

GOODMAN RESEARCH GROUP, INC.
Program Evaluation • Consultation • Market Research

The Science Festival Alliance: Creating a Sustainable National Network of Science Festivals *Year 2 Summative Evaluation*



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EXECUTIVE SUMMARY

Goodman Research Group, Inc. (GRG) is serving as the external evaluator of the NSF-funded Science Festival Alliance (SFA), a collaborative started by the University of California San Diego, the MIT Museum (Cambridge), the University of California San Francisco, and The Franklin Institute (Philadelphia). The early focus of the SFA has been on helping establish and sustain science festivals in each of these four cities. The Alliance's long-term goal is to facilitate the creation of a growing network of festivals and a community of science festival practitioners.

This report focuses on the knowledge gained about the project's impacts during the first and second years of project operations and evaluation. It describes the results of surveys of ISE professionals served by the SFA. It also describes the results of surveys of festival attendees and festival partners participating in the San Diego, Cambridge, Philadelphia, and Bay Area Science Festivals. The SFA currently supports over two-dozen science festival initiatives across the country, and SFA evaluation findings have significant implications for these many initiatives. However, unless otherwise indicated, for the purposes of this report the general term "SFA science festival" (or its equivalent) should be taken to refer only to these four festivals receiving NSF funds under grant 0840333.

KEY FINDINGS

Equity of access: Science festivals may have even greater potential than other informal science settings for supporting the participation of underrepresented groups.

- Underrepresented groups – minorities and women – constituted a higher percentage of "visitors" to the four SFA science festivals than to other informal science settings.
- Many of the attendees at the four SFA science festivals have never had substantive interactions with STEM practitioners of the type offered by the festivals. These attendees were more likely to be minorities.
- Family groups constituted a higher percentage of visitors to SFA science festival *carnivals and expos* than to other informal science settings.

Outcomes for public audience: The summative evaluation results to date provide indicators of the success of the SFA in achieving the impacts it articulated for its four SFA science festivals.

- SFA science festival participants had high-quality ISE experiences and reported becoming more interested in science, learning something new about science, experiencing science learning as more

fun and enjoyable, and feeling more connected to the science happening in their cities.

- Interaction with STEM practitioners during SFA science festival events was associated with better outcomes for attendees. We believe this finding is a unique contribution to the literature, thus advancing knowledge about the field of informal science education.
- One-year follow-up with San Diego and Cambridge festival attendees provided some evidence of continued engagement with science after the festivals, from simply looking for information on something they had learned about at their festivals (54%), to taking part in activities related to what they had learned (39%), to using information in their work or studies (44%).

Outcomes for professional audience: STEM practitioners and ISE institutions have had new opportunities and increased confidence to reach their target audiences through the vehicle of SFA science festivals.

- Within six weeks of the SFA science festivals, 41% of the festival partners had received follow-up phone calls, emails, visits or enrollment from festival attendees and 51% reported new opportunities for new partnerships with local academic, civic, cultural, educational, or private partners, as a result of the festival.
- A majority (65%) of STEM practitioners who exhibited and presented at the SFA science festivals reported increased confidence interacting with public audiences as a result.
- While about half of festival partners came from organizations with year-round K-12 ISE activities, a far greater percentage (87%) planned to contribute to local ISE efforts after their festival.

Networking and Dissemination: The SFA has already engaged in substantial dissemination of promising practices for science festivals (and other public science events), with demonstrated success. In particular, the International Public Science Events Conference complemented – and in many cases added value that was missing in – public science event practitioners’ professional association activities.

- The SFA has formally supported 31 science festivals in its first two years. It has supported the launching of festivals, facilitated specific public programs at festivals, helped festivals attract sponsors and gain visibility, and created a network of linked festivals that assist each other with festival specific issues.
- The conference helped form connections and relationships among science festival organizers, STEM experts, and researchers and evaluators (including international connections); 83% of respondents

said the conference had either quite a bit or a great deal of impact on their forming new connections and relationships.

- A majority (70%) of conference attendees planned to follow up to obtain and/or share information and resources with someone they met at the conference for the first time.
- The conference also increased awareness of and follow-up with the NSF-funded SFA; 60% of respondents said the conference had increased their awareness of SFA resources and support either quite a bit or a great deal and 42% percent of all respondents (and 68 percent of science festival organizers) were definitely going to follow up with the SFA after attending the conference.
- The conference added to the ISE expertise of science festival organizers and supporters. Attendees learned more about how their work fits into a larger field (98%), how public engagement in science is conceptualized (98%), information and resources to start or help sustain a new public science event (100%), and how to reach and impact target audiences through science festivals (98%).

The SFA is a vibrant and connected network that is achieving its impacts for public and professional audiences. There also is strong evidence that the SFA has played a central role in increasing the number of science festivals in the U.S. The future work of the SFA lies in creating a sustainability plan.

INTRODUCTION

DESCRIPTION OF THE SCIENCE FESTIVAL ALLIANCE

The mission of the Science Festival Alliance (SFA) is to foster a professional community dedicated to more and better science and technology festivals. The festival initiatives that are members of this community promote public interest in, engagement with, and new understandings of science, technology, engineering, and math. The SFA supports this community by building a network of science festivals and collaborators that support each other as colleagues.

The SFA is funded in this endeavor by a three-year grant from the Informal Science Education (ISE) division of the National Science Foundation (NSF) that was awarded to four institutions: the University of California San Diego, the MIT Museum (Cambridge), the University of California San Francisco, and The Franklin Institute (Philadelphia). The majority of this NSF funding provides direct support for regional science festivals produced by each of those four institutions. The SFA has also made surprising progress in the development of an expanding national network that establishes the legitimacy of the science festival concept and nurtures the growth of festival initiatives.

Target Audience and Intended Impacts

In their original project description, the SFA team described their primary and secondary target audiences and their intended impacts on each. The three segments of their primary target audience include:

1. Families (defined as one or more adults with one or more children aged 5-16), including those from underserved communities (e.g., economically disadvantaged, ethnic minorities underrepresented in the sciences);
2. Children and youth (5-18), particularly public school students and those involved with ISE community organizations in underserved communities; and
3. Adults, particularly those residing in communities where scientific research and science based innovation take place, but who are not themselves either professionally involved or even necessarily aware of these activities.

The intended impacts for these audiences are:

1. Families and adults will increase their awareness of the role that science, engineering, and technology play in their region.

2. Families and adults will increase and sustain their engagement in science, engineering, and technology learning opportunities in their region.
3. Families and adults will have a greater understanding of and interest in science.
4. K-12 students will increase their engagement with year-round ISE opportunities and festival extensions.

The three segments of their secondary target audience include:

1. STEM practitioners, including undergraduate and graduate students;
2. Science communicators (e.g., school science teachers, science center practitioners, science journalists, writers, broadcasters, science-based corporate communications professionals); and
3. The team members organizing science festivals.

The intended impacts for these audiences are:

1. Individuals and organizations will both initiate and sustain new regional STEM celebrations as a result of support from the Science Festival Alliance.
2. STEM practitioners will increase their understanding of how to impact target audiences through STEM celebrations.
3. STEM practitioners will increase engagement in public outreach through festival related experiences.

DESCRIPTION OF THE EVALUATION

Goodman Research Group, Inc. (GRG), an evaluation research firm in Cambridge, MA that specializes in the evaluation of educational programs, materials, and services, is conducting the external evaluation of the SFA project. GRG is conducting a multi-method process and summative evaluation to assess the success of the SFA project at meeting its intended impacts. Our summative evaluation is taking place primarily in this, the final, year of the SFA's NSF award. However, the evaluation has already generated significant knowledge about the project's impacts, which is the focus of this report. This knowledge has been gained largely through surveys of public and professional audiences as well as SFA document review, conversations with SFA science festival team members, and participatory observations at SFA meetings. The University of California San Diego's Human Research Protections office approved this evaluation.

Survey of Public Audiences

Information about the primary target audiences for this project are being gathered primarily through intercept surveys conducted at each festival each year (a total of two festivals in Year 1, and four in each of Years 2 and 3). GRG works with a team of field researchers at each site to gather data from the primary target audiences that attends festival events. Data are collected from a sample of 13 events hosted during each festival. One of these is the centerpiece Expo or Carnival event. Of the other 12 events, GRG randomly selects 6 and each festival director selects the other 6.

The 2011 survey instrument upon which this report is based was two pages in length and took fewer than five minutes to complete. A copy of the survey is appended to this report.

Survey of Professional Audiences

Festival Partners

GRG has conducted one of two rounds of an online retrospective, anonymous survey of festival exhibitors, presenters, and sponsors. A copy of the survey is appended to this report. The first round included partners affiliated with the 2011 San Diego, Philadelphia, and Cambridge festivals. The second round will include partners from all four 2012 SFA festivals and the results will be included in our final evaluation report.

Each festival provided GRG with their partners' email addresses. GRG then emailed each partner a personalized invitation (where first names were provided) containing a link to the survey. Reminder emails were sent to non-respondents. Across the three festivals, we received feedback from more than 200 partners for an overall response rate of 35%.

Survey of SFA Conference Attendees

GRG has also conducted an online retrospective, anonymous survey of public science event professionals who attended the SFA's first International Public Science Events Conference (IPSEC). A copy of the survey is appended to this report. The SFA will be hosting a second IPSEC in fall 2012, after which GRG will again survey attendees and will include the results in our final evaluation report.

GRG provided the SFA manager with an email invitation containing a link to the online survey. The SFA manager then sent the invitation to all 218 attendees. GRG also worked with the SFA manager to send reminder emails to non-respondents. We received completed surveys from 97 attendees yielding a response rate of 44%.

FINDINGS

The findings are organized by the impacts described in the Introduction, first for the public audience and then for the professional audience. Prior to presenting the findings for each audience, we provide a profile of the audience.

PROFILE OF PUBLIC AUDIENCE

Across the four SFA festivals, we collected surveys from a grand total of 4,432 festival goers. Females comprised a slight majority of public audience survey respondents. About two-thirds of the respondents were white, while the other one-third was from a group underrepresented in STEM. A majority of the respondents had a college degree or higher. About half were working or studying in a STEM field. About four in ten respondents had come to the festival as part of a family group.

Table 1
Demographic Profile of Respondents

		Percentage
Attended festival with one or more children aged 5-16		38%
Worked/studied in STEM		52%
Age group	<14	4%
	15-17	8%
	18-24	10%
	25-34	25%
	35-44	21%
	45-54	17%
	55-64	10%
	65+	6%
	Gender	Female
Male		43%
Race/Ethnicity	American Indian or Alaska Native	2%
	Asian	18%
	Black or African American	6%
	Hispanic or Latino/a	9%
	Native Hawaiian or Other Pacific Islander	1%
	White or Caucasian	67%
	Other	3%
Highest degree	Less than High School	8%
	High School	11%
	Associates/2-year	6%
	College/4-year	35%
	Master's	26%
	Ph.D./Professional	14%

Minorities, women, and family groups constituted a higher percentage of festival-goers than science museum goers cited in two other research studies.

Underrepresented groups – minorities and women – constituted a higher percentage of “visitors” to the festivals we evaluated than to other informal science settings. Across the 2011 iterations of the four SFA science festivals – San Diego Science Festival, Cambridge Science Festival, Philadelphia Science Festival, and Bay Area Science Festival – 67% of respondents identified as white. In contrast, a recent study of over 40,000 museum-going households reported that 84% of science center respondents identified as white.¹ 57% of SFA festival goers were female, compared to 47% of the visitors to the Smithsonian science museums.²

Family groups constituted a higher percentage of visitors to SFA science festival *carnivals and expos* than to other informal science settings. Seventy-five percent of SFA science festival *carnival and expo* respondents were attending with one or more children aged 5-16, compared to 43% of Smithsonian science museum visitors that came as part of a group of adults with children/teens.³

The most common reason for attending the festival was a general interest in science. More than a quarter of respondents came to support the experience of others. A lower percentage of respondents were motivated by a specific interest related to their work or pastime.

Table 2
Reasons for Attending the Festival

Reason for attending	Percentage
General interest in science	44%
Specific interest related to profession or hobby	16%
To support the experience or learning of children or others	27%
Seemed like an important event to attend	8%

On average, attendees rated the festival events as “very good,” the second highest rating on a 5-point scale (mean rating =4.27). Eighty-three percent of attendees gave their events one of the top two ratings (very good or excellent) on the 5-point scale.

¹ http://reachadvisors.typepad.com/museum_audience_insight/2010/04/whos-coming-to-your-museum-demographics-by-museum-type.html

² http://www.si.edu/opanda/Reports/Reports/SI2004_Survey_Booklet.pdf

³ http://www.si.edu/opanda/Reports/Reports/SI2004_Survey_Booklet.pdf

PUBLIC AUDIENCE IMPACTS

Public Audience Impact #1: Families and adults will increase their awareness of the role that science, engineering, and technology play in their region.

Attendees learned about and became more interested in science as a result of festival experiences. They also had fun!

We turned to two indicators for evidence as to whether the project is accomplishing this impact: attendees' reports that they learned something about science at the festivals and attendees' interactions with STEM practitioners during the festivals.

Attendees rated the extent not only to which festival events helped them learn something new about science, but also the extent to which events increased their interest in science, made science learning fun, and connected them to the science happening in their cities. See Table 3. The festivals received quite positive ratings for each of these items; across festivals attendees rated them as having *some* to *quite a bit* of impact, on average, on making science learning fun (mean rating = 3.96 out of 5) and on helping them learn something new about science (mean rating = 3.88 out of 5).

Table 3
2011 Science Festival Attendees' Ratings

To what extent did today's event ...	Not at all	Only a little	Some	Quite a bit	A great deal
Increase your interest in science	6%	7%	30%	36%	21%
Make science learning fun	4%	5%	19%	38%	35%
Help you learn something new about science	4%	6%	22%	37%	32%
Help you connect to the science happening in your city	9%	10%	24%	30%	27%

Attendees also reported whether they had had the chance to voice a question or comment in any discussion with a STEM practitioner, do an activity with a STEM practitioner where they got to handle and manipulate materials, and/or hear a STEM practitioner talk about their work. See Table 4. Across the four festivals, a majority of attendees had heard a STEM practitioner talk about their work. About four in ten attendees had voiced a question or comment to a STEM practitioner and almost half had done a hands-on activity with a STEM practitioner.

Table 4
Interactions with STEM Practitioners at the Festival

	Percentage
Voiced a question or comment in any discussion with a STEM practitioner	40%
Did an activity with a STEM practitioner where they got to handle and manipulate materials	45%
Heard a STEM practitioner talk about their work	76%

Public Audience Impact #2: Families and adults will increase and sustain their engagement in science, engineering, and technology learning opportunities in their region.

For this impact, indicators of success include audience plans for actual (in the case of returning attendees) and continued engagement with science. Across festivals, attendees were *likely* to *very likely*, on average, to talk about the festival with others, look for information on something they learned about at the festival, and attend festival events again next year. They were *somewhat likely* to take part in activities related to what they learned about at the festival, yet *somewhat unlikely* to use information from the festival in their work/studies. See Table 5.

Table 5
Mean Ratings of Likelihood of Follow-up Behavior

	Mean (out of 5)
Talk about the festival with others	4.37
Look for information on something they learned about at the festival	4.05
Take part in activities related to what they learned about at the festival	3.71
Use information from the festival in their work/studies	3.40
Attend festival events again next year	4.28

Many returning attendees had looked for information on something they had learned about at their festival, used information from their festival in their work/studies, or taken part in activities related to what they had learned about at their festival.

In Cambridge and San Diego, visitors who had attended the festivals in 2010 answered questions about their *actual* continued engagement with science after last year’s festival. The results are displayed in Table 6. Nearly all attendees had talked about their festival with others and about half had looked for information on something they had learned about at their festival. About four in ten had used information from their festival in their work/studies and four in ten had taken part in activities related to what they had learned about at their festival. One quarter had followed up with groups or organizations they learned about at the festival.

Table 6
Percentage of Returning Attendees Who Engaged in Follow-up Behavior

	Percentage
Talked about the festival with others	93%
Looked for information on something they had learned about at the festival	54%
Followed up with groups or organizations they learned about at the festival	25%
Took part in activities related to what they had learned about at the festival	39%
Used information from the festival in their work/studies	44%

Public Audience Impact #3: Families and adults will have a greater understanding of and interest in science.

The first Impact statement used the percentage of attendees who interacted with a STEM practitioner as an indicator of the project’s success. Impact #3

expands on these data to focus on the number of *first* interactions provided to attendees.

We asked respondents whether – before ever coming to the festival – they had voiced a question or comment in any discussion with a STEM practitioner, done an activity with a STEM practitioner where they got to handle and manipulate materials, and/or heard a STEM practitioner talk about their work. While a majority of respondents had had previous interactions with science practitioners, 20% of those who had voiced a question or comment in a discussion with a STEM practitioner at the festival had never done so before the festival. Similarly, 21% of attendees who engaged in hands-on activities with a scientist at the festival had not had that experience before the festival. One in ten (11%) of those who heard a scientist talk about their work at the festival were having that experience for the first time.

These attendees who had never had substantive interactions with science practitioners of the type offered by the festivals were more likely to be minority. Before coming to the science festivals, 39% of minority respondents had never voiced a question or comment in any discussion with a STEM practitioner, compared to 22% of white respondents ($p < .001$). Thirty-six percent of minorities had never done an activity with a STEM practitioner where they got to handle and manipulate materials, compared to 24% of whites ($p < .001$). Twenty-three percent of minorities had never heard a STEM practitioner talk about their work, compared to 11% of whites ($p < .001$).

The festival survey also asked respondents to think about everyday things one might do related to science (e.g., science TV, reading, web), science places (e.g., science museums, aquariums), and science programs (e.g., clubs, citizen science programs), and then asked respondents the extent to which they had been involved in science in these ways over the past year and the extent to which they had learned or enjoyed science in these ways over the past year.

Across the four festivals, 19% of attendees had been involved in informal science education *only a little* or *not at all*, 25% had been involved *some*, and 57% had been involved *quite a bit* or *a great deal*. In terms of learning and enjoyment from informal science education, 9% enjoyed science *only a little* or *not at all*, 21% enjoyed it *some*, and 70% enjoyed it *quite a bit* or *a great deal*.

Public Audience Impact #4: K-12 students will increase their engagement with year-round ISE opportunities and festival extensions.

Summative evaluation results are not yet available for this impact. The four festivals have begun to serve as focal points for expanded, year-round ISE activities and initiatives throughout their surrounding geographic areas and we expect to be able to address this in our final evaluation report.

Many attendees had never had substantive interactions with STEM practitioners of the type offered by the festivals and these attendees were more likely to be minority.

PROFILE OF PROFESSIONAL AUDIENCE

The SFA’s professional audiences include STEM practitioners, science communicators (e.g., teachers, science center professionals, journalists), and science festival organizers and team members. There are two major ways in which the Alliance interacts with these audiences. The first is through support services and resources they offer to these audiences, primarily to science festival organizers. The second is by SFA partner festivals engaging these audiences in their festivals as exhibitors, collaborators, and sponsors.

The highest percentage of partner survey respondents – respondents who had exhibited, presented, collaborated with, and/or sponsored the 2011 festivals – were informal science educators. Many respondents chose “other” to describe their role. These included outreach and business professionals, non-science educators and respondents from arts organizations, and librarians. A lower percentage of the sample was professional scientists.

Because NSF has a focus on increasing the science participation of historically underserved groups, we asked partners their own races/ethnicities. Across festivals, one or two in ten of the partner representatives were racial/ethnic minorities. NSF is also interested in the participation of younger professionals: 36% of respondents were younger than 35.

Table 7
Roles of Partner Survey Respondents

	Percentage
Professional academic scientist	8%
Professional industrial scientist	6%
K-12 science educator	10%
Informal science educator	27%
University science professor	8%
Science undergraduate/graduate student	7%
Science journalist/media	4%
Other	33%

The highest percentages of International Public Science Events Conference (IPSEC) survey respondents were public science event organizers and potential collaborators. One-third was science festival organizers. Of those who were science festival organizers, two-thirds (65%) were current organizers, about one-quarter (26%) were first-time organizers, and about one in ten (7%) were considering organizing a festival.

Table 8
Roles of IPSEC Survey Respondents

	Percentage
Science festival organizer	33%
Science café organizer	29%
Other public science event organizer (other than festival or café)	47%
Interested in collaborating with or supporting public science event(s)	46%
IPSEC speaker or presenter	20%
Other	10%

PROFESSIONAL AUDIENCE IMPACTS

Professional Audience Impact #1: Individuals and organizations will both initiate and sustain new regional STEM celebrations as a result of support from the Science Festival Alliance.

Indicators from Document Review

The SFA has supported 31 science festivals, including support to launch, offer specific programs, attract sponsors, gain visibility, and network with one another.

In this section, we review evidence of the initiation and sustaining of science festivals through SFA support. Through document review, we are able to report that the SFA has formally supported a total of 31 science festivals or other STEM celebrations in its first two years. This is 80% higher than its stated goal of supporting six festivals. These 31 festivals include the four SFA science festivals, with a major focus on the launches of the Philadelphia Science Festival and the Bay Area Science Festival (both new festivals launched successfully under this project, in April 2011 and October 2012, respectively).

Among the other 27 festivals supported by the SFA are two statewide festivals, two festivals happening abroad, and three festivals currently preparing for a first celebration slated to occur before the end of 2013. The early Cambridge and San Diego festivals of the SFA directly inspired the start of 11 of these festivals and the SFA has since provided start-up support to an additional six festivals. The SFA manager has personally provided direct consultation to all but two of the festivals.

The SFA has enabled specific programming for six festivals by fostering relationships with national exhibitors, or by offering a live link at one festival to an event occurring at another. The Alliance has created sponsorship opportunities for six festivals, by promoting the sharing of corporate sponsor contacts. The SFA has provided visibility to festivals by profiling them in the SFA-produced “First Look at Science Festivals” (five festivals) and by proactively garnering national press attention (12 festivals).

The network has provided on-the-ground support in the form of site visits involving 21 festivals. Eighteen festivals made site visits to other existing festivals prior to the start of their own festivals; and eleven made such visits after their first festival. Thirteen festivals have served as hosts to other festival organizers, a practice encouraged and often facilitated by the SFA.

Finally, the SFA has facilitated the sharing of several key resources, including planning documents (20 festivals), online tools (18 festivals), evaluation resources (13 festivals), and marketing materials (8 festivals). In addition, representatives from 19 of the festivals attended IPSEC and representatives from 17 of the festivals have attended SFA in-person networking sessions.

The Experience of the “First Four” SFA Festival Directors

We asked the four directors of the SFA science festivals to reflect on the most important ways in which being a member of the SFA had benefited their festivals. Several themes emerged. First and foremost was that the SFA had created a network of colleagues that can reach out to each other for input

“My festival wouldn’t have happened at all without the SFA in-person meetings. There is no question I drew so many resources from SFA members.”

-Director of the Bay Area Science Festival

of every sort and create better programs and build upon their production value. The directors have spent time together revamping programs, both in terms of designing higher quality events and ones that penetrate target neighborhoods. They have discussed how to keep festivals fresh and exciting for partners who are handling much of the event production and design. They have revised models to engage corporate funders in new and interesting ways around STEM and have found that being able to leverage information from one another adds to their legitimacy as ISE programs.

This professional community of practice, in turn, has put their festivals in a broader context and facilitated a general awareness of the science festival movement. Directors cited the IPSEC meeting, in particular, for its value in enabling festivals to meet face-to-face, while discussing key hurdles for the movement. They also valued the opportunities they had through the SFA to visit other festivals to see firsthand new programming models that have allowed them to adapt successful events to their own festivals.

“The SFA was a source of motivation and our ‘cheerleader’ if you will.”

-Director of the San Diego Festival of Science & Engineering

Another key theme was that of access to national professional associations and other important organizations outside of their regions and states. Directors emphasized they would not have obtained this access on their own. One way in which the SFA has accomplished this is by creating speaking engagements at key conferences, including AAAS, ASTC, and ACS President’s Symposium. These SFA engagements in turn led to individual festival engagements (sometimes in the form of sponsorship) with scientific societies, such as ASHG, ASCB, and ACS.

A third way in which the SFA has benefited its founding members is by keeping on top of what is happening in the STEM world. In this way, the SFA has become the “go to” organization for the latest trends, concerns, and ideas on stimulating STEM informal education. The SFA has also provided directors with statistics and information on the national growth of festivals that they have used with potential funders.

Indicators from Survey of Public Science Event Practitioners

There were more than 215 people in attendance at the SFA’s first professional conference, the 2011 International Public Science Events Conference (IPSEC). When surveyed after the conference, about a quarter of respondents anticipated starting or supporting the start of a science festival and another quarter intended to start or support the start of a science café. Looking only at the one-third of respondents who were science festival organizers, more than half (56%) aimed to start or support the start of a science festival. The conference had other benefits that bolstered STEM practitioners to initiate, sustain, and improve their STEM celebrations. These benefits are discussed below, followed by Tables 8-10 presenting the relevant data.

The conference provided for face-to-face networking between attendees that is likely to lead to greater collaboration. This was perhaps the most successful aspect of the conference. Respondents mostly rated the range of attendees and the opportunities to network at the conference as *very good* and 83 percent said the conference had either *quite a bit* or *a great deal* of impact on their forming new connections and relationships. After the conference, 70

The SFA's International Public Science Events Conference inspired many science festival organizers to commit to starting or supporting the start of a science festival.

percent of respondents said they would *definitely* be following up with someone they met at the conference for the first time to *obtain* information and resources. Similarly, 70 percent of respondents said they would *definitely* be following up with someone they met at the conference for the first time to *share* information and resources.

The conference fostered exchange that demonstrated potential to improve the quality of science festivals and science cafes. On average, respondents rated the range of conference speakers and presenters as *very good*. They also felt the conference had some to *quite a bit* of positive impact on their understanding of how their work fits into a larger field, their conceptions of public engagement in science, their public science event practices, and their information and resources to start or help sustain a new public science event.

The conference created a current snapshot of public science engagement strategies related to events. After the conference, 48 percent of respondents said they would *definitely* adopt a new practice for their science event that they had learned about at the conference for the first time. Science festival organizers were more likely to do so than were organizers of cafes and other public science events.

The conference increased awareness of the NSF-funded Science Festival Alliance. Sixty percent of respondents said the conference had increased their awareness of SFA resources and support either *quite a bit* or *a great deal*. Forty-two percent of all respondents and 68 percent of science festival organizers were *definitely* going to follow up with the SFA after attending the conference.

Table 8
Participant Ratings of Conference Quality

	Poor	Fair	Good	Very good	Excellent
Range of topics	0%	2%	28%	49%	21%
Range of presenters	0%	5%	26%	44%	25%
Range of attendees	0%	4%	16%	48%	32%

Table 9
Extent to which Conference Benefited Participants

Benefits	Not at all	Only a little	Some	Quite a bit	A great deal
Better understanding of how your work fits into a larger field	2%	5%	29%	27%	37%
New/improved conceptions of public engagement in science	2%	3%	30%	40%	25%
New/improved public science event practices	1%	2%	30%	47%	20%
Information/resources to start a new public science event	0%	9%	34%	41%	16%
Information/resources to help sustain a public science event	1%	5%	36%	46%	12%

Table 10
Public Science Event Practitioners' Planned Behaviors

	Definitely	Possibly	Probably not/No
Follow up with someone you met at the conference for the first time to obtain information or resources	70%	29%	1%
Follow up with someone you met at the conference for the first time to share information or resources	70%	29%	1%
Adopt a new practice for your science event that you learned about at the conference for the first time	48%	43%	8%
Start (or support the start of) a science festival	27%	40%	33%
Start (or support the start of) a science cafe	25%	45%	30%
Follow up with the Science Festival Alliance	43%	56%	1%

Professional Audience Impact #2: Public science event practitioners will increase their understanding of how to impact target audiences through STEM celebrations.

Indicators from Survey of Public Science Event Practitioners

Among other benefits discussed under Impact #1, public science event practitioner who attended felt the SFA Conference had *some to quite a bit* of positive impact on their understanding of how to reach and impact target audiences through public science events.

Table 11
Extent to which Conference Benefited Participants

Benefits	Not at all	Only a little	Some	Quite a bit	A great deal
Increased understanding of how to reach target audiences through public science events	3%	6%	39%	38%	15%
Increased understanding of how to impact target audiences through public science events	2%	9%	39%	38%	13%

Indicators from Surveys of Science Festival Partners and Attendees

A majority (65%) of STEM practitioners who exhibited and presented at the four partner festivals reported increased confidence interacting with public audiences as a result. Moreover, analysis of attendee outcomes by interaction with STEM practitioners during festival events, demonstrated that interaction with STEM practitioners was associated with better outcomes for attendees.

Attendees who intermingled with STEM practitioners at a festival had more fun, were more interested, and learned more than attendees who did not interact with a scientist.

Table 12
Festival Success in Achieving Impacts, by Interaction with a STEM Practitioner

To what extent did today's event ...	Percentage reporting quite a bit or a great deal	
	Interacted with a STEM practitioner	Did not interact with a STEM practitioner
Increase your interest in science***	61%	41%
Make science learning fun***	76%	58%
Help you learn something new about science***	72%	51%
Help you connect to the science happening in your city***	60%	40%

p<.001

Finally, the extent to which this Impact is met also depends, in part, on whether and how festival teams prepare their partners to implement festival programming. The relevant indicator identified by the SFA team is that 90% of attendee ratings of the quality of individual events and festivals overall will be at the *very good* or *excellent* level. The results related to this indicator are presented in Table 13. The percentage of attendees rating individual events as *very good* or *excellent* ranged from a low of 50% to a high of 100%. Overall, the festivals are within 4-12% of their ambitious benchmark.

Table 13
Percentage of Attendees Rating Events and Festivals as *Very Good* or *Excellent*, by Festival

	Festival A	Festival B	Festival C	Festival D
EXPO/Carnival	84%	78%	85%	83%
Event 1	94%	92%	98%	100%
Event 2	89%	91%	96%	100%
Event 3	89%	91%	95%	99%
Event 4	82%	89%	91%	94%
Event 5	80%	84%	85%	91%
Event 6	79%	83%	81%	88%
Event 7	77%	77%	75%	82%
Event 8	77%	73%	74%	76%
Event 9	75%	72%	67%	74%
Event 10	74%	69%	67%	67%
Event 11	72%	69%	50%	57%
Event 12	67%	52%	N/A	N/A
Total	81%	78%	86%	85%

Professional Audience Impact #3: STEM practitioners will increase engagement in public outreach through festival related experiences.

STEM practitioners engaged in festivals were committed to continued public outreach, even if their own organizations did not offer year-round ISE opportunities.

This section of the report relies solely on data from our survey of science festival partners. When asked, a majority of partners (77%) reported having previous experience with Informal Science Education, but more than one-fifth (23%) were new to ISE. Thus, merely through partnering they increased their engagement in science outreach. About half (48%) of the partners came from organizations that offered year-round K-12 ISE activities *directly associated with their festival exhibit or activity*, presumably offering opportunities for festival-goers to extend their ISE experience beyond the festival itself.

When asked to think about the upcoming year and their commitment to ISE beyond their science festival, partners (88%) were highly likely to contribute to local ISE efforts in the next year. On average, 40% more representatives planned to contribute to local ISE efforts in the next year than provided year-round ISE opportunities. This shows a driving interest and commitment to extend the circle of those who are effectively engaged by festival-related, year-around ISE initiatives.

Returning as exhibitors, presenters, collaborators, and sponsors was another indicator of the project's accomplishment of Impact #3. When asked in 2011 if they would participate in their city's 2012 science festival if given the opportunity, nearly every partner (87%) asserted they would. A small but substantial number of partners (11%) selected "Other," and these answers ranged from monetary concerns to relocation. The intentions of the partners to continue participating in their festivals also speaks to the quality of their experience and to the potential sustainability of the science festivals.

CONCLUSION

In conclusion, we find that the SFA is a vibrant and connected network that is achieving its impacts, including promoting public interest in, engagement with, and new understanding of science, technology, engineering, and math. The project has strengthened science festival organizational capacity for existing festivals by extending the impacts of science festivals, extending reach to underrepresented audiences, and extending STEM practitioners' engagement in outreach.

There also is strong evidence that the SFA has played a central role in increasing the number of science festivals in the U.S. (and thus in increasing the percentage of the U.S. population within reach of a science festival). These science festivals are diverse geographically and in terms of festival models. Through its sharing of resources and facilitation of networking, the SFA can also take responsibility for increasing the number of science festival innovations occurring throughout the festival network. The future work of the SFA lies in creating a sustainability plan.

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