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

Pushing the Limits: Making Sense of Science
Summative Evaluation

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September 26, 2014

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This material is based upon work supported by the National Science Foundation under Grant No. ISE # DRL-1010577. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

ACKNOWLEDGMENTS

Goodman Research Group, Inc. (GRG) wishes to acknowledge the following members of the Pushing the Limits (PTL) team, who contributed directly to the success of the evaluation: PI Dan Rockmore, Dartmouth College; co-PI Meighan Maloney, Dawson Media Group; co-PI John Falk , Oregon State University; Karen Brown, Dominican University; and Linda Crowe, Wendy Cao, and Wayne Walker, the Califa Group. We would also like to thank the Phase I and Phase II library professionals, science partners, and patrons for their patience and thoughtful responses as they completed surveys, allowed field researchers to observe their events, and talked informally with us at site visits.

The PTL project was created and made possible by a large team of individuals:

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Additional Footage	ESA/Hubble Collaboration, NASA, and the Hubble Heritage Team (STScI/AURA)
Equipment	Abel Cine Tech, Filmsound, Flying Dog Films, Gearhead Grip, High Output, Hornet Grip, Koerner Camera, Murmac Video Productions, North by Northwest Spectrum Video and Film, Serious Grippage
Special Thanks	Kristin Cunningham, McMenamin's Kennedy School
Onscreen Appearances (Program Units)	Jean M. Auel, Maria Baldwin, Carlene R. Bartel, Brian Baxter, David Belanger, Mattew Boswell, T.C. Boyle, Sean Brock, Kevin Carroll MS.LP. FAAOP, Cameron Clapp, Donnie Clapp, Dillon Clapp, Clive Cussler, David Dobbins, Nathaniel Fuentes, Sharon Hill, Jeremiah Langhorne, Eric Larson, Julius G. Moore, Jr., Kendra Myers, John Pirhalia, Nataly Plotner, Randy Richardson, Santiago Romero, Nuvayoiyung Sekakuku, Bradley T. Shrum, Cory Shrum, Julie Shrum, Shardell Shrum, Rose B. Simpson, Roxanne Swentzell, Porter Swentzell, Ailani Swentzell, Chas Swentzell, Latha Woods
Onscreen Appearances (Professional Development)	Mary Austin, Heather Backman, Peggy Barber, Connie Barrington, Karen Brown, Linda Burns, Regina Doi, Jamie Falo, Linda Fields, Larry Grieco, Nancy Kishpaugh, Colleen Leddy, Mandy Luchs, Pattie Mayfield, Jessica Miller, Annie Miller, Debra Peterson, Sonja Plummer Morgan, Fred Stein, Diana Sterling, John Stevens, Sandy Van Dusen
Case Studies	Georgetown County Public Library (Georgetown, SC): Dwight McInvaill, Heather Pelham, Jeffrey Pelham; Gustine Branch Library Appearances (Gustine, CA): Nola Ramirez, Kenneth Rickard; Richfield Public Library Appearances (Richfield, UT): Patrick Bodily, Linda Chappell, Linda Fields

EXECUTIVE SUMMARY

Pushing the Limits: Making Sense of Science (PTL) is an NSF-funded program designed to build the capacity of rural and small libraries to provide programming to enhance public understanding of science and math. PTL provides professional support, technical assistance, specially produced video segments, and funding for library professionals and their local science partners to co-facilitate a series of science café-style public discussions with adult patrons.

In Phase I of the PTL project (September 2012-August 2013), 20 rural and small libraries piloted the program. In Phase II (September 2013-August 2014), the PTL program was scaled up to 74 additional libraries.

External evaluator Goodman Research Group, Inc. conducted the external evaluation of the PTL project, including the second formative evaluation during Phase I and the summative evaluation during Phase II, described in this report. The summative evaluation focused on the effectiveness of the PTL project in meeting its goals for the library professionals, their patrons, and their science partners.

METHODS

GRG's summative evaluation design included background and post-programming surveys for the Phase II library professionals, post-programming surveys for their science partners, patron surveys after the first and fourth PTL event at 19 libraries, and observations at 10 libraries. Responses rates were excellent for the library professionals (93-94%) and the patrons (84-88%) and very good for the science partners (73%).

KEY FINDINGS

- The Phase II PTL libraries have moderately low staffing and STEM resources. The library professionals are very experienced with adult programming, but only a quarter had experience with adult science programming.
- For the science partners, fewer than half had experience with public science programming for adults. Before PTL, they gave themselves fairly high ratings in interest, ability, and comfort in public science programming.
- Library professionals found the PTL-provided PD resources — particularly the website, listserv, and webinars — very helpful in preparing them to plan, market, and implement their PTL programming. They gave high marks to the organization and clarity of the PD and felt it was especially strong in preparing them to plan and facilitate events.

- The majority of science partners felt the PTL-provided materials prepared them to co-facilitate the program; most also drew on their own professional background in science.
- Library professionals and science partners customized their events to the topics, audience interests, and their local community and culture in interesting ways, including with food, activities, demonstrations, and examples.
- Library professionals and science partners reported great success in planning the series, engaging audiences, and facilitating lively discussions. On average, across all objectives, 79% of library professionals and 85% of science partners rated themselves as *very* or *extremely* successful in accomplishing them.
- The PTL programming successfully drew a crowd that was not necessarily already interested in STEM topics; 61% were only somewhat or less interested. At most libraries, the PTL events drew people who don't usually attend the programming. More than half said PTL events drew more men than usual, and a third had bigger crowds than usual.
- PTL events were very successful in engaging patrons. The most engaging component was the science partners, followed by the audience discussion. Library professionals also gave high ratings to the PTL programming in terms of broader goals, particularly advancing library goals and serving their communities.
- Patrons at the 19 surveyed libraries were extremely engaged, interested, and curious to learn more about the topics. Fully 59% were more interested in the science, technology, and engineering aspects of the event than they had expected. In describing what they had learned, 41% mentioned something involving science or technology.
- Library professionals made large gains in self-efficacy, especially in science knowledge, comfort finding science resources, and comfort facilitating science programming. They also felt much better prepared to continue developing and planning science programming. This translates into concrete plans to continue science programming for about two-thirds of the library professionals.
- Most science partners plan to continue their involvement with public science programming. Despite their initially high ratings in interest, ability, and comfort with public science, there were significant gains after PTL, particularly in comfort in informal learning environments and in interest in facilitating science programs.

KEY RECOMMENDATIONS

- GRG recommends further enhancing the customizability of the PTL programming by offering several book choices per topic, along with links to existing author videos that could be used with the alternate book selections. Discussion questions at varying levels of scientific sophistication would also help them tailor the program to their audiences.
- Library professionals and science partners wanted some additional materials. GRG suggests providing science partners with a brief written orientation to the PTL program, its goals, and the science partner's role along with a very brief video of the program in action. For library professionals, PTL should supply more customizable marketing templates and expanded lists of related books, videos, and resources. GRG also suggests expanding the discussion questions and providing a set of programming suggestions, activities, and display ideas.
- Because there is a fair amount of turnover in library personnel over the course of a programming year, GRG urges the PTL team to consider placing all of the PTL material, including all media, on the website to make it easier and more convenient for libraries to share materials with new staff and with science partners.
- Because *Pushing the Limits* is a highly successful program, GRG recommends providing libraries with more than four thematic units and expanding the program to additional small and rural libraries, as well as to other libraries.

INTRODUCTION

"This was a wonderful opportunity for a small library to offer a first-class program!"

–Library Professional

Pushing the Limits: Making Sense of Science (PTL) is an NSF-funded program designed to build the capacity of rural and small libraries to provide programming that enhances public understanding of science and math. PTL provides professional support, technical assistance, specially produced video segments, and funding for selected library professionals and their local science partners to co-facilitate a series of four science café-style public discussions with adult patrons at their libraries.

The discussions are structured around the notion that we all use science in our everyday lives to "push limits." Each discussion topic — Knowledge, Nature, Survival, and Connection — is linked to a popular work of literature and includes two specially produced brief video segments, one featuring the work's author and the other featuring a human interest story illustrating relevant themes for discussion.

The PTL program aims to increase engagement with and understanding of science among two adult audiences that historically have had less access to scientific programming: rural library professionals and adults in the communities they serve. The program builds library professionals' capacity to support informal science learning (ISL) in their communities by providing professional development (PD) and by guiding them in selecting and working with a local science partner to coordinate and co-facilitate adult programming on science-related topics.

PTL was created by an interdisciplinary team of library professionals, scientists, and filmmakers from Dartmouth College, Dawson Media Group, Oregon State University, the Association of Rural and Small Libraries, and the Califa Group.

PHASES I AND II OF THE PTL PROGRAM

In Phase I of the PTL project (September 2012-August 2013), 20 rural and small libraries piloted the program. In Phase II (September 2013-August 2014), the PTL program was scaled up to 74 additional libraries.

Topics, Books, and Videos

As noted above, PTL has four topical themes: Knowledge, Nature, Survival, and Connection. Each has a brief author video and a longer related human interest video, as shown below.

Figure 1
PTL Topics, Books, and Human Interest Videos

KNOWLEDGE

The Land of Painted Caves, Jean Auel
Sean Brock, Celebrity Chef

NATURE

When the Killing's Done, T.C. Boyle
Cameron Clapp, Athlete

SURVIVAL

Arctic Drift, Clive Cussler
Julie and Cory Shrum, Family Farmers

CONNECTION

Thunderstruck, Erik Larson
Roxanne Swentzell, Sculptor

Virtual PD Resources for Library Professionals

During Phase II of the project, there was one significant change: Instead of delivering the PD for library professionals via a two-day meeting, the PD was delivered via a distance education model. The PTL program provided a comprehensive suite of resources designed to help the library professionals:

- Become familiar with ISE and the potential role of the library in building a community's capacity to understand science;
- Develop competencies for planning, coordinating, and co-facilitating PTL programs; and
- Prepare a customized action plan for implementing the PTL programs in their community.

There were two live webinars, and participants received a DVD that included six video PD units. Additional resources were provided online on the PTL website and through a listserv discussion group that served as a virtual community of practice where library professionals could share experiences, seek advice, and ask questions of other participants, the PTL leadership team, and several of the pilot library professionals.

The two webinars were held in September and October of 2013 and covered the following topics:

- *Planning Your Programming:* General background information, specifics related to planning the PTL program series (slides available on website).
- *Programs in Action:* Techniques to promote audience discussion and inquiry, including strategies to handle difficult facilitation situations (slides available on website).

Library professionals were instructed to view the first five units before the first webinar and the sixth before the second webinar:

- *Unit 1, Introduction:* PTL project and goals, what series might mean for community (handout on website).
- *Unit 2, What Is Informal Science Learning (ISL)?* Key aspects of ISL and how libraries play an important role in its implementation (handout & article on website).
- *Unit 3, Libraries as Community Resources for ISL:* Advantages ISL can bring to community and how libraries can benefit from PTL (handout on website).
- *Unit 4, Working with Science Partner:* Creating and/or strengthening relationships with local science partners (handout on website).
- *Unit 5, Marketing PTL Series:* Using the Marketing and Communication Plan template to develop strategies to promote the program series (template on website).
- *Unit 6, Fostering Engaging Discussions:* Tips for leading discussions as a co-facilitator with science partner (handout & article on PTL website).

Other resources available on the PTL website included:

- A STEM video podcast led by two of the PIs covering content-related questions to support library professionals and their science partners.
- A programming toolkit with seven downloadable documents, some customizable, to help library professionals plan and implement the PTL series. These included documents on planning timeline, program sequencing, program format, working with science partners, marketing and communications samples, and a set of discussion questions for each program topic.
- Recommended readings and collection development resources, including books and other supporting materials complementing the PTL themes.

Resources for Science Partners

Science partners had access to the website resources, including discussion questions, the STEM video podcast, and the slides from the webinars for the library professionals; some library professionals also shared the DVD with six video PD units with their science partners.

GRG'S EVALUATION OF THE PTL PROGRAM

Goodman Research Group, Inc., a Cambridge, Massachusetts research firm specializing in the evaluation of educational programs, materials, and services, conducted the external evaluation of the PTL project, including the second formative evaluation during Year 3 of the project and the summative evaluation during Year 4, described in this report.

The summative evaluation assessed the effectiveness of the PTL project in meeting its goals for the library professionals, their patrons, and their science partners. The summative evaluation was guided by the following questions:

- Does project participation increase library professionals' perception of themselves as science resources in their communities and as facilitators of public science programming?
- How effective is the content of the project's PD via a distance education format (i.e., web-based materials and resources, listserv, two webinars, six-module DVD)?
- Does attending a PTL discussion event increase rural adults' interest in and knowledge of science and their motivation to learn more about science and attend science-related free-choice learning?

METHODS

SUMMATIVE EVALUATION DESIGN

GRG's summative evaluation design for Year 4, the final year of the PTL program, included background and post-programming surveys for the 73 library professionals[1] participating in the full scale-up of the project,[2] post-programming surveys for their science partners,[3] observations at a sample of 10 libraries, and patron surveys administered after the first and fourth PTL event at a sample of 19 libraries.[4] Most libraries held PTL events on a monthly basis, with the earliest occurring in January 2014 and the latest occurring in September 2014.[5]

EVALUATION INSTRUMENTS

Library Professional Surveys

The background library professional survey was designed to gather information about the libraries' baseline resources and history with adult science programming and the library professionals' demographics and own capacity to facilitate such programming.

The post-programming survey asked respondents to reflect on their experiences implementing the PTL program and assess the effectiveness of different aspects of the program, including support and PD materials from the PTL team, their experience planning and facilitating the events, the audience's engagement, their library's capacity to run adult science programming in the future, and their own capacity to facilitate such programming. Library professionals were also asked to provide suggestions for future iterations of the PTL programming. The full list of questions and results from the library professional background and post-programming surveys can be found in Appendix A.

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[1] Many of those planning and implementing the PTL programming served their libraries in roles other than librarian, so the term "library professional" is used throughout this report.

[2] 73 libraries participated in the full scale-up, but only 68 completed their PTL programming by July 31, 2014, making them eligible to participate in the summative evaluation. All library professionals were invited to take the background survey, while only those eligible for the summative evaluation were asked to complete the post-programming survey.

[3] Each library had 1-4 science partners; library professionals listed a total of 137. However, science partners at libraries that did not provide accurate contact information for them or whose programming extended beyond July 31, 2014 were not included, leaving 124 science partners as the total N described in this report.

[4] Twenty libraries were asked to administer patron surveys, but one library had two attendees (who opted not to fill out surveys) at its first event and nobody at its fourth event, leaving 19 libraries as the total N described in this report.

[5] As noted above, five libraries continued their PTL programming beyond July 2014, but were not included in the summative evaluation.

Science Partner Survey

The post-programming survey asked science partners to reflect on their experiences preparing for and facilitating the PTL program and to assess the effectiveness of different aspects of the program, including the materials from the PTL team, their experience preparing for and facilitating the events, the audience's engagement, and their own capacity to facilitate adult science programming (before and after participating in PTL). Science partners were also asked to provide suggestions to improve the PTL programming and for their demographic information. The full list of questions and results from the science partner post-programming survey can be found in Appendix B.

Patron Surveys

Surveys administered immediately after the first and fourth event at a subset of libraries asked patron attendees about their interests, their assessment of the value and effectiveness of the PTL events, how they heard about and why they attended that particular PTL program, and how the PTL events might influence them in the future. The full list of questions and results from the patron first and last event surveys can be found in Appendix C.

Observation Protocol

The site visit observation protocol was designed to give GRG an understanding of how the PTL events actually unfold, including the structure and organization of the event, the audience's engagement with different aspects of the event, and the discussion among the science partner, library professional, and audience. The protocol included objective, quantitative measures as well as a qualitative narrative. Full results from the site observation protocol can be found in Appendix D.

PROCEDURES

The table below shows the summative evaluation activities, the timeline, and the response rate for each. Procedures are described in further detail beneath the table.

Table 1
Summative Evaluation Activities, Schedule, and Response Rates

	Completed	Participated/ Invited	Response Rate
Library Professionals			
Background survey	July 2013	70/75[a]	93%
Post-programming survey	July 2014	64/68	94%
Science Partners			
Post-programming survey	July 2014	90/124	73%
Library Patrons (19 libraries)			
Patron survey at event #1	February-April 2014	203/232	88%
Patron survey at event #4	April-July 2014	141/168	84%
Site Visits (10 libraries)			
Site visits, observations	March-June 2014	72[b]	n/a

[a]The original scale-up included 75 libraries, but two dropped out shortly after background survey invitations went out to library professionals.
[b]Response rates are not applicable to the site visits. Instead, the number of attendees present is reported.

All surveys for library professionals and science partners were administered online, whereas patron surveys were administered on paper. To select the libraries for patron surveys, GRG conducted a random sampling of libraries whose first event was held no earlier than February 2014 and whose final event was held no later than July 2014. As noted earlier, 19 libraries distributed paper surveys to all patrons attending the library's first and fourth (final) PTL event. Library professionals returned completed surveys to GRG via overnight mail.

To select the 10 libraries for site visit observations, GRG chose events held between February and July 2014 in geographically diverse areas across the United States where researchers would be available to conduct site visits. GRG staff conducted four visits and field researchers hired by GRG conducted the other six. Researchers were passive observers at the events, and library professionals were instructed to run the program normally without attention to the researcher.

The library professional, science partner, and patron surveys achieved high response rates. For their respective surveys, library professionals and science partners received an email invitation and up to four reminders to complete it. The library professionals, who were in communication with GRG and were familiar with GRG's evaluation of the PTL program, were the most responsive to the surveys. As library professionals also controlled the administration of the patron surveys, patrons were also highly responsive to the surveys. The science partners, who were less familiar with GRG and with the evaluation, were relatively less responsive to their survey, although almost three-quarters of them did respond.

RESULTS

In this section, we first describe the demographics and background experience of the library professionals and their science partners as well as their initial ability and interest in facilitating public science programming. Next we turn to the usefulness of the web-based professional development (PD) resources in preparing library professionals to plan, coordinate, publicize, and co-facilitate the PTL programming and the materials provided for science partners in preparing them to plan and facilitate events.

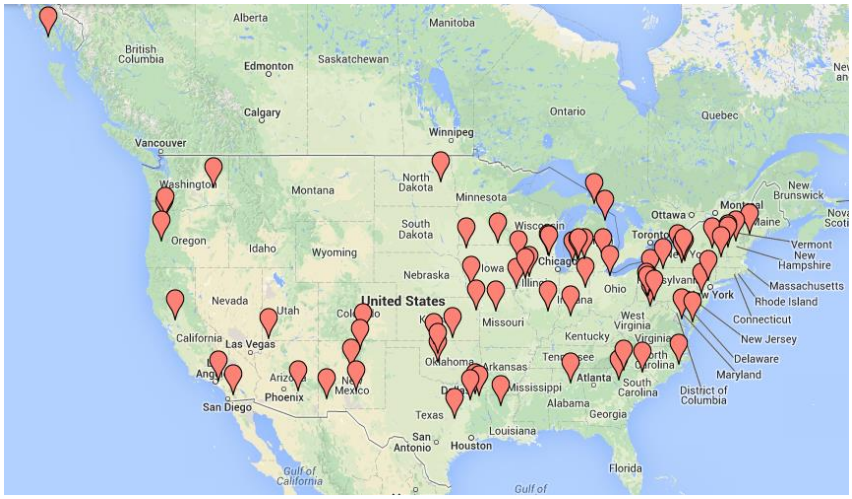
In order to illustrate the way the PTL events tended to unfold, we describe field researcher observations of 10 selected PTL events, followed by quotes from the listerv describing how library professionals and science partners customized the PTL events to make them their own. Next we present data from library professionals, science partners, and patrons assessing the quality of the PTL programming and offering suggestions for improvement.

Finally, we turn to the impact of the PTL programming on library professionals, science partners, and patrons. Appendices A-D show quantitative and open-ended findings from the library professional, patron, and science partner surveys and from the PTL event observations.

WHO ARE THE LIBRARY PROFESSIONALS AND SCIENCE PARTNERS?

Libraries serving towns with a population of 10,000 or less were invited to apply for PTL funding of $2,500 each. Initially, 75 libraries were selected from 102 that applied; two dropped out before any PTL programming began. The 73 libraries participating in the full scale-up of the PTL program are distributed across the United States, from Craig, Alaska to Julian, California, and from Paris, Maine to Chesterfield, South Carolina. Sixty-eight libraries completed their PTL programming between April 1 and July 31, 2014, and were thus eligible to participate in the summative evaluation.

Figure 2
Location of the PTL Libraries



The libraries have moderately low resources. The median number of full-time staff is just three, plus four part-time staffers and five volunteers. Just 10% of the libraries rate their library's STEM resources as *very good*, although 41% rate them as *good*; the rest rate them as *fair* (41%) or *poor* (9%).

Library Professionals

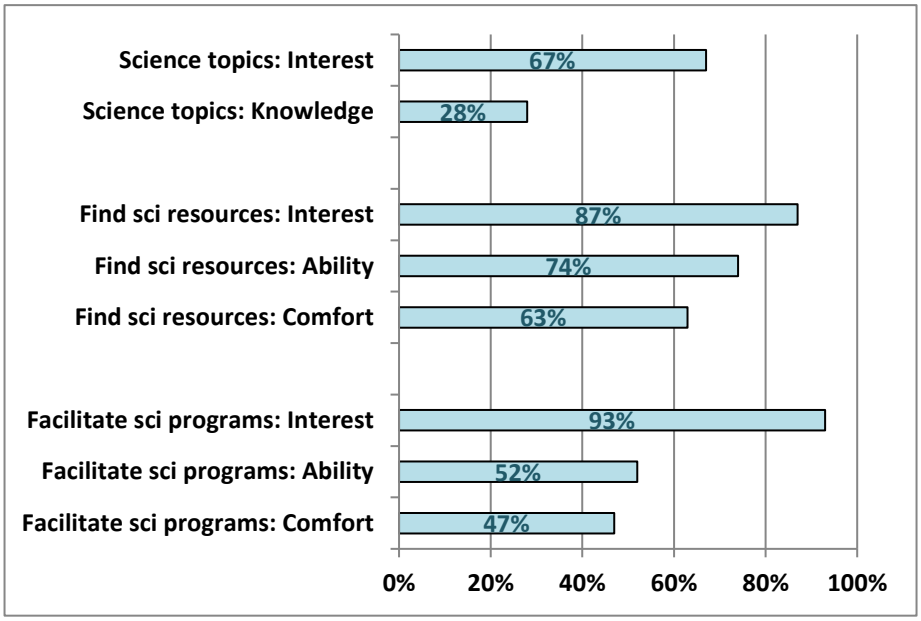
Most of the library professionals are women (86%), and almost all are White (96%). They have been employed as library professionals for a median of 8 years (range = 1-37 years), and almost three-quarters (71%) have a master's or professional degree.

These library professionals are an accomplished and motivated group in terms of PD and adult programming experience. Almost three-quarters (73%) have run more than 10 public programs, and more than half (57%) have participated in more than five PD programs within the past two years. Most (78%) have partnered with professionals outside the library in this programming.

However, only a quarter (25%) have experience with science-related adult programming, and just over a third (37%) have done adult programming

integrating books and videos. Not surprisingly, then, the library professionals see a fair amount of room for improvement in their interest, ability, and comfort in serving as informal science education (ISE) resources in their communities. This is especially true for knowledge of science topics and for ability and comfort in facilitating science programming.

Figure 3
Library Professionals' Initial Self-Efficacy as ISE Resources



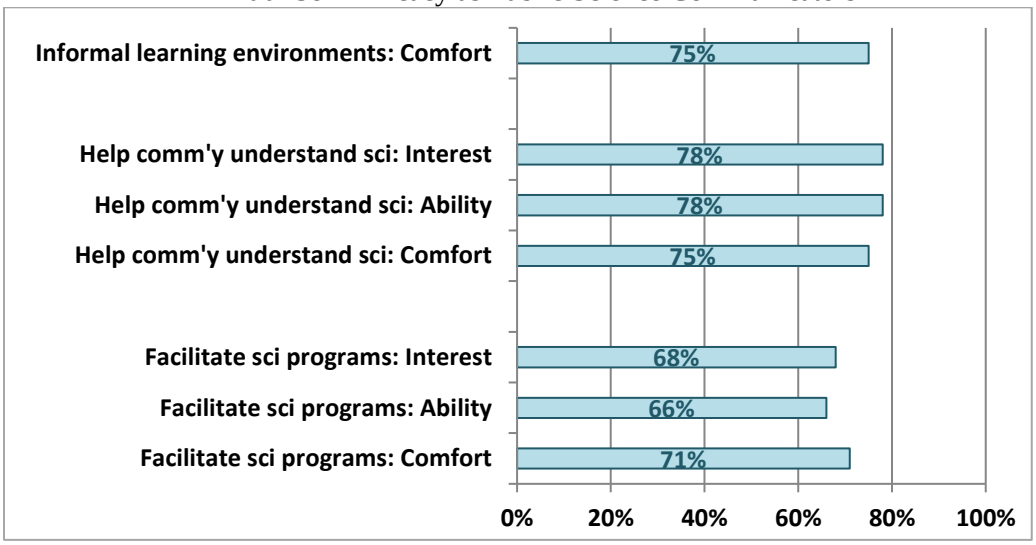
N=69-70
Note: Bars represent the percentages who responded *quite a bit* or *a great deal*.

Science Partners

In contrast to the library professionals, the science partners are evenly split between men (50%) and women (50%). As with library professionals, almost all are White (99%). Almost three-quarters (72%) have a master's, professional, or doctoral degree. Fewer than half (46%) of science partners have previous experience with public science programming for adults, including public or school-based fairs, festivals, events, presentations, and lectures, most often in the areas of science, history, and nature.

Asked to reflect on their interest, ability, and comfort in public science programming before their PTL participation, science partners gave themselves fairly high ratings, with over two-thirds responding *quite a bit* or *a great deal* to each item. Not surprisingly, those with previous experience with adult public science programming rated themselves significantly higher than did science partners without prior experience for every self-efficacy item, with one exception: Regardless of past experience, science partners are equally interested in helping people in the community understand science-related topics.

Figure 4
Science Partners' Initial Self-Efficacy as Public Science Communicators



N=88-89
Note: Bars represent the percentages who responded *quite a bit* or *a great deal*.

Science partners were fairly evenly distributed in terms of which PTL events they helped facilitate. On average, they facilitated between two and three events, but 47% facilitated only one and 35% facilitated all four.

Almost three-quarters of science partners (73%) volunteered to participate in the PTL program because of personal interest. About two-thirds (65%) mentioned their educational and/or occupational background in science, and about a quarter (24%) mentioned participating in similar science programming previously. Almost a third of science partners (32%) participated, in part, simply because the library professional or a colleague asked them to.

HOW USEFUL WERE THE PTL-PROVIDED RESOURCES?

Library Professionals' Preparation to Implement PTL

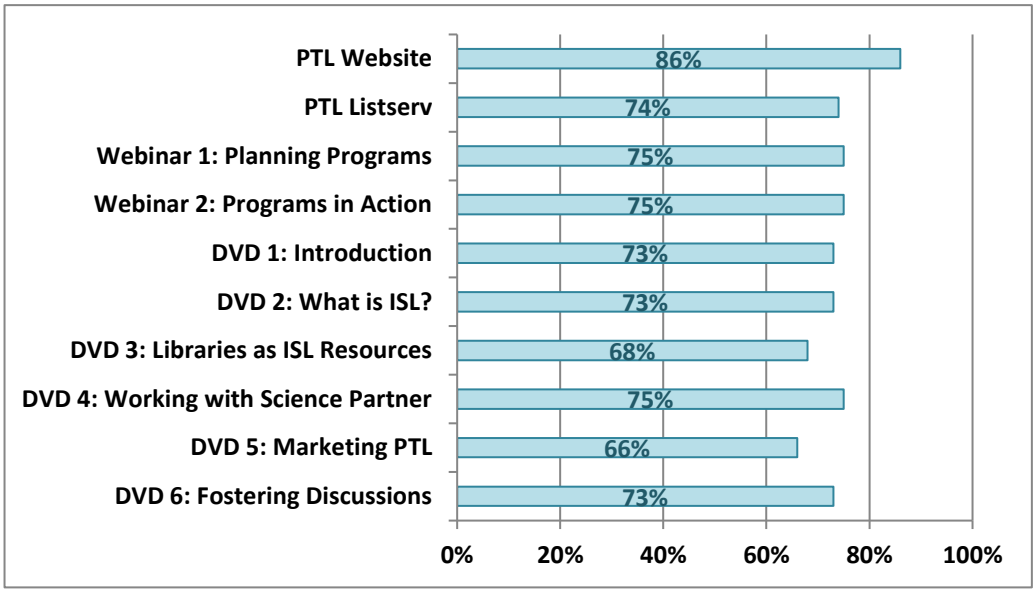
"A very good program, and 'out of the box' easy to run."

–Library Professional

Library professionals found the PTL-provided PD resources very helpful in preparing them to plan, market, and implement their PTL programming. They were particularly appreciative of the PTL website, but most also found the webinars, DVDs, and listserv to be quite helpful as well:

> *It's so great that we have this listserv to share what happens with the series in all our libraries — exciting to see all this discussion going on and to see that patrons like the events!*

Figure 5
Library Professional Ratings of PD Resources

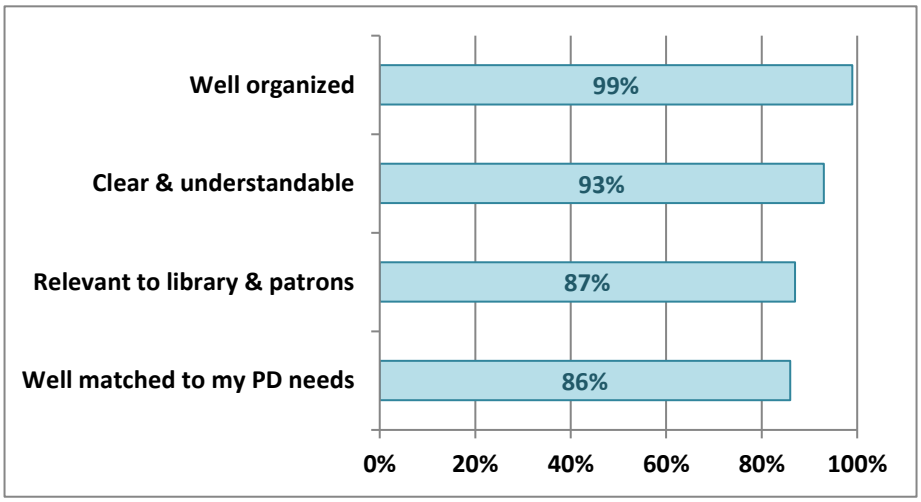


N=59-64

Note: Bars represent the percentages who responded that the resources had prepared them *quite a bit* or *a great deal* to plan, market, and co-facilitate the PTL program in their library.

The library professionals gave extremely high marks to the overall quality of the PD provided to them by the PTL team, particularly in terms of the PD's organization, clarity, and understandability.

Figure 6
Library Professionals' Ratings of the Quality of the PTL PD Resources



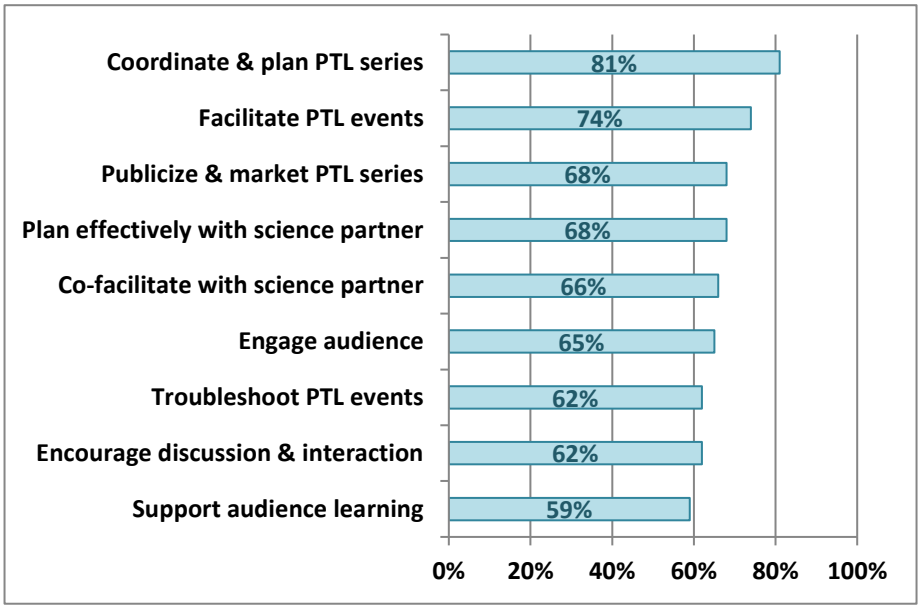
N=62-64
Note: Bars represent the percentages who *agreed* or *strongly agreed* that the PTL PD and training had these characteristics.

The PD resources were designed to help the library professionals develop specific competencies in planning, coordinating, and co-facilitating PTL programs, and the majority felt that the resources did so. The library professionals rated the PD as particularly strong in the areas covered in the two webinars: (1) coordinating and planning the PTL series, and (2) facilitating individual PTL events.

"I thought the program was wonderful. Very well organized and lots of information provided to make planning the events easier."

–Library Professional

Figure 7
Library Professionals' Preparation to Implement PTL

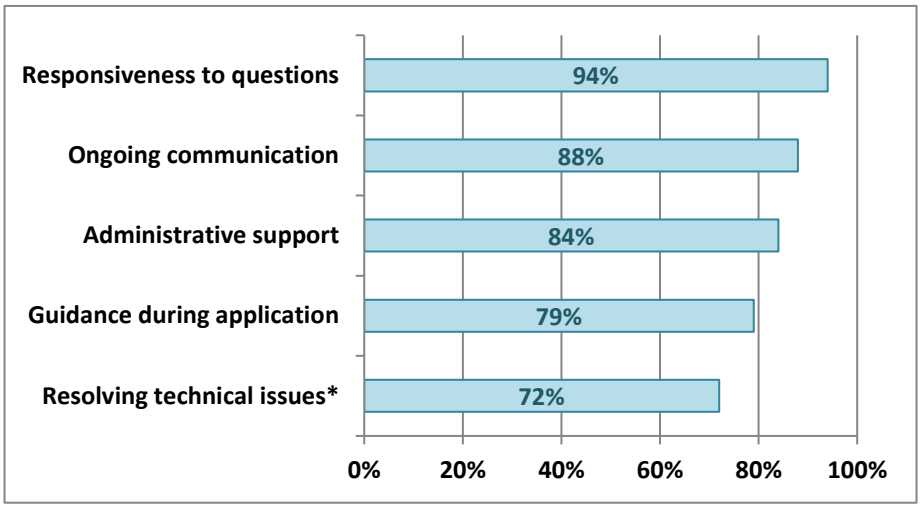


N=42-63
Note: Bars represent the percentages who responded that the PD prepared them *quite a bit* or *a great deal*.

PTL Team Support of Library Professionals

The library professionals felt well supported by the PTL team, especially in terms of responsiveness to questions and ongoing communication.

Figure 8
Library Professional Ratings of Quality of PTL Support



N=42-61
Note: Bars represent the percentages who responded that the quality of support in each area was *very good* or *excellent.*
*Note that fully one-third of the library professionals reported that this question did not apply. Of the two-thirds for which the question did apply, 72% found the support *very good* or *excellent*.

Science Partners' Preparation to Implement PTL

Almost two-thirds of science partners (62%) indicated that the materials provided by the PTL team prepared them *quite a bit* or *a great deal* to co-facilitate the PTL program. Most science partners felt prepared and knowledgeable to co-facilitate the program by drawing on their own background in science, using the materials provided by the PTL team and conducting further research on the PTL topic events:

> *The materials provided by the Library and the PTL program were wonderful for preparing me as the science partner. I felt that I was very well prepared to be a discussion leader for this topic. I had ample time to do further research and reading on invasive and introduced species so that I was able to contribute additional information that was pertinent for our area.*

> *At the outset, I wasn't sure what I'd agreed to do. The librarian who worked with me, though, explained things well enough that after I'd reviewed the materials, I did feel well prepared. I knew more than enough to help guide readers' discussions about science and the nature of knowledge.*

> *I am a scientist so felt comfortable with the content, and as a professor, was adequately prepared for each event.*

Nonetheless, there were some additional materials that science partners would have found helpful. Science partners who did not feel *extremely* successful at accomplishing the program goals for science partners in facilitating the PTL program (91%) were asked which materials or training could have better supported them in running successful and engaging PTL events. These science partners most frequently selected video of similar programs and written material describing successful strategies. For example:

> *I think providing links to videos of the program being carried out at other libraries would be helpful. I ended up finding a recording of a session through YouTube and found that very helpful in preparing my discussion.*[6]

[6] It should be noted that the PD DVD for library professionals did actually include this type of material, so it is already available.

Table 2
Additional Helpful Materials and Training

	Percentage
Video of similar programs in action so I could observe the process	43%
Written material describing strategies that are successful in this type of setting	41%
Live webinar or other interaction with people who communicate science to the public	19%
Other	12%
None of the above	28%

N=75
Note: Percentages exceed 100% because respondents could select more than one response.
"Other" responses related to: increasing attendance (2), better/more discussion questions (2), access to demonstrations/rubrics for the program (2), better books, more science information relating to the books, and more preparation materials in general.

In their open-ended comments, science partners offered more detailed suggestions for how the PTL team could help them feel better prepared, including providing them with a more detailed description of the role of the science partner, more information on the science in the books and videos, and improved discussion questions, particularly so that they do not need to do as much of their own research in advance of the events:

> *I think it would be helpful to improve upon the narrative that describes to the science partner what PTL is trying to do and how you expect it to be done. I spent quite a bit of time sifting through the material to get a better sense of what I should be doing.*

> *As an educator and a scientist, I found the PTL questions to be restrictive.*

> *I think this was a great program. It would have been nice to have a short summary about why each book was chosen, especially for "The Land of the Painted Caves." A short explanation of the science in each book may have also been helpful, especially for "Arctic Drift." I did a bit of research before our discussion of that book, but it was sometimes still difficult to separate fact and fiction.*

One of the library professionals agreed:

> *I would also like to have seen a web section that showed the science partner exactly what they were meant to do so they didn't feel that they had to go through so much information. It could have listed sample classes that included book, video, questions.*

HOW DID THE PTL PROGRAMMING UNFOLD?

As noted earlier, field researchers visited and observed 10 selected PTL events across the country. In order to give a sense of how the PTL events typically unfolded, we describe some of the commonalities and differences in the observed events below (fuller details on the results of the site observations can be found in Appendix D).

"I felt that the audience was very engaged in our discussion — we had a good time! I think that there was an appreciation and recognition that scientists like me are "real people, too." We found common ground in discussing science education and our society's need for innovation."

–Science Partner

Commonalities Among Observed PTL Events

Each observed event occurred in the library, either in the library proper (book stacks) or a designated meeting room. Regardless of room size, the attendees sat relatively close together, often in a circle or semi-circle with the facilitator(s) at the front. Nine of the 10 libraries provided refreshments, ranging from snacks to a full dinner.

At all ten observed libraries, events began with a discussion of the book and then flowed naturally into discussion of related ideas and topics. At the eight libraries that used the PTL videos, the author video was typically shown next, followed by the human interest video, with brief discussion following each video. One library had a more defined structure for the event, in which the library professional started with an overview of the event agenda and described goals for the event; this event was received very positively by attendees.

Field researchers noted that the science partners had done advance research on the book, the theme, and related scientific topics. Science partners also typically had some discussion questions in mind for the audience, whether those provided by the PTL team or their own. In some instances, the library professional had also done advance research and come prepared with discussion questions.

Most attendees were highly engaged in the events and interested in the discussion. At nine libraries, field researchers rated attendee interest and enjoyment as *high* or *very high*. Even those who were less vocal during discussions were interested and attentive. On average, observers rated attendees as being actively engaged — that is, contributing comments or asking or answering questions — 74% of the time, and more quietly engaged — listening, nodding, looking at the person talking or at the book — 25% of the time.

The topics discussed and the ideas shared tended to become broader and more science-oriented toward the end of events. The book was often used as a launching pad for later scientific discussion of related topics. At eight events, field researchers specifically noted attendee interest in scientific discussion and how attendees were, at least in part, spurring or driving the scientific conversation by contributing comments and asking questions; the facilitators were not the only ones guiding the discussion toward scientific topics. Field researchers estimated that, on average, both facilitator and attendee comments and questions were more often related to science topics than to details of the books or the videos.

At seven libraries, field researchers noted that some or all attendees knew the library professional and one another well, whether because they had attended prior PTL events together, were regular attendees of the library's other programming or book club, and/or were regular visitors to the library. These attendees were especially comfortable sharing ideas, disagreeing with one another, and infusing jokes and humor into the discussion. Attendees who had been to prior PTL events often referenced these events during the discussion.

At eight of the libraries, attendees were not terribly enthusiastic about the book itself, and not all attendees had read or finished it. (At the other two libraries, attendees seemed to have enjoyed the T.C. Boyle and Clive Cussler books.) Nevertheless, most attendees still enjoyed discussing and critiquing the book. Discussion was lively, although less so among those who had not read the book.

Differences Among Observed Events

Among the libraries that used the videos, there was slightly mixed success in incorporating these into the discussion. At five libraries, field researchers noted that both the author and human interest videos helped encourage discussion. One researcher noted that the conversation became deeper and more complex as attendees and the facilitators integrated information from the videos into their discussion of the book and of the scientific topics.

At two other libraries, field researchers reported that the human interest video was more effective than the author video at stimulating further discussion. At one of these, the library professional included a second clip to compare with the PTL human interest video; both were very successful at stimulating discussion.

In contrast, at one library, the field researcher noted that both videos seemed to interrupt a naturally flowing conversation. At this event, the discussion had already moved to broader scientific topics before the videos were shown, so when the conversation was paused for each video, the video did not particularly relate to the discussion that was happening.

At four libraries, the library professional and science partner acted as co-facilitators, leading the event together or each leading a portion of the event. At two of these, the library professional was the primary facilitator, whereas at one, the science partner was. At the fourth, the library professional and science partner truly facilitated together and quite equally. At the other six libraries, the science partner was the facilitator and the library professional typically participated in the discussion as an attendee, if at all.

At five of the libraries, field researchers noted that the facilitator had to play a fairly active role in prompting and guiding the discussion, whereas at two libraries, attendees carried on lively discussions with little to no prompting. Observers rated seven of the science partners as providing *very good* or *excellent* facilitation. Of the six library professionals who played a role in facilitation, three were rated as providing facilitation of that quality.

Ways of Customizing the PTL Events

The PTL listserv was a rich source of data on the different ways library professionals and science partners customized their PTL events to their topics, audiences, and locales.

Topical Food, Activities, and Demonstrations

At some libraries, library professionals and science partners incorporated food, activities, and demonstrations related to the PTL event's theme (i.e., Connection, Knowledge, Nature, Survival). Some library professionals were very creative in customizing the refreshments to the topic:

> *I made a midnight black chocolate cake with fresh whipped cream and frosted so it looked like snow drifts, lemon balls rolled in coconut so they looked like snowballs, and "ice cube" chocolates, plus hot chocolate with marshmallows. [Survival]*

> *For our first session on "Arctic Drift," we served Arctic Punch (blue with ice cream icebergs) and "survival food" – jerky, dried fruit, trail mix (and my idea of survival food: chocolate cupcakes). [Survival]*

> *We just finished the Nature program. We had a really good turnout for this one...We had one discussion and had gummy rats as a treat for everyone. [Nature]*

Science partners also showed their creativity in coming up with scientific activities and demonstrations to illustrate the event's theme:

> *Our science partner started the program with two "ice breakers," one actually involving ice cubes to demonstrate the effect of cold on your motor skills. The other one involved carbonated water/tap water demonstrating the acidification of oceans and what this means for crustaceans. [Survival]*

> *For Knowledge, we just finished our event with a member of the CalPoly–Pomona Robotics club. This was a completely hands-on event with all participants making their own simple brushbots and a watercolor-painting vibrobot…The highlight was the 80-year old woman learning to strip wire and tweak her little robot. [Knowledge]*

> *My two science partners were from the Rec department of our US Forest Service Ranger Station. Both have backgrounds in invasive species from the governmental policy angle. Wow! The conversation moved from fox farms to mink farms to endemic species to wolves to invasives to transplanted Aleutian sea otters to wild horses in the American Southwest...! [Near the end of the event], they announced a field trip to a test plot near town, so we*

all piled into cars and took a field trip! By the time it was over, EVERYONE was talking about how much fun it had been. [Nature]

We were able to get a Senior Criminologist from the Los Angeles department of the Coroner! For reference, this is the criminologist that collected and analyzed the samples from Michael Jackson's body as well as testified in the Phil Spector case. It was an amazing (albeit somewhat disgusting) presentation (at one point she showed photos of stomach contents and let people guess the cause of death). Technically she was talking about people that did not survive things, but it still tied in nicely with the books and videos. [Survival]

My science expert made a Morse code machine out of spare parts and hooked up to a radio as a tuner and "sparked" while doing an SOS. [Connection]

Our science guide is a local teacher, very well known and well liked. Great discussion and tasty treats. [Our science guide] showed us 23andme.com and his genetic makeup — he is 3% Neanderthal — everyone thought that was pretty cool! [Knowledge]

Audience Interests

At many libraries, library professionals and science partners planned the PTL events and discussion topics with the interests and comfort levels of their attendees in mind and allowed attendees to guide the direction of discussion:

We reviewed the T.C. Boyle book, but our audience had let me know in advance that they were most interested in talking about science and the impact of invasives in the Great Lakes. We discussed Asian Carp and Zebra Mussels and cormorant control, and we invited a local soil conservation officer to talk about phragmites. Her information spilled over into several other plant invasives, and our audience was riveted. [Nature]

We talked about Neanderthals and human origins, innovation and its effects on culture, and the evolution of methods of passing on knowledge. I was surprised when the discussion turned to intergenerational communication today, and the value of community. It was cool. [Knowledge]

We had some debate about whether humanity can rely on technology to protect us from climate change. Attendees expressed their opinions about water management and genetically modified organisms. [Survival]

We had so many people interested in geo-thermal heating, wind turbines, solar panels, and recycling that we could've continued in that vein for the whole evening. [Survival]

Local Connections

Some library professionals and science partners made particular efforts to connect the PTL events to the local community and/or culture through discussion, food, and activities, and at some libraries, the patrons made these connections themselves:

We branched out to discuss some local equivalents of rats; namely, wild hogs and fire ants that have invaded our area. [Nature]

We had 17 this evening who came out for local foods (corned bear, halibut, locally grown greens, and sea asparagus) and discussion. [Knowledge]

The presenter for the night was the Director of our local Nature Center. He was wonderful at speaking about the book and connecting it in with local events. [Nature]

I mentioned how the video goes into local and heirloom foods, and the nutritionists at SEARHC (Southeast Regional Health Consortium) got all interested, so it looks like we're going to be having a program with a local, Native potluck dinner and then the video and book discussion. [Knowledge]

We hosted [a] New Mexico State Climatologist — great presentation on New Mexico weather patterns, historical data, regional climate, U.S. and global. [Survival]

Book Substitutions

Almost half of the libraries (47%, or 30 libraries) elected to make substitutions for the recommended books, with 29 of the 30 replacing Jean Auel's *The Land of Painted Caves*. Of these 29, 22 substituted *The Clan of the Cave Bear*, the first book in the Auel series.

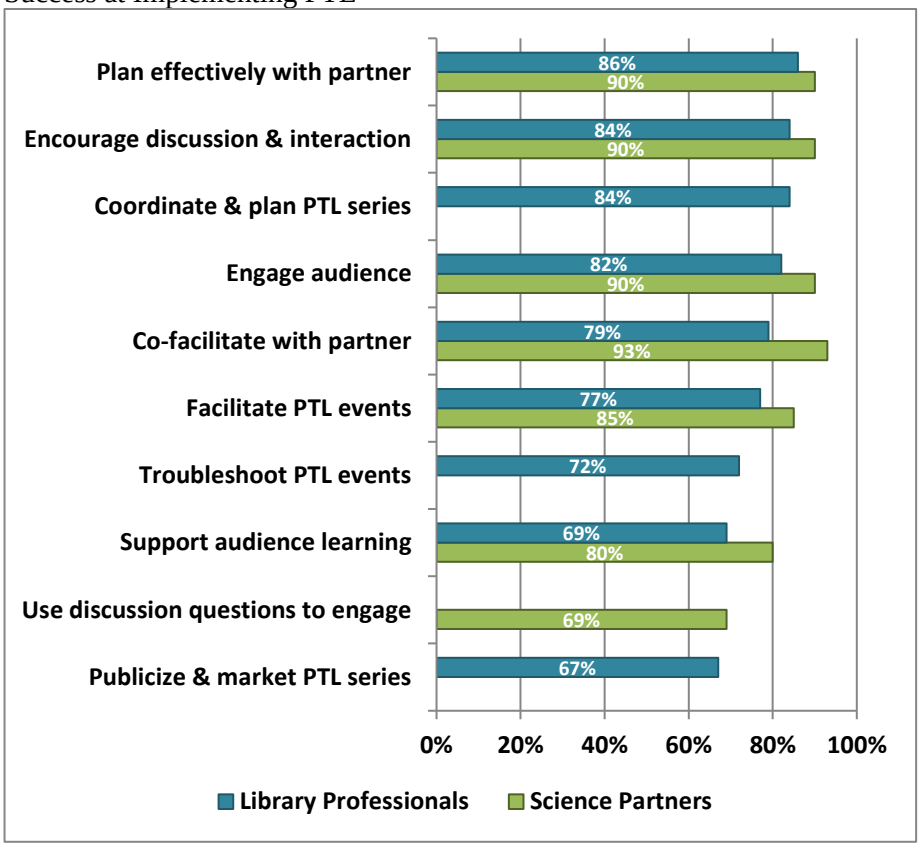
HOW SUCCESSFUL WAS THE IMPLEMENTATION OF THE PTL PROGRAMMING?

In this section, we present data from library professionals, science partners, and library patrons on the success of the planning and facilitation of the PTL programming, the degree to which the different program components successfully engaged attendees, and the extent to which library professionals were able to draw a diverse audience of people who were not necessarily initially interested in science topics.

Success of Planning and Facilitation

Both library professionals and science partners reported great success in planning the PTL programming, engaging their audiences, and facilitating lively discussions. Both library professionals and science partners believed they were especially successful at co-planning and co-facilitating events with their partners as well as engaging patrons and encouraging audience discussion.

Figure 9
Success at Implementing PTL



N=63-64 library professionals, 88-89 science partners
Note: Bars represent the percentages who responded that they had been *very* or *extremely* successful in accomplishing each objective. Library professionals were not asked about using discussion questions, and science partners were not asked about publicizing/marketing, coordinating/planning, or troubleshooting.

On average, across all objectives, 79% of library professionals and 85% of science partners rated themselves as *very* or *extremely* successful in accomplishing them. Library professionals and science partners commented on the successful implementation of the PTL programming:

> *It was exciting to watch the group and see how engaged everyone was. This is a very good thing for our community! [Library Professional]*

> *Great program! It encouraged me to go outside the box for the usual programming, to learn the appropriate technology, and to stretch my patrons in their thinking (and civil discussions). The program went beyond simply reading a book and talking about it to incorporating thematic (science-based themes!) discussions. It was a very valuable program for our library — great time! Thank you, thank you! [Library Professional]*

> *I really enjoyed the event and loved working with the librarians. At first I thought that the pairings of the film and literature too disparate, but once we engaged in discussion the topics supported each other. [Science Partner]*

> *We had a small group of participants (in a small community), but they were very interested and discussions were deep and varied. The program sparked some spin-off activities in the community, and we are holding more book sessions. [Science Partner]*

Compared to library professionals, the science partners were somewhat more confident in their success, especially in terms of facilitation, audience engagement, and supporting audience learning. These findings are not surprising given the respective roles and expertise of the science partners and the library professionals.

Library professionals felt slightly less successful at publicizing and marketing the PTL series than they did at planning, facilitating, and engaging audiences at these events, although about two-thirds still rated themselves as *very* or *extremely* successful in this area. As one noted,

> *I really needed to do more marketing, but that was "on me." The professional development materials gave me the background I needed, I'm just a relatively new director that is figuring things (including what works in my community) out.*

Science partners felt slightly less successful in using discussion questions to engage the audience, although, again, about two-thirds still rated themselves as *very* or *extremely* successful in this area. About half did not find the discussion questions provided by the PTL team especially useful or relevant to their audience's conversation, and others prepared their own discussion questions:

The discussion questions were not well thought out. The result was that I spent a great of time coming up with my own questions. I did a great deal of research on my own, as well, but I was OK with that.

Success at Drawing Diverse Audiences

"Word spread through the community about how much fun the program was and I've given away all 10 free books, and all the audiobooks I bought for the library are out for the next one."

–Library Professional

The PTL programming was successful in drawing a crowd that was not necessarily already interested in STEM topics. Averaging across science, technology, and engineering, just 39% of patrons who completed surveys said they were *very* or *extremely* interested in those topics, while 61% were less so. As one library professional noted, the PTL books fell outside many patrons' comfort zone:

We had great discussion on the science of modern technology and the communication of people. Many people reported this [Erik Larson's "Thunderstruck"] was not the style of a book they would normally pick up but enjoyed it very much. They were amazed by the footnotes and that most of the book was factual based on very interesting research.

Most of the library professionals (84%) agreed that the PTL events brought in people who don't attend the library's usual programming:

I think the book club people are struggling with the technical nature of these books, but there is a core of people that have NEVER participated in library programs before that have engaged with the nonfiction aspects of the books.

Our community really responded to this programming, and the people who did come in were very, very interested and often not the folks who attend humanities programs (although there was some good overlap).

We really enjoyed the events. This program pushed me to reach out to portions of my community that I had not before, and my patrons enjoyed meeting people from fields they were not familiar with.

Thank you for including us in this program. We hold a regular book club, but I had not realized that there was such an interest/need to have science-specific book club/talks. This brought out more men and new faces. I will definitely work to continue this theme in library programming.

More than half (53%) said PTL events drew more men than usual:

> *We have been thrilled that we have a fifty-fifty mix of men and women, and one of the surprise outcomes of these programs is that we get married couples to attend.*

> *Of the 18 people, we had 5 men. I was totally thrilled about that, because it is my objective to attract more men to our programs, and to this science-focused one in particular. Success!*

Finally, about a third (33%) reported that the audiences were larger than usual:

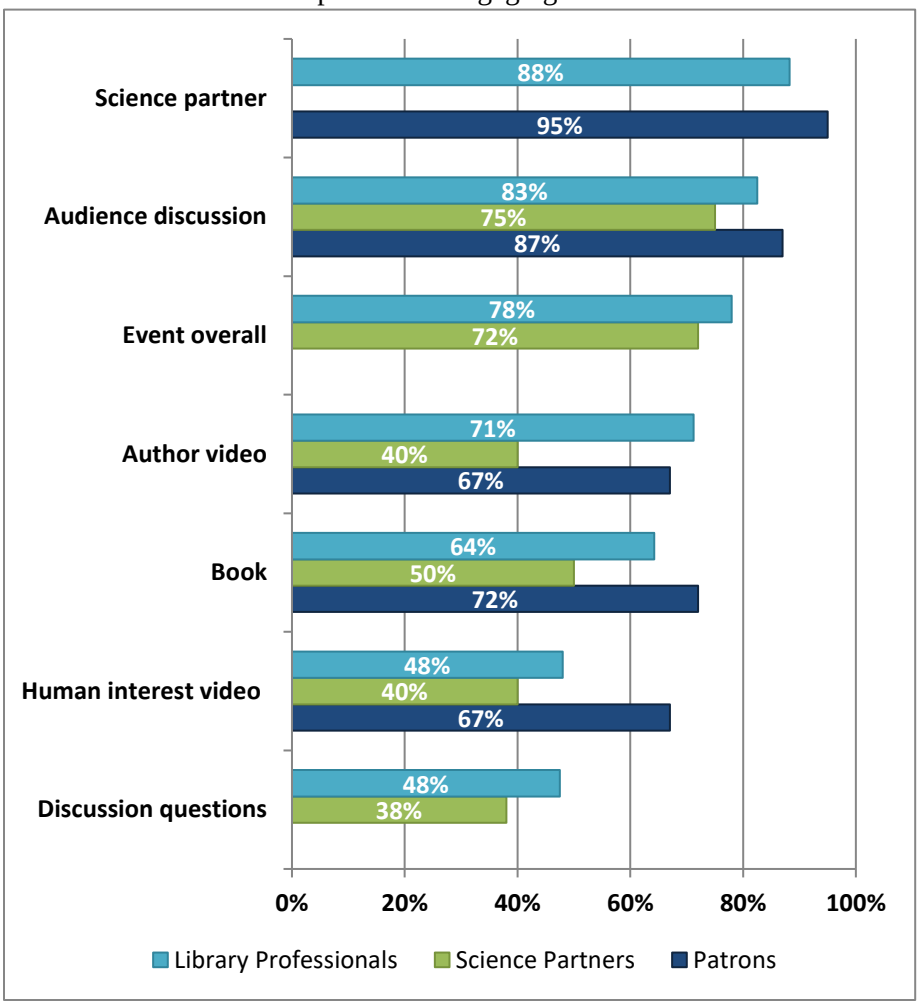
> *This was only our second program. The first had been about invasive species, a hot topic around here. I thought our good attendance on that day was due to the subject. This time, more competition for people's time, and an even better turnout.*

Success at Engaging Audiences

The library professionals and science partners found that the PTL programming was very successful in engaging library patrons: The majority of each group rated the PTL events overall as *very* or *extremely* engaging to the audience. Library professionals rated the science partners as the most engaging component of the programming, and their patrons agreed. All three groups agreed that the next most engaging component was the audience discussion.

"AWESOME! Let's do it again!"
–Patron

Figure 10
Effectiveness of PTL Components at Engaging Audience



N=51-64 library professionals, 78-87 science partners, and 295-337 patrons.
Note: Bars represent the percentages who reported that the component was *very engaging* or *extremely engaging* to the audience. Science partners were not asked to rate themselves, and patrons were not asked to rate discussion questions or the event overall.

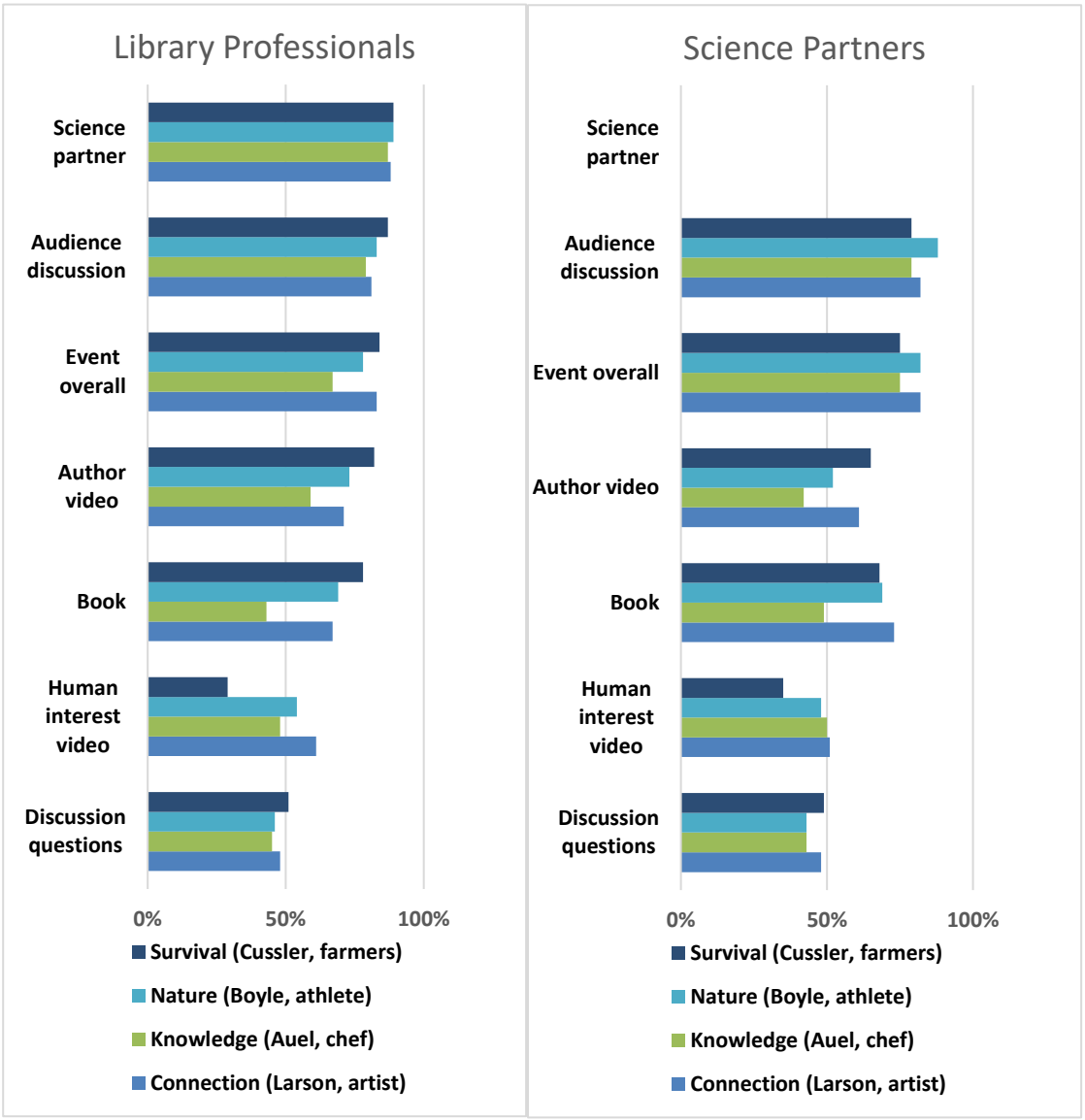
"Exceeded expectations. A diverse group of people with some surprising insight due to personal experience."
–Patron

Although library professionals and science partners were less enthusiastic about the human interest videos, just over two-thirds of patrons found them *very* or *extremely* engaging. For the author videos, science partners were not enthusiastic, but two-thirds or more of the patrons and library professionals rated them as *very* or *extremely* engaging. Finally, 48% of the library

professionals and 38% of the science partners thought the discussion questions were *very* or *extremely* engaging to the audience.

Library professionals and science partners made separate ratings of each PTL program. As shown below, both groups gave relatively lower ratings to the Jean Auel book and video and to the human interest video about the farmers in the combine demolition derby.

Figure 11
Effectiveness of PTL Components at Engaging Audience for Each Topic



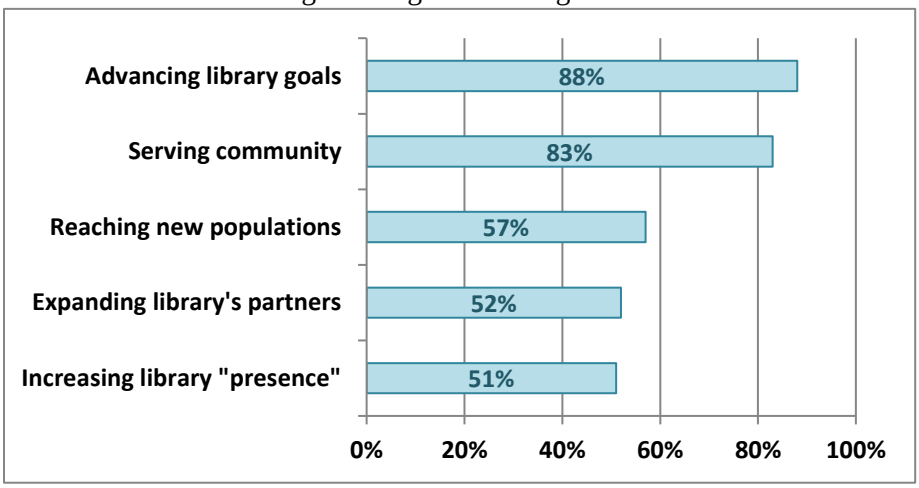
N=51-64 library professionals and 78-87 science partners.
*Science partners were not asked the starred question.
Note: Bars represent the percentages who reported that the component was *very engaging* or *extremely engaging*.

Success in Serving Broader Library Goals

Finally, the library professionals also gave high ratings to the PTL programming in terms of broader goals, particularly advancing library goals and serving their communities. For example, one library professional noted:

> *We loved being able to offer our adult community an opportunity for serious, thoughtful discussion about science issues. During one of our sessions, an audience member spoke of the importance of community, and how it is becoming a rarity. Yet there we were, creating "community" because of this program, a circumstance not lost on anyone. All attendees seemed to very much enjoy the programs, and our science partner (who participated in 3 of the 4 events) expressed equal pleasure with being a part of it.*

Figure 12
Effectiveness of PTL Programming in Reaching Broader Goals



N=62-64
Note: Bars represent the percentages who responded *very effective* or *extremely effective*.

WHAT WAS THE IMPACT OF THE PTL PROGRAMMING?

Impact on Library Patrons: Science Engagement and Awareness

"It was a wonderful program and discussions; people enjoyed and learned so much more about the science around them."
–Library Professional

Library patrons at the 19 surveyed libraries surveyed PTL events rated their engagement in the events extremely highly, especially in terms of making them want to learn more on the topic and holding their interest:

> *Interesting in format; I've certainly increased my desire to explore the scientific world. [Patron]*

> *One of the attendees said this program is pushing her limits, because the books selected aren't ones she would normally read, but since she read them for the program, the themes have gotten her more interested in reading the science books we purchased for our display. [Library Professional]*

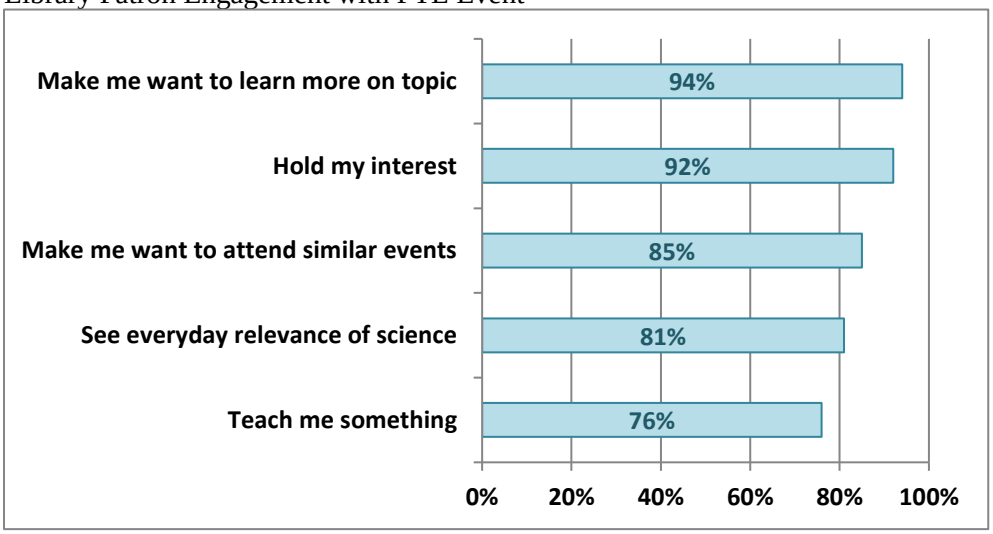
A number of patrons discuss specific topics they had learned about and that had piqued their interest:

> *This evening's presentation and discussion has sparked my interest to learn more about humans' origins and lives.*

> *[It met my expectations] very well; learned quite a lot about electromagnetics.*

> *I learned more about local invasive species.*

Figure 13
Library Patron Engagement with PTL Event



N=334-43
Note: Bars represent the percentages who responded *very effective* or *extremely effective*.

Remarkably, 59% of patrons said they were *more interested* in the science, technology, and engineering in PTL events than they expected to be. Another 39% were *as interested* as they expected to be, which is consistent with the 39% described earlier as being *very* or *extremely* interested in STEM topics already.

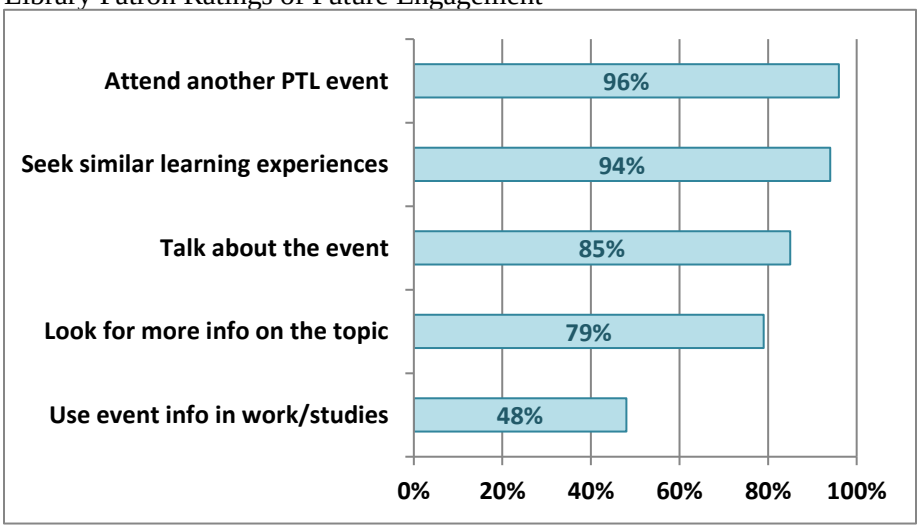
"Enjoyed this discussion/videos very much. Hope to have more in the future."
–Patron

Patrons were asked to describe what they had learned at the event that was new to them. Of the responses that provided enough information to code, 41% of patrons learned something involving science or technology.[7] Science- and technology-related responses ranged in specificity, but some were as follows:

> *Types of waves for communication; how radio, telegraphy actually work.*
>
> *That plants really do make a difference if the environment, but not quite the way I thought.*
>
> *More about why invasive species take over.*
>
> *Photosynthesis and how they are attempting this synthetically; algae provides most of our oxygen.*

Patrons also reported that the PTL event had piqued their interest in similar programming and topics, as shown below.

Figure 14
Library Patron Ratings of Future Engagement

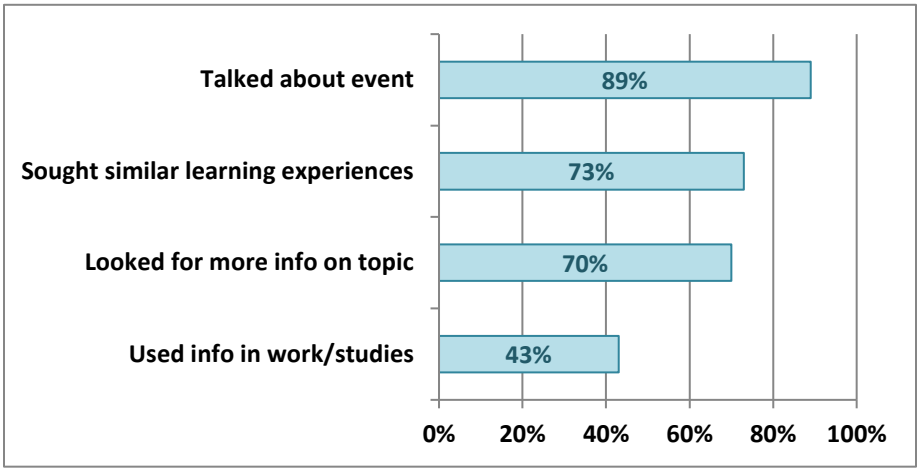


N=202-343
Note: Bars represent the percentages who responded *likely* or *very likely*.

[7] The non-science responses included things about the books and authors, history, culture, and hearing other people's viewpoints.

Patrons who had attended prior PTL events were asked whether they actually had engaged in these behaviors; most had at least talked about the event, and the majority had sought out similar learning experiences and looked for further information about the topics discussed.

Figure 15
Library Patron Ratings of Engagement Behavior



N=107-114
Note: Bars represent the percentages who responded that they had engaged in the behavior.

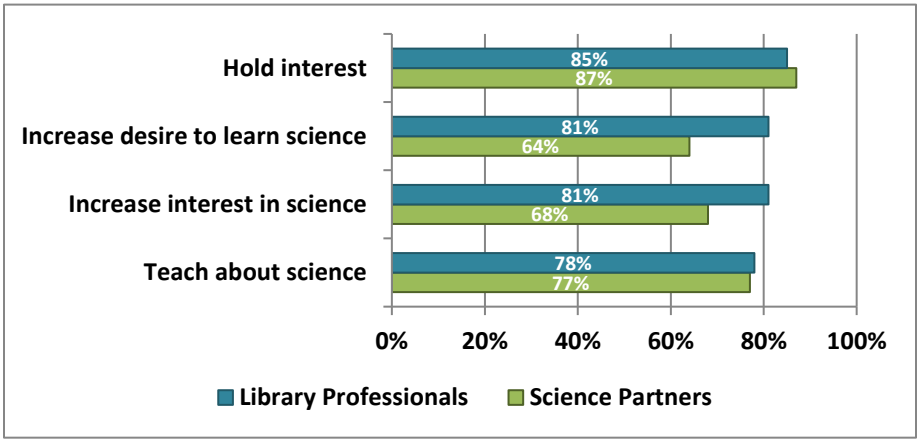
In terms of learning, 70% of patrons reported being more aware of the science, technology, and engineering in everyday life and of the role of these STEM topics in civic, cultural, and economic affairs. More than half (53%) assigned greater importance to the role of science, technology, and engineering after the PTL series than they had before.

“”

–Science Partner

Library professionals and science partners were also asked about patron engagement and learning, with more explicit reference to the science-related aspects of the programming than the items patrons saw.[8]

Figure 16
Library Professional & Science Partner Ratings of Patron Engagement and Learning



N=62-64 library professionals and 77-87 science partners.
Note: Bars represent the percentages who responded *very effective* or *extremely effective*.

The library professionals gave high ratings to both patron engagement and patron learning. Science partners agreed with the library professionals that the PTL programming held patrons' interest and taught them something about science, but they were somewhat less sure the programming had increased patrons' interest in science or their desire to learn more about it.

[8] The Limits team made the decision not to foreground the science aspects of the programming with library patrons in order not to alienate those who might not initially be interested in science. Therefore, the Event #1 patron survey did not make explicit mention of science, whereas the Event #4 patron survey did.

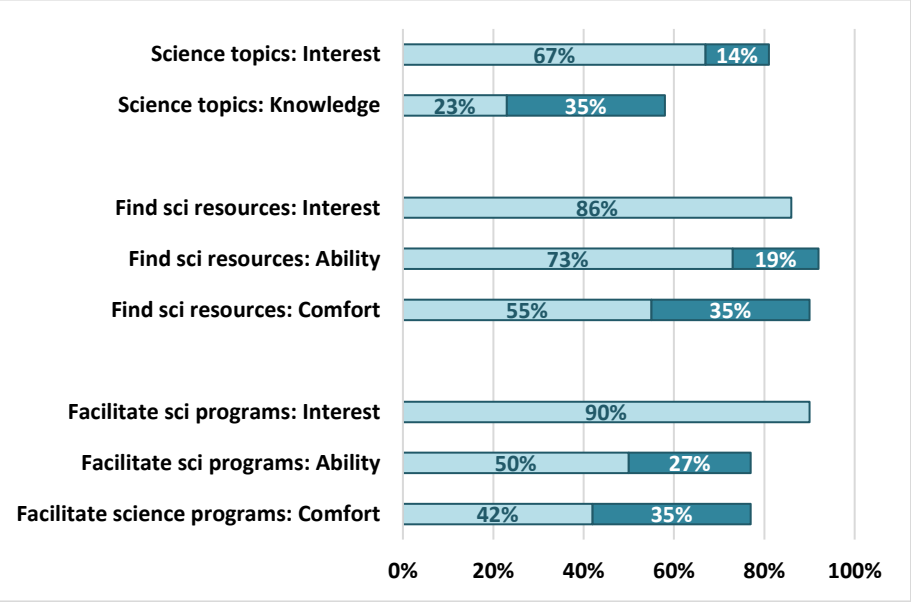
Impact on Library Professionals: Self-Efficacy and Capacity as ISE Resources

One of the primary goals of the PTL project was to increase the capacity of library professionals at small and rural libraries to plan and facilitate science programming and to serve as ISE resources in their communities. Their interest in finding science resources and in facilitating science programming was already high. However, the PTL library professionals made great strides between baseline in July 2013 and the post-programming survey in July 2014.

These gains were especially notable in the areas of science knowledge and in comfort with finding science resources and facilitating science programming. In all three areas, 35% more library professionals reported *quite a bit* or *a great deal* of knowledge, comfort, and interest after participating in PTL than had before. There were somewhat smaller, but still impressive, gains in ability to facilitate science programming (27%), ability to find science resources (19%), and interest in science (14%).

"Thank you — great program — enriched my library, my patrons and myself."
–Library Professional

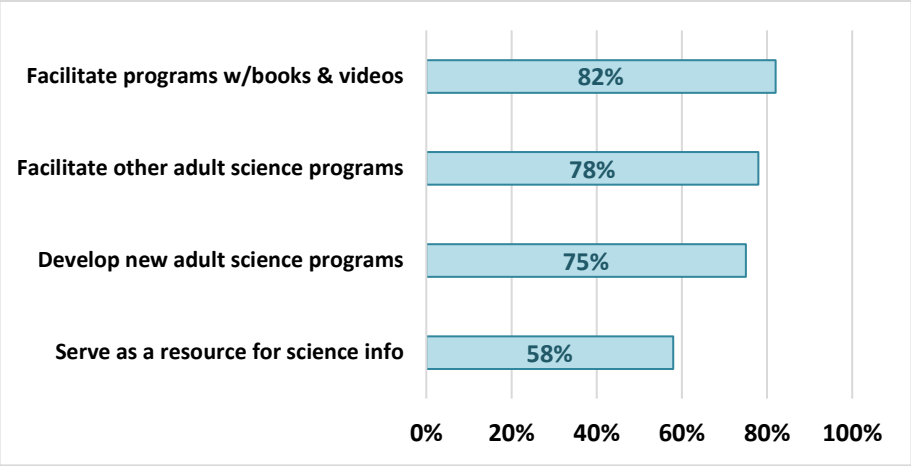
Figure 17
Library Professional Gains in Self-Efficacy as ISE Resources



N=64
Note: Each bar represents post-programming ratings of *quite a bit* or *a great deal*. The lighter segment shows baseline ratings, while the darker segment shows gains from baseline to post-programming ratings. For all gains, means were significantly different at the $p < .05$ level.

In terms of capacity building, the library professionals also reported gains in how well prepared they are to continue to present such programming.

Figure 18
Library Professional Preparation to Present Science & Book/Video Programming



N=64
Note: Bars represent the percentages who responded that their PTL experience had prepared them *quite a bit* or *a great deal*.

Several respondents eloquently described capacity gains:

> *Overall, awesome! I made some new connections, my science partner wants to work with me again (and got a library card), I learned how to do an effective poster campaign, and I got much more comfortable with leading discussions. I learned that next time, I need to buy more copies of the books.*

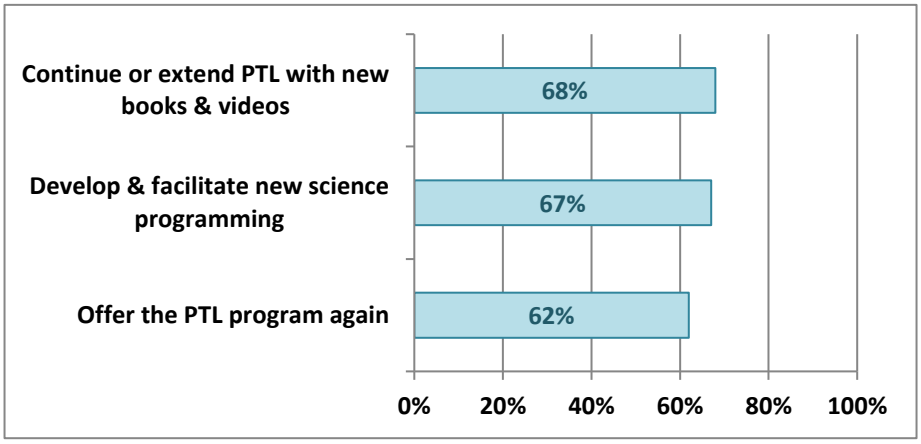
> *This is a wonderful program, and I am so grateful to be chosen for the grant. It has opened up the possibility of a totally new type of programming for our community and helped us establish new partners. I used 3 science partners, and they all want to participate again. In addition, I have 3 or 4 other science professionals that have indicated they would like to partner. We have a small regional college in [town], so current and retired professors are excited, and also medical people in the community.*

"This was a blast. I can't remember the last time I had so much fun with adult programming. We had fantastic attendance, great discussions, and no one wants the program to go away. We will be starting up again in September. It's a keeper."

–Library Professional

In fact, this preparation translates into plans for about two-thirds of the library professionals, who reported that they were *very likely* or *extremely likely* to develop new science programming or offer or extend the PTL programming.

Figure 19
Library Professional Plans to Present Future Science Programming



N=63-64
Note: Bars represent the percentages who responded that their PTL experience had prepared them *quite a bit* or *a great deal*.

Impact on Science Partners: Self-Efficacy and Interest in Public Science

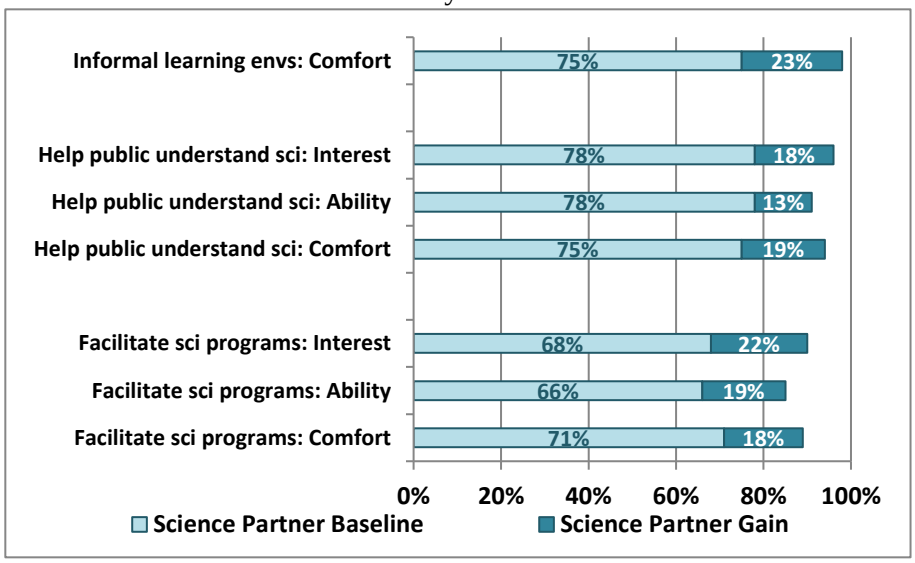
"The events exceeded my expectations…The attendees were always engaged in discourse, questioning, and looking at various aspects of the science in the text and questioning reliability. It was an energizing experience and I would do this again."
–Science Partner

The science partners were not the primary target audience for the PTL program. Nonetheless, to the extent that they are willing to continue working with PTL and other public science projects, the science partners are a key component of their communities' capacity to sustain public science programming.

There were certainly indicators of PTL impacts on the science partners. Most science partners (82%) reported that, based on their experience with PTL, they are *very likely* or *extremely likely* to continue their involvement with public science programming.

Further, although the majority of science partners already rated their interest, ability, and comfort in public science communication fairly highly before PTL began, there were significant gains in the numbers giving these high ratings after participation in the PTL program. These were particularly notable regarding comfort in informal learning environments and in interest in facilitating science programs, which bodes well for future public science programming in these communities.

Figure 20
Science Partner Gains in Self-Efficacy as Public Science Communicators



N=88-89
Note: Each bar represents post-programming ratings of *quite a bit* or *a great deal*. The lighter segment shows retrospective ratings, while the darker segment shows self-reported gains over the course of the PTL program. For all gains, means were significantly different at the $p < .05$ level.

One science partner discussed the importance of scientific literacy and the relevance of PTL topics to the community:

> *I enjoyed the opportunity to participate in this new program. The idea of bringing science literacy to rural communities (or anywhere) is exciting and crucial. My community is quite*

cosmopolitan in feel, despite the low population density, but even though we have a lot of programs about sustainability, local food, and the like, the fact that many people don't understand some basic scientific concepts (about energy or natural selection, for example) makes it difficult to have rigorous and realistic conversations about critical issues.

In their open-ended responses, some science partners mentioned unexpected personal benefits to participating in the PTL program and a desire to participate in science programming again:

I really enjoyed this program and felt like I benefitted from it as much as the adult learners did. I am now leading an informal book club with some of the participants from the PTL program!

I really enjoyed the dialogues my husband and I had about the books together. We hadn't done anything like this since we were in college together. We were both scientists with a love of literature. Our personal discussions were an unexpected benefit from participating in the series.

I was not at all [sure] what to expect from the evening. I must say, I found it a marvelous experience. The attending folks were so eager to talk about the book and related topics therein with a "real scientist." And it is always great to debunk the myth that scientists are by nature aloof and unfriendly. My presence was very well received, and most of the attendees inquired individually afterwards if I would be able to join the next month's session.

"This was a very exciting program. I really enjoyed discussing the books, the science, and other related aspects with the participants…They were extremely interested, engaged, and willing to share and participate. I believe that they felt that they got a lot out of it too."

–Science Partner

Impact on Communities: Future Science Programming

As noted earlier, about two-thirds of the library professionals reported being *very likely* or *extremely likely* to develop new science programming or offer or extend the PTL programming. Many of them used the project listserv to share ways in which they plan to extend or add to the PTL program and to discuss other similar adult and science programming they plan to run at the library in the future.

> *I'm thinking of purchasing multiple copies of some of the supplemental reading books to use as a continued book discussion. We won't have author interviews or the other video, but we may be able to find something on YouTube, and I'm sure there are discussion questions out there for most of these titles, to get us started…I hate to lose the momentum we have gained with these programs and would love to hear your ideas or suggestions.*

"I had a blast being a part of this project. We had a consistent following of 10-20 people at each discussion that were able to produce a lively discussion. We were so successful that we have decided to move forward with some additional discussions"

–Science Partner

> *The discussions have been great, and we have already made the decision to hold additional programs next year using this STEM science café format. One of our science partners is willing to conduct the same type of program with our 8th grade students in the school system, with the library sponsoring the program. Very excited to have this opportunity, as we are working with the school system to bring classes of students to the library for programming that will support their curriculum and promote the library to the students.*

> *I met with a high school science teacher who is a consummate brainstormer, and together we came up with a solid four months' worth of science programming to take us through the rest of the year. I'm excited to get started.*

Many of their comments illustrate how the experience of preparing for and running the PTL events increased their interest and confidence in running adult science programming:

> *I am in the process of planning our additional program…I'm going with "Flight Behavior" too. And I found a couple interviews on NPR and the Diane Rehm show with Barbara Kingsolver. I think I will try to use a segment of one of those. I also found a TED talk by Louis Schwartzberg about the hidden beauty of pollination, and the talk showed clips from the Disney nature film "The Wings of Life," which he directed. And from there I discovered that we have a copy of this movie in our collection...I am also hoping to get one of our local birders or butterfly experts to attend and offer insight. I've never planned a program like this entirely on my own, so here's hoping for the best! And thanks to the Pushing the Limits folks for showing me how something like this can be done.*

I'm also bringing an adult program to [the library] (going back to the human feature video related to the chef). On July 31, there will be a program "Food Preservation: What's Science Got to Do with It?" I am thrilled to be offering such diverse programming to promote science.

I have a list of ten subjects to explore for a slate of science programming for the fall. This has tapped a vein of interest I was unaware of, and presents some great opportunities.

We are looking into continuing this program under a similar structure utilizing TED Talks and books. I just love the idea of offering this opportunity to adults. I believe it has touched on an unmet need among adults for meaningful discussion on the community level, and I've been glad to be a part of it.

Some of their comments also reveal how the PTL program increased library patrons' interest in science and the demand for adult science programming in the libraries:

I appreciated the comments about continuing with other book choices sans the wonderful videos to keep things rolling. Already people are asking me what is next!

The audience was really riveted as [the science partner] spoke and unanimously requested a separate program or series of programs addressing these types of issues [i.e., climate change and humans' impact on the environment].

One of the people called me the next day to say that she thought this was the best discussion we've had so far and that she was sure hoping I'd have enough money left for additional events. I've checked our expenses and it looks like we could do one more after the Auel event in June. Our science partner is enjoying this series and is willing to facilitate another discussion if he can work it into his schedule, probably later in the summer. I am so pleased with how this series is turning out for us and our patrons! I think it's showing us new possibilities.

Overall, the PTL program was a great outreach opportunity for the libraries, particularly in drawing new people into the library and helping establish the library as a resource for scientific learning.

> *Four newcomers joined our book discussion, and they were very welcome additions. Our science partner was also new to the library. Several men joined the discussion and remarked they had no idea the library had such depth in their discussions. New nonfiction selections have been suggested and added to our collection. We partnered with the county extension to present two adult programs coordinated with our discussions. The library has added several new patrons and formed new partnerships due to its participation in the Pushing the Limits program…This turned into a great outreach program for our library.*

> *We only had 7 people in attendance, but the bright side was that 3 were high school students who have been drawn into the series through their serving as presenters for an earlier event.*

HOW COULD THE PTL PROGRAM BE IMPROVED?

Participants were also asked for their suggestions for improving the PTL program. Suggestions fell into several common themes across the three groups. Librarians were also asked to provide detailed feedback on several potential future iterations of the program.

Provide a Range of Possible Books for Each Topic

Some participants rated the PTL books highly:

> *Being a biology professor, I felt very comfortable leading the discussion on the Boyle book and the nature of science. I believe that it was a great choice of a book for getting people to think about nature, what is natural and the role that science plays in understanding the nature around us. It also provided a basis for talking about the tension between science and society. I really enjoyed leading the group. [Science Partner]*

> *Excellent program, book was interesting, speaker excellent. Totally met/exceeded expectation. [Patron]*

> *I enjoyed the book; discussion topics are wide reaching. [Patron]*

In contrast, some library professionals, science partners, and patrons commented that certain books, particularly the Auel book, could have been more effective in terms of length, patron interest, and science content. Aside from that example, responses to the books varied quite a bit by library and by patron.

Several science partners and a number of library professionals suggested providing a list of related books so that library professionals and/or patrons could choose among them:

> *Maybe having more than one [book] option for each of the themes might be helpful. [Science Partner]*

> *Having a choice of 2 or 3 books for each theme would be helpful in creating events to interest our audience. [Library Professional]*

Having a range of books would allow library professionals to better tailor their choices to the particular populations they draw. Two library professionals mentioned challenges tailoring the material to their very different audiences:

> *I need more assistance in making the series interesting to people with less than a college education. [Library Professional]*

To be honest, we (and our patrons) didn't find the recommended books sophisticated enough from a science perspective for our people. [Library Professional]

Clarifying Linkages Among Theme, Books, and Videos

Library professionals and science partners sometimes had difficulty seeing the linkages among the topic, the videos, and the book:

Our science partner and I often had a hard time getting people to see the connection between the book and the videos, especially the human interest videos. [Library Professional]

We didn't always see a direct connection to the human interest stories and the books… [Library Professional]

I'm still not quite sure where they were going with [the human interest video] and how it connected with the book. There [was] not as much in-depth material to accompany the video. [Science Partner]

I think the author videos are helpful in sparking discussions related to how the author developed the story and science behind the books…I think if [the human interest] videos could have a clearer, more tangible connection to the discussion topic, they would engage the attendees in more discussion. [Science Partner]

A few patrons had corresponding difficulties, not surprising if some facilitators themselves were not completely clear on the linkages:

Better coordinate the presentation to book themes. [Patron]

Talk about both books and how they relate to the series topic. [Patron]

However, many of the comments the facilitators made were about difficulties linking the book to the video, when the goal was actually to link both book and video to the broad, overarching theme. This could be addressed by providing both facilitators with an overview of the goals and the rationale behind the program design. Written documentation could also include more specific linkages among specific themes, books, and human interest videos:

While [the videos] are all connected to the other materials, it would have been good to have that be a bit of a stronger connection. I thought there should be a little more material on how some of the personal interest videos tied in with the book. [Library Professional]

> *Closer alignments between video segments and topic and/or more information about those relationships; i.e., summaries and [discussion] questions related to highlighting connections. [Science Partner]*

Finally, one of the library professionals had a helpful way of describing the linkages:

> *We are meeting with our science partner…to see if we might tweak a few things before the next event, such as pointing out the relationship between theme, book, and video more strongly and noting that the discussion is about more than the particulars of the book — that the book is the vehicle into the discussion, but not necessarily the whole discussion.*

Provide More Supplementary Materials

In addition to material on thematic linkages, both library professionals and science partners requested a few other types of supplementary materials. Library professionals were interested in specific suggestions and ideas for planning their programming:

> *[One] idea would be to provide plans for four simple, low-cost, hands-on activities related to each theme that could be set up on a table in the library. A hands-on station would serve as a means for anyone to consider the theme, as well as the opportunity to sign up for [the] discussion series.*
>
> *Provide science experiments to go along with [the program].*
>
> *Maybe some suggestions of types of science partners for each subject; i.e., meteorologist or environmentalist, for Arctic Drift.*
>
> *It was very helpful to get the ideas from the listserv. Maybe they could be collated as an ideas packet.*

Science partners were also interested in resources and ideas to help them on the day of the event:

> *Icebreaker activities or other ideas for things to do while people enter would be nice. I could have also used some ideas for ways to wrap up both the individual sessions and the entire program. I came up with them, and sometimes they were just organic, but it's nice to have a few ideas coming into the event.*
>
> *Provide hands-on objects or demonstrations. People like to see some of the science in action.*

As noted earlier, science partners would also have appreciated a focused, clear explanation of the PTL program and their role.

Bring in More People to Events

Patrons, library professionals, and science partners all wanted to see more people attending the PTL events. For example, two of the patrons said,

> *Better promotion. More people should be able to know about this.*

> *Wish we could reach more people; I think they would enjoy us.*

A couple of library professionals regretted not doing more publicity, but others offered suggestions for things that would make it easier for them to market the program, primarily revolving around easily customizable promotional materials. For example:

> *I needed help in developing promotional materials (I'm just not very creative). Perhaps some generic forms that could be edited for the individual library's name/logo and event date, time, place*

> *Better marketing materials that are easy for librarians to access and adapt to their library. Short video promos would be fantastic.*

Several science partners also mentioned some ideas for drawing a larger audience:

> *By merging with groups like Master Gardener, adult learning groups, adult outdoor volunteer groups to catch a larger audience of interested people to possibly engage more discussion and even action at [the] local level with local issues related to discussions.*

> *Need larger audience, although local promotion was thorough. Perhaps offer during school year and partner with science teachers at local high schools.*

FEEDBACK ON PTL ITEMS ABOUT DIFFERENT POSSIBLE ITERATIONS OF THE PTL PROGRAM

Library professionals were also asked to give their feedback about several possible future iterations of the PTL programming. First, they were asked to select from a list of possible resources which ones would have made them more successful in establishing their library as a resource for informal science learning.

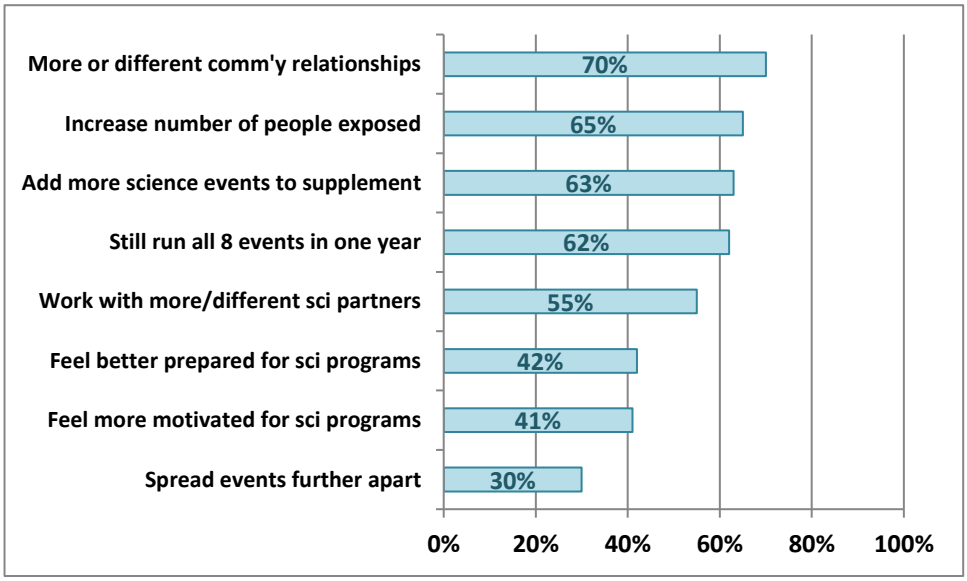
Just over one-fifth said no additional resources were necessary because the program was already successful. However, almost half (47%) would have liked materials to hold more than four thematic events. Almost as many (42%) would have appreciated being provided with some shorter videos for promotional use. One-third (33%) would have liked additional funds for books or other circulation materials.

Library professionals also indicated how they would implement the programming if they had materials for eight thematic events rather than four. The most commonly endorsed responses were the ones related to expanding the scope and reach of the programming: forming more or different community partnerships to enrich it, adding more supplemental science events, and increasing the number of people exposed to the programming.

"We loved the program. The patrons who attended were sad it was over so soon. It has only been within the last several years…that the library has begun to offer adult programs, which the adults love. PTL helped in a big way for us to move past simply offering programs for children. We want more!"

–Library Professional

Figure 21
Changes to Program Implementation if Eight Topics Instead of Four



N=63-64
Note: Bars represent the percentages who responded *very likely* or *extremely likely*.

Finally, library professionals were asked about two different potential program models, one in which there were no books, and one in which there were multiple book options for each topic, but, therefore, no author video. A quarter or more of the respondents had no opinion or were not sure how successful these models would be compared to the original model.

Of those who did express opinions, they were somewhat polarized. The majority (60%) preferred to retain the book component of the programming, but fully 40% disagreed. The quotes below articulate each position well:

> *[KEEP BOOKS] I prefer having the books to augment the programs. It give[s] the participants a chance to read and think about topics before the events. While some of the titles were not what I would have chosen, they set the stage for discussion. Those who did not read the books still came, so it was not exclusionary, but it gave everyone a starting point for the conversations.*

> *[DROP BOOKS] In our case, I think we would have had more participation without the books. The books seemed daunting to some, and many did not finish the whole book. I think the videos and discussion questions would be a huge draw and help widen the audience. Book clubs are everywhere, but this discussion format would be a new idea.*

The majority were also in favor of offering multiple book options (59%), even if that meant no author video would be provided. However, a number of the dissenters were against dropping the author video more than they objected to providing multiple book options. The following quotes summarize the pro and con positions:

> *[OFFER MULTIPLE BOOKS] I would like multiple book suggestions as community interests often vary with the community. I think this would be a very successful model. Although people like the author videos, they did not add to the discussion as much as the human interest videos did.*

> *[KEEP ONE BOOK] Our readers gravitated to the author videos. The readers wanted to "know what the author thought." The lead-in provided by the author and library narrator were enough to start the conversations.*

CONCLUSIONS

Data from library professionals, science partners, and library patrons converge to demonstrate that the PTL program was quite successful in its aims to engage and inform patrons and to increase the capacity of library professionals to provide informal science programming for adults in their communities.

PATRONS ARE ENGAGED IN SCIENCE AND LEARN ABOUT SCIENTIFIC TOPICS

The PTL program was very successful in engaging patrons with science, stimulating their curiosity about science, and raising their awareness and knowledge of scientific topics. They particularly enjoyed hearing from and interacting with the science partners and the lively, wide-ranging discussions. Books and videos were generally effective at stimulating discussion, even when patrons did not particularly enjoy them (e.g., the Auel book, the combine demolition derby video).

LIBRARY PROFESSIONALS GAIN SELF-EFFICACY AND CAPACITY AS ISE RESOURCES

The PTL program and resources greatly enhanced library professionals' self-efficacy as ISE resources and their capacity to develop and implement new science programming for adults in their communities. Library professionals found the PTL PD, materials, and resources quite helpful, although they would have liked some more material on the linkages among theme, book, and human interest video. They had positive experiences with the programming and were generally quite impressed with their science partners. A number of them have already extended their PTL programs on their own.

SCIENCE PARTNERS GAIN SELF-EFFICACY AND INTEREST IN PUBLIC SCIENCE COMMUNICATION

The PTL program increased science partners' self-efficacy in public science communication and their interest in continuing to work in informal settings to raise scientific awareness. A number of them are continuing to work with the library professionals to implement additional adult science programming. The science partners would have felt more prepared if they had been provided targeted information about the PTL program and their role, as well as more information about thematic linkages.

THE COMMUNITY LANDSCAPE OF SCIENCE PROGRAMMING IS ENHANCED

The PTL program broadened adult public science programming in the participating communities, and is poised to continue to do so. Many of the library professionals — along with some of their science partners — already have plans in place to implement future adult science programming to meet the heretofore-unmet need they discovered in the course of their participation in the PTL program.

RECOMMENDATIONS

GRG has several recommendations to make future iterations of this successful programming even more effective. Most do not require large additional expenditures of money or time. They include making it even easier for library professionals to tailor the programs to their particular communities, providing a few more supplementary materials for library professionals and their science partners, enhancing the repository of materials stored on the PTL website, and expanding the availability of the PTL program to more communities.

ENHANCE CUSTOMIZABILITY

As described earlier, the PTL program offers library professionals and science partners many opportunities to tailor their programming to their geographic area, community, and particular audience. GRG recommends providing several book choices for each topic would allow further customization, or a chance for patrons to collectively choose which books the group will read.

The PTL materials already include a list of other related books for each topic. However, only two of the 30 library professionals who substituted books used one of the books from that list. This may have been because they wanted to make use of the author video, as did the 29 who replaced the Auel book with an earlier book from the same series.

Some librarians tracked down their own videos to use via sources such as YouTube and TED Talks. Perhaps future PTL materials could include an author video for the primary recommended book and links to existing alternate video clips for the alternate book selections.

Including discussion questions at varying levels of scientific sophistication would also help library professionals and science partners to tailor the PTL program to their audiences.

PROVIDE MORE SUPPLEMENTARY MATERIALS

GRG suggests that PTL materials include a one-page written orientation for science partners describing the PTL program itself as well as the expected role of the science partners in the programming. This would assist science partners in preparation, but would also be helpful to library professionals as they begin reaching out to potential science partners.

Some 43% of the science partners would also like to see video of programs in action to help them prepare; a few-minute clip would likely suffice to show how science partners and patrons interact. Because this type of video material already exists on the PD DVD for library professionals, GRG recommends making this material available to science partners and considering whether any of the other DVD materials might be useful to science partners as well.

For library professionals, GRG recommends providing more — and more easily customizable — templates for creating marketing collateral, as well as expanded lists of related books, videos, and places to go for more information on the topical themes.

GRG also suggests expanding and deepening the discussion questions as well as providing a list of programming suggestions, activities, display ideas, and so on. Much of this could be compiled from existing material, both in the listserv archive and in library professionals' and science partners' survey responses.

MAKE MOST MATERIALS AVAILABLE ONLINE

There is a fair amount of turnover in library personnel over the course of a programming year. For example, at 12 (19%) of the libraries responding to the post-programming survey, the person in charge of the PTL programming had changed. To accommodate this turnover, GRG urges the PTL team to consider placing all of the PTL material on the website. This includes the program video clips and the PD units that are currently only available in DVD format, as well as archived recordings of the two introductory webinars. Even if these were in a restricted, password-protected area, it would be easier and more convenient for libraries to share materials with new staff or with science partners if it were all available online.

EXPAND AVAILABILITY OF PTL PROGRAM

Given that the data from both phases of the PTL program indicate that *Pushing the Limits* is a highly successful program, GRG recommends providing libraries with more than four thematic units and expanding the program to more small and rural libraries, as well as to other libraries.

LIST OF APPENDICES

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