natural events, understanding medical implications of emergency situations, etc.) in all of these aspects of local First Response.

Our motivation for introducing the First Response Teen Science Café model was threefold. First, we wanted to feature STEM professionals who were truly accessible to the youth - people they might know in their own town and therefore relate to more easily. Second, we wanted the youth to see that interesting and evolving STEM professions existed in and were important to their own rural community. Third, we aimed to attract a broader audience of youth to the Café events by reaching out to those for whom traditional STEM topics were not a central or driving interest.

Background. Before we began the program, we conducted a survey of 1,300 high-school students in one inland region of rural Maine, and asked them a variety of questions centered on their STEM attitudes and ambitions. One fill-in-the-blank question asked respondents, "What kind of work do you expect to be doing when you are 30 years old?". We found that "game warden" and "engineer" were the top occupational choices for boys while "teacher" and "nurse" topped the list for girls (Mokros et al., 2014). With this knowledge in hand, we searched for a program that would introduce STEM careers to high school aged rural youth that would be compatible with their existing interests and also accessible. We decided to leverage the existing TSC format, which has a proven successful track record in more urban areas connecting youth with experts in the field (NSTA, 2016). After lower-than-expected turnout rates and difficulty connecting with experts in year one, we decided to modify some key components to fit the needs of rural youth and experts and focused on First Response careers in year two of the program. The aim of the modified or First Responder Teen Science Café program was to highlight the careers such as firefighter, police officer, and EMT that are not traditionally at the forefront of STEM discussions but comprise the backbone of many rural communities.

Teen Science Café. Teen Science Cafés (TSC), developed in 2012 by Michele Hall and Michael Mayhew of Science Education Solutions, are youth-organized events that integrate STEM learning with casual socializing. TSCs are able, through an informal setting, to introduce youth to people who work in STEM fields in their community, and may inspire them to consider pursuing STEM careers (Hall et al., 2013). Each 1-2 hour event focuses on a specific STEM topic or question. A typical TSC might consist of an adult expert giving a brief description of their own STEM career path, followed by an interactive presentation of part of their current work and a hands-on activity. Cafés always involve food and informal time for conversation among participants as well as between participants and the featured experts (Teen Science Café, n.d.). They commonly take place on evenings or weekends at or near museums, higher education institutions, community centers, zoos, aquaria or other organizations.

Adult experts at classic TSCs are often salaried professionals. By and large there is little personal cost to their participation other than the lost opportunity to pursue something else with their time. Further, sharing their work with youth audiences is an important and valued part of their role. For example, many federally funded researchers are required to reach new audiences as a condition of their funding, providing an even greater personal incentive to participate in TSC programs (Mayhew and Hall, 2016). The same cannot be said of local First Response professionals, particularly those in rural areas. We encountered no evidence of a formalized expectation, incentive, or reward for individual workers who reach out to expose and interest young people in this career path.

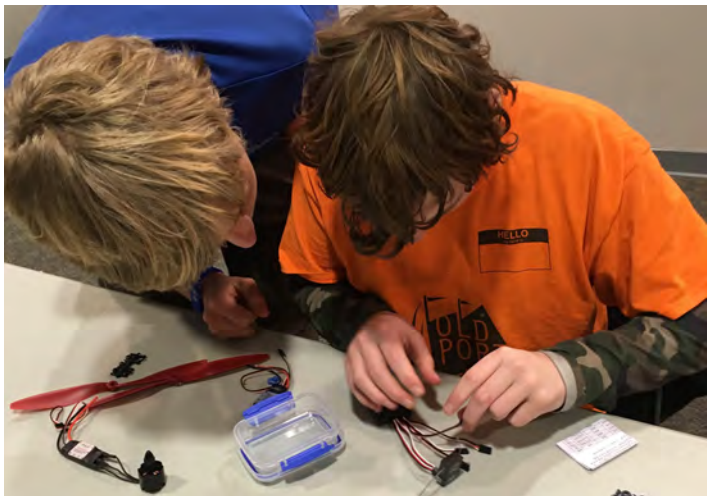

Figure 1. Youth work together to assemble drone components.

The classic TSC program is coordinated by a "Youth Leadership Team" (YLT) comprised of high school-aged youth who volunteer to select café topics, connect with featured experts, review the presentations and hands-on activities, as well as advertise, and run each event (Teen Science Café, n.d.). The YLT has an adult mentor, whose role is typically limited to guidance and support as the youth take primary responsibility for organizing and running the events.

In 2016, we attempted to implement a series of TSCs based on the classic model as part of our NSF-funded STEM Guides project. The first year had myriad issues, including trouble finding a group of youth that could meet at all, let alone with any regularity to plan, design, and implement programming as prescribed by traditional TSC model. The TSC Mentors, local adults who connect youth with out-of-school STEM resources and professionals, said that finding a way to communicate with the youth was part of this problem; even after implementing a chat app that the youth suggested, the youth were often unresponsive to requests to get together as a group to plan upcoming events. One frustrated TSC Mentor said, "The biggest challenge is getting everyone to show up at meetings. It's just how their lives are – there's always something extra: test, prep, swim meet." A second problem was that the youth did not have easy access to transportation to gather together, even within the local community. Access to transportation is a statewide issue in Maine as well as other rural regions (Kastelein et al., 2018). A report from the Maine Department of Transportation states, "Most Mainers don't have the option of using public transit because of limited geographic service areas and limited service availability…" (Maine Department of Transportation, 2015, p. xvi).

It was not only the families who had a difficult time with travel distance. While Maine does have some science-based

industries and companies and a robust University system, sometimes experts had to drive for hours to participate in a Teen Science Café. For example, students from the University of Maine in Orono traveled to Lincoln Academy, a two-hour drive each way, to present information on the school's Virtual Environment and Multimodal Interaction (VEMI) lab. When a TSC in an even more distant location invited the students to do a similar presentation, the University had to decline; it was simply too far to drive for a two-hour long event. Unlike the traditional TSC which encourages its members to first look for experts on unique topics and open to the informal Café format, the rural TSC Mentors in Maine had to narrow their candidates to those who were within driving distance. We looked to the STEM-rich, and often overlooked field of First Response, which is not only present in nearly every rural community, but is currently looking for ways to connect with and inspire youth (Lukens, 2018).

Figure 2. TSC participants examine their surroundings through a thermal imaging device.

First Response. First Response includes a wide variety of professions at all levels of government and in the private sector such as firefighters; police; emergency medical service providers; forest rangers; Coast Guard and National Guard units; wilderness EMTs; emergency veterinarians; and helicopter, plane, and drone pilots (United States First Responders Association, 2014). The United States Bureau of Labor predicts a nationwide 15% increase, or an additional 37,500 in jobs for EMTs and paramedics alone, between 2016 and 2026 (Bureau of Labor Statistics, 2019). This growth coincides with the aging of the population as well as the continued need for emergency and disaster assistance (King et al., 2018).

Despite the increased need for First Responders, the number of individuals choosing this career path, particularly in rural areas, is in decline (Lukens, 2018; Scardina, 2015; Cordes, 2018). When asked in an interview why he was interested in participating in a TSC, one expert answered, "I need to find more young people interested in saying yes! I'm almost 40 and most of the people on the fire department are twice my age. To spark interest in younger generation would be a huge benefit to everyone. That's the biggest reason I jumped on it."

Although it may not be obvious, the application of STEM knowledge is a critical aspect of many First Response careers. For example, firefighters must perform rapid mathematical calculations at the scene of an emergency in order to supply water on demand to a wide variety delivery systems and apparatuses, each with its own exigencies and requirements (Fire Rescue Academy, 2019). Emergency medical technicians and paramedics diagnose and administer prehospital life support and use a wide range of medical and communication technologies (Bureau of Labor Statistics, 2019). Search and rescue teams understand and employ the concepts and skills of navigation, first aid, and mapping technologies (Human, 2019). Drone pilots master and apply STEM in aviation, drone repair and maintenance, photography, and mapping (University of Maine, Augusta, n.d.). The combination of a STEM-rich set of professions and an increasing need for new people in the field made it an appropriate focus for Teen Science Cafés.

PROGRAM DESCRIPTION

First Response Teen Science Café Design. In order to shift focus to First Response careers, we adapted the traditional TSC model in three ways. First, we narrowed the range of permissible STEM topics so that every Café would reflect one common theme: STEM in First Response. Second, we set aside the expectation that our adult TSC Mentors would recruit and facilitate a YLT (Youth Leadership Team) to help select the topics, prepare the speakers, and run the events. This change freed the Mentors to spend more time recruiting prospective adult experts as well as working with these new recruits to identify and highlight the STEM in their work. Finally, we coordinated with local schools to use their space for TSC directly after school, and brought the program to the youth, instead of youth needing to find transportation to other locations.

The careers represented included emergency veterinarian, firefighter, police officer, drone operator, and EMT. The topics and associated activities included reconstruction of a car accident, donning and doffing hazmat suits, flying drones, and using search and rescue dogs to find an item.

As part of our larger goal of supporting youth in their pursuit of further STEM learning experiences, we encouraged Mentors and adult experts to provide information to youth participants about specific out-of-school opportunities that would allow them to continue exploring one or more aspects of the topics presented. These options included a paid

summer internship, funded by the project, in one of the region's law enforcement or firefighting departments. We also connected the youth to opportunities such as game warden camps, junior firefighting programs, first aid courses, orienteering competitions, search and rescue training, and civil air patrol units. These opportunities gave youth the opportunity to explore and form even deeper connections to the First Response fields in their communities.

Study Questions and Methods. Over the course of 12 months the rural TSC Mentors organized and ran a total of ten First Response Teen Science Cafés. We gathered data at these events to learn whether our modified TSC model would be engaging to local youth, motivating to the community-based First Responders, and promising as a way to interest the youth in First Response careers with STEM components.

We used five methods to gather data:

- Detailed sign-in sheets allowed us to track the total number of attendees, as well as how many Cafés a unique individual attended.
- Our research staff observed all ten Café events either in person or virtually and took detailed notes on the nature of the presentations, activities, and discussions.
- Short exit surveys were administered to the youth at the end of every Café event. They included questions that captured attitudes towards and interest in science and technology, as well as in emergency management. Surveys also asked participants about their willingness to attend another TSC, as well as post-high school education and career plans.
- We interviewed TSC Mentors and gathered feedback about each TSC program, pre- and post-event.
- We conducted post-Café phone interviews with six out of eight TSC experts. Interviews gathered information such as experts' background experience, their goals in participating, what they thought went well, suggestions for improvement, and whether they would be willing to present again.

Youth surveys were analyzed by creating four scales to represent the variables we were hoping to understand: current interest in STEM, intent to further learn about or have a career in STEM, current interest in First Response, and intent to further learn about or have a career in First Response. Table 1 shows the items included in each scale. Since some of the survey responses elicited yes/no responses (coded one or zero), and some were scored on a 5-point Likert scale, we recoded the Likert-scaled responses so that "agree" and "strongly agree" were coded one, to represent "positive" responses, and "disagree", "strongly disagree" and "neutral" were coded zero, to represent "non-positive" responses. The percentage of positive responses was then calculated across the items within each of the four areas. Interviews were analyzed for emergent themes using NVivo software. Below we present key findings from TSC observations, expert interviews, and youth exit surveys.

Table 1. Survey Items Within Each Scale.

Scale	Items
STEM Interest	I think science is interesting
	I think technology is interesting
	I believe that science is important to my daily life
	I believe that technology is important to my daily life
	I do not care much about science (reverse-coded)
	I do not care much about technology (reverse-coded)
	This TSC positively changed how I think about STEM
STEM Intent	I want to learn about science issues in my community
	I want to learn about technology issues in my community
	I plan on taking extra STEM classes in HS
	I plan on majoring in STEM in college
EMT Interest	I am interested in the work done by first responders and others involved in emergency management
	Attending this TSC increased my interested in first response and emergency management careers
EMT Intent	Participating in an internship in emergency response
	Learning more about first response training

Findings. Over the course of TSC program, we engaged 185 students, 39 of whom attended more than one Café. The majority of participants, 58%, were in high school. In total, we were able to collect surveys from 110 survey participants, 22 of whom reported having attended two or more TSCs.

Youth Interest and Intentions to Pursue STEM and First Response. Table 2 shows the average percentages of positive responses for each scale. It appeared that, on average, the responses were not very positive. Only 57% of the items regarding interest in STEM and EMT were positive, and the percentages were considerably lower for the scales related to intent. However, the percentages of positive responses ranged from 0%-100%, inspiring the question, "Would higher interest in STEM be positively related to higher interest in EMT and a greater intent to pursue further studies in EMT?" The Pearson correlations shown in Table 3 indicated that all

Table 2. Summary Statistics.

	N	Mean	SD
STEM Interest	107	57.21	17.98
STEM Intent	107	42.29	36.16
EMT Interest	103	57.28	42.82
EMT Intent	107	29.91	33.94

Table 3. Pearson Intercorrelations.

	STEM intent	EMT interest	EMT intent
STEM Interest	.53***	.43***	.24*
STEM Intent		.49***	.25**
EMT Interest			.25**

**** p < .001 ** p < .01 * p < .05*
Note: EMT Interest n = 103, otherwise n = 107

of these relationships were statistically significant. In other words, youth who did have current interest in EMT and intent to learn more about it were also interested in STEM and intended to learn more in that area.

We were able to survey a small subset of 23 students a second time. The Interest and Intent scales based on their first and second survey responses were compared using paired *t*-tests. While the differences were not statistically significant, all scales showed numerical increases, suggesting that a larger sample size might have revealed positive impacts of repeated attendance.

Unearthing the STEM in First Response. At most Café events, youth were exposed to at least one aspect of the First Responder's job that demonstrated the direct relevance of STEM. These were embodied in both the expert's presentation and his or her hands-on activities. We observed that many of the experts stated that they did not consider themselves in a STEM career, before going on to explain the STEM components of that job. Frequently, experts spoke of their indifference or, in some instances, intense dislike for the math or science classes they had taken in high school. For example, during a presentation by a firefighter, the expert said, "math is not my thing." However, the specifics of what was demonstrated or discussed often showed that the experts did, in fact, have considerable STEM skills that were integral to their work, and that were a constant focus of learning and greater mastery. The same firefighter who commented on his dislike of math went on to demonstrate how to work the equations for calculating water pressure in different scenarios, and how to calculate friction loss.

Because of the implicit nature of much of the STEM in these non-traditional STEM careers, sometimes opportunities to elaborate on an underlying STEM concept were missed. For example, during one TSC, a search and rescue dog was used to locate an object by smell, but the expert never explained how the dog was able to use its sense of smell to do so, or how it differed from a human's. It seems likely that such missed opportunities might become less frequent over time if experts were further encouraged to focus on the STEM content of their careers in particular.

Motivations and Interests of First Response Experts. Through our post-program interviews with experts, we found that most were motivated by the desire to inspire and motivate youth in their community. This motivation was enough to overcome the concerns and inexperience they had when it came to speaking in front of an audience. For example, one expert said:

> *I was fortunate that I had people in my life who gave me opportunities to see and try different things and understand how the world works. I look at these kids in this rural area – I don't know what their lives are like, or if they have had the opportunity to see what we do…I'm a local boy too – I didn't have any special connections worked hard and moved my way up. So, I'm trying to get that message to the kids. And another goal is that anytime I can, I get in front of people and talk about our agency and work that we do.*

Despite the time involved in preparing for the program and the unfamiliarity of the Café format and STEM focus, experts almost unanimously spoke favorably about their experience. One enthusiastically said, "Who knows…one of those kids may remember it for the rest of their life. It was a short amount of my time, and if I can impact someone in a positive way it's worth it." Notably, a stipend was offered to all who facilitated a café, but at least two refused the payment noting that it was illegal for someone in their profession to accept outside compensation. A few others asked that it be returned as their donation back to the TSC program. For most, the chance to interact with the teens appeared to hold its own reward.

DISCUSSION

The modified TSC model we piloted focused on unearthing STEM concepts and practices embedded in First

Table 4: Comparisons of First and Second Survey Responses.

		First Survey		Second Survey		Difference				
	N	Mean	SD	Mean	SD	Mean	SD	*t*	*df*	*p*
STEM Interest	23	57.66	17.53	60.25	18.25	2.59	19.28	0.64	22	0.526
STEM Intent	23	44.93	34.34	56.52	40.74	11.59	38.50	1.44	22	0.163
EMT Interest	22	68.18	42.39	77.27	33.55	9.09	45.35	0.94	21	0.358
EMT Intent	23	26.09	31.71	40.58	41.39	14.49	37.37	1.86	22	0.076

Figure 3. A police officer demonstrates how dogs are used during search and rescue operations.

Response careers. These events highlighted the diverse knowledge needed to perform duties in these fields to rural youth who may have been aware of the careers, such as firefighter and search and rescue, but unaware of the responsibilities they entail, and the training needed. We were able to demonstrate that although rural communities may not have the traditional STEM centers of urban areas, such as large tech-focused companies, it is nevertheless possible to create successful TSC programs by harnessing the trusted and readily available resource of community-based First Responders. Because such professionals are active in small communities across the country, this model also serves as an example of using Funds of Knowledge (González et al., 2006) to advance STEM learning in rural places.

We were heartened to see the high levels of correlation among the four scales for youth who had high interest in EMT, because it meant that youth who were attracted to a possible EMT career would not be thwarted by a corresponding disinterest in STEM topics. We were also pleased that youth who attended multiple events showed some evidence of increasing ratings on all scales. The small size of this subsample reflects a common problem in research and evaluation in rural settings in particular, where participation in out-of-school events is unavoidably limited to relatively small numbers of residents (Kastelein et al., 2018).

The low ratings of interest and intent to learn STEM and First Response recorded for the larger group who had attended only one event could be seen as discouraging. Alternatively, it may reflect a degree of success insofar as one of the goals of the TSC's was to attract attendance by youth who were not already in the STEM or First Response "pipeline." Having the events held on the school grounds may have lowered the bar for attendance by youth who were not the "usual suspects," while the already-interested also attended and were affirmed in their preferences and intentions. Clearly more data would help to distinguish among these options in future studies.

The interview data showed that the community-based First Responders were intrinsically motivated to lead events, mostly due to their desires to connect with local youth and show them viable career options. As mentioned above, many rural communities are in dire need of volunteer and career First Responders in numerous fields, and our research showed that experts were not only willing and eager to participate in TSCs but would enthusiastically do so again. The program does need a central individual to organize, find experts, and coordinate with schools for afterschool space. A small amount of funding for food and advertising may also be necessary.

An unexpected finding was that the First Responders did not always find the STEM components of their work as salient as did members of our project team. For future versions of the program, we would recommend that surfacing STEM more explicitly be a major focus of the orientation of the First Responders, and not just a learning goal for the youth.

The First Response TSC was able to strengthen community connections by introducing youth to First Responders in their community and creating a better understanding of what they do and how STEM is seamlessly embedded in those careers. First Responder experts benefitted by having an opportunity to share their work with youth in their community. We believe this adapted model is promising enough to be further explored in other rural communities.

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Author Contributions

The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript.

ACKNOWLEDGMENTS

The authors wish to thank project partners Michele Hall and Jan Mokros of Science Education Solutions; Sandy Copel-Parsons, Jennifer Lobley, Danielle O'Neill, and Ryder Scott of UMaine Cooperative Extension: 4-H; Valerie Lawson and Ed Latham of Axiom Education and Training Center; and Patrick Carson and Dylan Cox of Oxford Hills Regional School District for their significant contributions to the project on which this article is based. Also thanks to Linda Deacon for providing valuable insights and statistical analyses.

FUNDING SOURCES

The research in this paper was supported by NSF grant #1322827. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation. This submission has not been published elsewhere, is not presently under review at other journals. The Institutional Review Board has deemed this work exempt from further review.

ABBREVIATIONS

EMT: Emergency Medical Technician; STEM: Science, Technology, Engineering, and Math; TSC: Teen Science Café; VEMI: Virtual Environment and Multimodal Interaction; YLT: Youth Leadership Team

REFERENCES

Bureau of Labor Statistics. (2018) U.S. Department of Labor. Occupational Outlook Handbook. EMTs and Paramedics. Retrieved from https://www.bls.gov/ooh/healthcare/emts-and-paramedics.htm

Cordes, R. (2018). Recruitment of emergency medical workers proves challenging — particularly in rural Maine. Maine Biz. March 5. Retrieved from: http://www.mainebiz.biz/article/20180305/CURRENTEDITION/302289994/recruitment-of-emergency-medical-workers-proves-challenging-—-particularly-in-rural-maine.

Fire Rescue Academy (2019) Fire Service Pump Operator. Retrieved from https://www.firerescue1academy.com/courses/fire/fire-service-pump-operator/

González, N., Moll, L. C., and Amanti, C. (Eds.). (2006). Funds of knowledge: Theorizing practices in households, communities, and classrooms. Routledge.

Hall, M. K., Foutz, S., and Mayhew, M. A. (2013). Design and impacts of a youth-directed café scientifique program. International Journal of Science Education, Part B, 3(2), 175-198.

Human, D. (2019) How to Join a Search and Rescue Team. Sky Above Us. Retrieved from: https://skyaboveus.com/wilderness-survival/How-to-Join-a-Search-and-Rescue-Team

Kastelein, K., Allen, S., Keller, T.E., and Mokros, J. (2018). The 2018 Rural Informal STEM Conference: Final Report, Maine Mathematics and Science Alliance. Retrieved from http://www.mmsa.org/projects/RuralConference2018

Lukens, J. (2018) Retention: Overcoming the rural EMS dilemma. The Rural Monitor. Retrieved from https://www.ruralhealthinfo.org/rural-monitor/ems-recruitment-retention/

Maine Department of Transportation. (2015). Final Strategic Transit Plan 2025: Transforming Public Transit, Meeting Future Needs, Managing Expectations and Resources. Retrieved from https://www.maine.gov/mdot/publications/docs/plansreports/MEFinalStrategicPlan2025.pdf

Mayhew, M., Hall, M. (2016). Teens and scientists come together at science cafes. Earth and Space Science News. April 12. https://eos.org/project-updates/teens-and-scientists-come-together-at-science-cafes Retrieved February 8, 2019

Mokros, J., Allen, S., and Keller, T. (2014). "STEM Guides: Building coherent infrastructure in rural communities." Presentation at National Association for Research in Science Teaching (NARST), Pittsburgh, Pa., March 30–April 2, 2014.

Kastelein, K., Allen, S., Keller, T.E., and Mokros, J. (2018). The 2018 Rural Informal STEM Conference: Final Report, Maine Mathematics and Science Alliance, https://www.mmsa.org/projects/RuralConference2018.

King, N., Pigman, M., and Hanson, B. (2018) EMS Services in Rural America: Challenges and Opportunities. Retrieved from https://www.ruralhealthweb.org/NRHA/media/Emerge_NRHA/Advocacy/Policy%20documents/05-11-18-NRHA-Policy-EMS.pdf

NSTA. (2016) Teens flock to teen science cafes. NSTA Reports. Vol 28. No2. Sept 2016. Retrieved from http://static.nsta.org/pdfs/nstareports/nstareports201609.pdf

Osborn, A. (2015). Moving the needle on emergency preparedness. FEMA Blog. Retrieved From: https://www.fema.gov/blog/2015-08-04/how-youth-can-move-needle-emergency-preparedness

Scardina, J. (2015). Volunteer firefighters continue to dwindle. Seacoast Online. October 4. https://www.seacoastonline.com/article/20151004/NEWS/151009705

Teen Science Café (n.d.) What is a Teen Science Café. Retrieved from https://teensciencecafe.org/about/

United States First Responders Association. (2014) Who is a first responder. Retrieved From: http://www.usfra.org/notes/Who_is_a_First_Responder

University of Maine Augusta. (n.d.) Advanced Certificate in Unmanned Aircraft Systems (UAS) Operations. Retrieved from https://www.uma.edu/academics/programs/aviation/uas/

U.S. Census Bureau. (2012, March 26). Growth in Urban Population Outpaces Rest of Nation (Report No. CB12-50). Retrieved from https://www.census.gov/newsroom/releases/archives/2010_census/cb12-50.html