Science Festivals and Fun: Promoting Science and Community Partnerships

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Introduction and Problem Statement

Science festivals are informal learning experiences intended to engage the public in science. They provide an opportunity for scientists and the public to connect and interact and are ideal for engaging the public in science by increasing interest, creating a dialogue between scientists and the public, and providing social context for science issues (Jensen & Buckley, 2014). The National Research Council proposes that participation in these type of events can improve science literacy and, "lead to further inquiry, enjoyment, and a sense that science learning can be personally relevant and rewarding" (NRC, 2009, p.12). Building public interest in science, an important desired outcome of informal science education, can result in participants developing an identity, or sense of belonging, as part of the science community (NRC, 2010).

Science festivals are planned events, bringing together science experts, local businesses and organizations, and people within the community to provide a physically, socially, and intellectually stimulating environment for informal science learning. On average, approximately 5% of an individual's life is spent in the formal classroom and only a small fraction of that on science education (Falk & Dierking, 2010). Because of this, informal science learning through science festivals is essential for fostering a scientifically literate community and encouraging youth to pursue science related careers and promoting a sense of community ownership. Science festivals foster networking (science experts, K-12 science education, universities, community businesses) in which science experts members may address and solve issues in the community, improve skills in communicating science, promote science research and application, and potentially widen science research horizons based on the needs of the community. Engaging the

public will also illuminate the needs and priorities of the community so that science educators are better informed in implementing future science outreach efforts.

Studies, such as surveying STEM hobbyists (Authors 2 2018), Citizen Scientists (Authors 3, 2018), and Science Cafés (Authors 1, 2018) highlighting the impact of informal science learning, indicate that there may be great potential for the science festival movement to have a broad impact on the public's knowledge of and attitudes toward science. However, a lack of research demonstrates a need for further studies. Because science festival events enable science experts to communicate with the community in an informal learning environment, there may be significant implications of how these events affect attendees and experts' motivations, influences, and interactions. In this study, we explore the science festival movement in a small city located in the Southeastern United States by documenting attendees' motivation to attend a science festival.

Theoretical Framework

This research builds on previous models and research related to documented science concepts (informing K-12 science education practices) of the Contextual Model of Learning that focuses on providing information related to informal learning experiences and environments. The Contextual Model of Learning suggests that learning includes a connection between the individual and the environment (Falk & Dierking, 2000, p. 136). According to this model, learning is a result of three environmental factors in an informal learning setting: **(1)** personal (motivation, interest, and choice in attending a science festival); **(2)** socio-cultural (interactions with others, such as science experts and community members, at a science festival); and **(3)** physical factors in the environment (follow-up interactions to reinforce learning).

The Contextual Model of Learning is appropriate for this research in that it recognizes that science learning in an informal learning environment, such as a community-organized science festival, is a complex model and process. These frameworks guided the development of the survey protocol aimed to document attendees' motivations for attending science festival events, how the science information gained is integrated, and what they do with the information after the science festival concludes.

Methodology and Design

Research Questions

1) What activities do science festival attendees participate in at the science festival?

2) What motivates individuals to attend science festival events?

3) What do individuals do with the knowledge of information gained from a science festival event?

Study Context

The science festival was designed and implemented by a team consisting of faculty members and undergraduate students associated with the local state university, K-12 science educators, and community members. The community resides in a rural area in the Southeastern United States with an approximate population of 7,000 residents.

Participants

Attendees (n = 42) of the science festival were given the opportunity to take a post-festival survey providing feedback of the events, what they learned, and how they plan to use the information they learned. There were 13 (31%) male and 29 (69%) female respondents to the survey. The mean age of the forty-two participants was 43 years. Out of the 42 participants, three ethnicities/races were self-identified Asian (1), Hispanic or Latino (2), White (37), and one

individual preferred not to answer. The education level of the participants ranged from some college (n=5), Associates/2 Year Degree, (n=1), Bachelors/4 Year Degree (n=9), Doctorate Degree (n=6), Trade/Technical School (n=2), and other (n=3).

Survey Protocol

A survey was developed based on a review of the literature of the Next Generation Science Standards and Contextual Model of Learning, which guided the development of the survey protocol aimed to document attendees motivations of attending science festival events, science information gained, and what they do with the information after the science festival concludes. The survey was reviewed by a team of education researchers and science education experts. The survey was then piloted and revised before administering to the science festival attendees.

Analyses and Findings

Open-ended survey items were read and reread by four (2) researchers. Following initial readings, codes were developed based on the concept of the Contextual Model of Learning, and were designed to capture information including participants' motivation to attend science festival events and document what participants do with the information or knowledge they gained. One round of an inter-rater review was conducted with an overall reliability score of 80%. Further inter-rater reviews are currently being conducted.

Activities participated in at a science festival event (Research Question 1)

Science festival participants noted that they attended different activities at the community event (Table 1). Primarily, 39% of individuals attended *science expert talks* in which a science expert on a specific topic would share their area of expertise with the audience. These expert talks would last about 40-45 minutes leaving approximately 15 minutes for audience members to

ask questions about the science topic. *Discussion panels* were attended by almost a third of participants (*n* = 28) and *hands-on science activities* accounted for 20% of science festival attendees' participation.

Table 1. *Science Festival Activities Participation Table*

Science Festival Activity	Description	Science Festival Participants % *(n)*
Discussion Panels	Participant responses who indicated that they attended at least one discussion panel at the science festival where professionals in science (professors, researchers, authors, etc.) and the attendees discussed various high profile scientific topics.	28% (n= 22)
Science Experts Talk	Participant responses who indicated that they attended at least one science expert talk at the science festival where an expert on a scientific topic would share their area of expertise with the audience through lecture, followed by Q&A.	39% (n= 31)
Hands-on Science Activities	Participant responses who indicated that they attended at least one hands-on science activity at the science festival where they actively participated (experiments, 3D printer creations, family science activities, etc.).	20% (n= 16)
Other	Participant responses who indicated that they attended another event at the science festival.	13% (n= 10)

**Some science festival participants reported attending more than one event.*

Motivation to attend science festival events (Research Question 2)

A majority of science festival attendees reported personal factors (such as prior experience) were their primary motivation in attending events at the science festival. However, few participants suggested that the physical context (3%) or sociocultural context (5%) were motivational factors (Table 2).

Table 2. *Participant motivations to attend science festival events*

Falk's Framework Factors	Science Festival Participants *%(n)*
Personal / Motivation & expectations	18% (n= 7)
Personal Factors / Prior knowledge, interests, and beliefs	53% (n= 20)
Physical Context / Reinforcing events and experiences outside the museum	3% (n= 1)
Sociocultural Context / Facilitated mediation by others	5% (n= 2)
Sociocultural Context / Within-group sociocultural mediation	21% (n= 8)

**Some Science Festival participants reported more than one factor*

What attendees do with the information after the events concludes (Research Question 3)

Overall, 50% of science festival attendees shared that they plan to use the information to expand their own knowledge through future readings and research. Approximately a fifth of participants suggested that they would use this information for instruction (K-12 classrooms or sharing with others) or community benefit such as volunteering or recycling (Table 3).

Table 3. *What do attendees plan to do with the information they heard at the science festival?*

Factor	Description of Factor	Science Festival Participants *% (n).*
Personal Knowledge Expansion	Participant responses who indicated that they plan to use the information they learned at the science festival to expand their own knowledge or have already done so (further reading, research, awareness, etc.).	50% (n=21)
Use for Instruction	Participant responses who indicated that they plan to use the information they learned at the science festival to instruct others in some form (in the classroom, sharing with others, etc.).	21% (n=9)
Community Advancement	Participant responses who indicated that they plan to use the information they learned at the science festival to benefit their community in some way (volunteering,	19% (n=8)

	recycling, informing others, creating their own science festival, etc.).	
Nothing (No Use)	Participant responses who indicated that they do not have a plan to use the information they learned at the science festival for various reasons.	10% (n=4)

**Some science festival participants reported more than one plan to use the information they learned.*

Contribution

Because of community member have access to scientific experts through science festival events, such as discussion panels and science talks, it is important for science educators to recognize the potential effect of science festival events on public understanding of science and the potential for impacting scientific literacy in the community. Specifically, science festival attendees noted that personal interest learning about science (biology, physics, and chemistry) was a major motivational factor to attend events. Science festivals, as collaborative learning spaces, can connect teachers, experts, students, and the public to scientific endeavors. This could potentially support a rich learning experience for students and the public to engage in open-dialogue discussions with scientific experts as well as an opportunity for science teachers to engage with the community and expand their knowledge of scientific concepts and applications. Science festivals may also connect the public to opportunities to engage in informal learning environments year round in their communities (e.g. at facilities such as local planetariums). The interaction between the public, science experts, and formal and informal learning environments and experiences may be crucial in supporting science education based on the ever-changing landscape of educational policy and practice.

Furthermore, there is a need for future studies to examine additional factors, such as influences, habits, characteristics, and the information flow from scientist to the community, which may enhance the understanding of how science information is viewed, perceived, and

shared in informal and formal learning environments. Future studies also could investigate attendees and students' interactions with science experts, exchange of practices, skills, and educational knowledge between science experts and the public, and the curricula development practices connecting science experts to formal and informal learning experiences. Science festivals could provide the opportunity for students and the public to interact with scientists, which may deconstruct misconceptions of scientists. Because of the current landscape of global connection and the understanding of the impact people have on each other and the environment, it is imperative for science educators to be prepared to support learning experiences that transcend the traditional K-12 school.

References

Authors 1. (April, 2018). Science and the community: Exploring individuals' motivations in attending science cafés. American Educational Research Association, New York, NY.

Authors 2. (2018). Characteristics of lifelong science learners. An investigation of STEM hobbyists. International Journal of Science Education, Part B, 8(1), 53-75.

Falk, J., Dierking, L. (2010) The 95 Percent Solution: School is Not Where Most Americans Learn Most of Their Science, American Scientist, 98 (6), 486-493.

Falk, J.H. & Dierking, L.D. (2000). Learning from museums: Visitor experiences and the making of meaning. Walnut Creek, CA: Altamira.

Jensen, E., & Buckley, N. (2014). Why people attend science festivals: Interests, motivations and self-reported benefits of public engagement with research. Public Understanding of Science, 23(5), 557-573.

Authors 3. (2018). Citizen scientists and non-citizen scientist hobbyists: Motivation, benefits, and influences. International Journal of Science Education, Part B. In Press.

NAP. (2012). Framework for K-12 Science Education Practices. Retrieved from https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts

National Research Council. (2009). Learning science in informal environments: People, places, and pursuits. National Academies Press.

National Research Council. (2010). Surrounded by science: Learning science in informal environments. National Academies Press.

Next Generation Science Standards. (2013). DCI Arrangements of the Next Generation Science Standards. Retrieved from http://www.nextgenscience.org/sites/default/files/AllDCI.pdf