

Science Communication in a Café Scientifique for High School Teens

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Abstract

The authors' adaptation of the popular Café Scientifique model has proven to be effective for communicating science to a high school teen audience. Their process for achieving effective science communication between scientist-presenters and teens focuses on overcoming the “information deficit” mode of presentation that most scientists are trained for. Their coaching stresses that effective science communication requires engagement on a personal level that meets the audience where it is in terms of both prior knowledge and social context, while making connections to the teens' daily lives. Scientist-presenters report strong satisfaction with the coaching process and the resulting quality of science communication.

Keywords

Café Scientifique, high school teens, science literacy, information deficit model, storytelling, science communication

A novel Café Scientifique program for high school teens in four towns of diverse character in northern New Mexico—Albuquerque, Santa Fe, Los Alamos, and Espanola—was inspired by the popularity of the adult Café Scientifique programs that have proliferated in recent years (e.g., Cohen &

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Macfarlane, 2007; Dallas, 2006; Giles, 2004; Sink, 2006). Such programs—in which citizens interact with a scientist to learn about some hot science topic in the news—originated in the United Kingdom and France and have now spread across North America and the world (www.cafescientifique.org). Adult Cafés are typically held in pubs or coffee shops but may also take place in other social settings, such as museums.

Café Scientifique programs combine two essential interactive elements. First, they take place in a collegial social setting where participants can interact with each other. Second, they satisfy participants' curiosity about a science-based topic through lively interaction with a scientist.

Our teen Café program has proven popular well beyond our initial expectations. The first key to its success is that the teens are given ownership of the program via youth leadership teams in each town. The second involves achieving effective science communication between the scientist-presenters and the teen audience. How we have sought to achieve the latter is the subject of this communication.

Importance of Engagement

With some exceptions, the teens attending the Café sessions can be characterized as being interested in science but having a low to moderate degree of science literacy; in this, they reflect the general population (Miller, 2004). We seek to increase teen science literacy by increasing their awareness of the fruits of science research across a wide range of subjects and its relevance to their lives. We would like them to be able to talk knowledgeably with peers, parents, and teachers concerning the science they have learned about in the Cafés. Our evaluations indicate distinct success in these areas (Foutz & Luke, 2010).

However, our primary goals are for the teens to get a significantly increased understanding of the nature of science and to develop a realistic perception of scientists and the lives they lead. We want to get across to the teens that a scientist is a real, complex, multidimensional human, like them, with his or her own unique set of motivations, delights, abilities, and baggage. We want our presenters to convey that—in part because of a career in science—he or she is having a particularly interesting life. This is in essence a way of “framing” the science message. We see it as a vehicle for achieving the enhanced science literacy goal. How our scientist-presenters communicate with the teens in the Café sessions is the make-or-break determinant of whether the goals are achieved.

Rejection of the “Information Deficit” Approach

It is well established that the “information deficit” approach to science communication—one-way transmission of facts from an expert to an information-deficient lay audience—is usually ineffective (e.g., Nisbet & Mooney, 2007a, 2007b).

Often the inadequacies of the information deficit model are discussed in the context of the need to “frame” a message in order to move an information-deficient public to a more enlightened view of a controversial subject. Such framing needs to take account of current knowledge, misconceptions, biases, and cultural and other affective responses (Kahan, 2010; Nisbet & Scheufele, 2009).

While the Café program is not in the business of persuasion about controversial subjects, the ineffectiveness of the information deficit approach applies fully. To achieve our goals, there needs to be full engagement between the Café presenter and the teens, who need to be met where they are. The presenter needs to be able to calibrate his or her presentation—often on the fly—to existing knowledge. It is important to make a connection wherever possible to their daily lives. Hands-on activities that actively engage the teens help cement the science message.

The teens do not want to sit through a science lecture—after all, they have been listening to lectures in school all day—and they will take little away from it. As in a school setting, passively sitting through a lecture will not foster the mental engagement required for learning.

This degree of engagement needed to spark interest in science topics is unfamiliar and daunting to many Café scientist-presenters, even those with experience in public speaking; most have been trained to approach science communication in the information deficit mode. But our experience has been that with coaching from the program staff, described below, after some initial trepidation the scientists rise to the occasion.

Recruiting and Training Café Presenters

Café Scientifique New Mexico is now in its fifth season. Over this period, we have offered Cafés spanning a broad spectrum of interesting topics in science and technology, from a search for cures to HIV to forensic seismology to diseases of the brain to climate change and the future of CO₂ sequestration. A list of Café topics, presenters, and their institutions is available at <http://www.cafenm.org>.

We are fortunate to have had Los Alamos National Laboratory as a partner; its staff of excellent scientists working at the cutting edge across a vast array of research areas has provided us with most of the Café presenters. A significant number of our presenters came from the University of New Mexico—the College of Medicine, the Department of Anthropology, and the Department of Computer Sciences. The remaining presenters came from a variety of organizations: the U.S. Geological Survey, the U.S. Air Force, the forensic team of the Santa Fe Police Department, the New Mexico Office of the Medical Examiner, a biological research institute, and a small business specializing in holographic technology.

Filling a large number of slots in a season's schedule with good presenters able to cover a breadth of subjects—and able to grasp the challenge of successfully interacting with our particular public audience—has made for some interesting recruiting and training challenges.

Recruiting Presenters

The process for entraining a scientist-presenter into the program begins with the youth leadership teams. The youth leaders are eager to tell us what topics they think would be interesting in a Café, and we poll their interest as we begin the recruiting process for an upcoming season. Now, the teens do not know the universe of interesting science, and we may not be able to find a scientist who is available to present on a particular topic. And a great presenter can make an obscure topic come alive, while a poor presenter can make the most interesting topic seem boring. Nevertheless, we make every attempt to satisfy the teens' wishes. So, for example, Cafés on cyberwarfare, brain pathologies, crime scene science, and nanotechnology resulted from teen recommendations.

The next step in finding good presenters is to simply ask around. We approach contacts in all our local organizations with a science mission—starting with those who have presented in the Café program before—and ask for recommendations on colleagues who are doing some particularly interesting research and have given good talks on the subject. We make further inquiries about likely presenters who have been recommended to us. We learned from hard experience that it is important to thoroughly vet potential presenters. They need to have a good science story to tell and already have some facility with speaking to a public audience.

We approach likely presenters and explore their interest in participating in a Café; with few exceptions, we have found the scientists we have approached to be eager to participate. We have found that our presenters are uniformly

interested in sharing their science with a broader audience. Some, of course, get encouragement from their institutions to do this kind of outreach. Quite a few of our presenters have initially said something to the effect of “sounds like fun.”

After setting tentative Café dates for a scientist’s Café series, we provide him or her with a written “Guidelines for Café Presenters” document intended to frame his or her preparation for and conduct of the Café sessions.

Know Your Audience

The Guidelines document stresses the importance of knowing the audience. Teens will readily engage with a presenter on some hot science topic if it is accessible to them. It is best to assume the audience knows nothing at all about the topic. The presentation needs to be free of jargon and delivered in an engaging manner at an entry level so that teens will be pulled in and have a chance to develop some new mental images.

It is important that presenters not try to cover the whole breadth of a science topic, thus creating too many new mental pictures for the teens to try to process at once. A better approach is to organize the presentation around one essential provocative idea or concept and let everything flow to it. This we refer to as the *Most Important Thing*, an idea deliberately designed to be accessible enough to the teens that they can engage in discussion of it.

It is most effective if a presenter leads up to the *Most Important Thing* by *telling a story*. In our first year of the program, we actually engaged a professional storyteller in a workshop for presenters, which was quite effective; we have used lessons learned from the storytelling workshop in all subsequent years.

It is a challenge to get the scientists to give presentations appropriate for the teens and the informal setting, as opposed to what they are used to: presentations to peers at a professional society meeting or a public lecture. In contrast, *interactivity* is one of the most important ingredients of a teen Café; communication—meaning two-way verbal interaction, supported by a few key graphics—is of the essence. Presenters must be able to paint a picture in the mind of each audience member of the concept they wish to convey, both with words and with judiciously selected, very simple, jargon-free slides specifically designed to help create mental images. Presenters need to put themselves into the mind of the teen in the audience who knows little or nothing about the topic and imagine how he or she is processing words into mental images. Feedback along the way by members of the audience provides clues to how to adjust the delivery.

Teens engage best if they are able to *do* something. So we strongly encourage presenters to increase interactivity and engagement with the teens by bringing some “hands-on” kind of activity, if that is at all feasible. For example, a paleoarcheologist from the state medical examiner’s office presented on human skeleton characteristics that allow determination of the gender, age, race, and cause of death. She then presented the teens with three complete human skeletons and a list of potential crime victims. They were challenged to match the victim descriptions to the skeletons. In another Café, teens learned about hydrogen fuel cell cars of the future, then constructed model hydrogen fuel cell cars and were able to race them. And in another Café, teens learned about the challenges of cybersecurity, then engaged in deciphering puzzles in a manner that computer security experts use to search for weaknesses in their networks, programs, or other systems that can be easily exploited.

The Essential Dry Run

We have found that it is highly valuable—indeed essential—for presenters to do a dry run with a small group of teens before presenting to a full house. Initially, we did dry runs with an audience of science peers. It was the youth leaders who suggested that they be done before a group of teens after school, and we adopted this advice. This has proven exceedingly valuable in getting the presentations pitched at the right level and the graphics comprehensible. It also serves to overcome a certain intimidation factor for many presenters concerning the prospect of presenting before an unfamiliar audience. While many of our presenters have initially told us they are experienced at presenting to the public and never do a rehearsal, *every* presenter has told us afterward that the experience was well worth their time.

In a questionnaire we asked our presenters to characterize how they perceive the value of the dry run; the following response is typical:

The dry run was immensely valuable. It helped me select appropriate verbiage and content for the presentation. It also helped me gauge the level of delivery. Furthermore, I found the student input extremely important in identifying what their peers would find interesting. After the dry run, I made significant changes to the presentation, including the elimination of confusing content, identification of real-world connections, and simpler examples.

The Essay and Bio

We ask the presenters to write 2 one-page essays, one a summary of the science topic as they will present it, the other a one-page biographic sketch. We work with them on the essays by providing constructive feedback and editing. The essays are posted on the Café website in advance of the Café session in order to stimulate good questions and substantive interaction during the session. The essays are most effective if both take the form of a *story*, as with the presentation itself.

In the bio, the presenter tells his or her own personal story. We stay away from the usual formal—and typically rather sterile—bio sketch. It is much more engaging to the teens if a picture of the real person emerges—where did they come from, how did they get to where they are, what has grabbed their interest along the way, what has pulled them in and what leaves them cold, what their lives are like in their present research position.

Scientists are not used to thinking in terms of their personal stories, but each has an interesting and unique story to tell. Telling that story is an important hook for pulling the teens into the science story. We encourage presenters to bring their personal stories into their Café presentations. The following are some of the questions that we ask speakers to consider when composing a bio:

- What was your life like growing up in the years before college? Were there particular aspects that shaped your inclination toward science?
- How did your education—formal and otherwise—prepare you for your science career?
- What has been your career path? Has it been fairly linear, or have there been twists and turns? Triumphs and setbacks?
- What drives you in doing your science? What are the rewards that make it worth the effort?
- Do you have interests and talents outside science that you could share? How do you mesh your life in science with the rest of your life?

The essays and bios have developed into an interesting collection on the Café website at <http://cafem.org>.

Benefits to the Presenters

Presenters have uniformly considered their participation in the Café program to be of personal benefit; none has reported a bad experience. We have

captured the varied nature of the benefit in responses to a questionnaire. One of the most significant benefits expressed by some was a recognition that effectively communicating their science has fed back into their thinking about their own research, which resonates with the findings of Feldon et al. (2011). The following responses are typical:

I found the Café experience very helpful, as it forced me to focus on the really basic elements of my research and how to communicate them. This is a skill that is important not only for engaging with the community but also for engaging with decision makers and funding agencies. In addition, since I am a social scientist and my presentation included an exercise asking students to evaluate the resilience of their own communities to disasters, I gained useful information from the students on the resilience of New Mexico communities. This helped me think more clearly about some of the main issues in disaster resilience.

The Café experience was beneficial to me as a scientist in that preparing an interactive talk for an audience of young people helped me identify the critical issues in my work: why I was doing it, why it is challenging, what we are trying to accomplish (vs. being bogged down in technical details). This really focused my thoughts about my work.

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Bios

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