

UK Science Festival Network Pilot Evaluation 2017

Science Communication Unit, University of the West of England, Bristol
Laura Fogg-Rogers



UK Science Festivals Network



Department for
Business, Energy
& Industrial Strategy

**UWE
Bristol**

University
of the
West of
England



Table of Contents

Table of Contents	2
1. Introduction	3
1.1. Background	3
1.2. Aims	4
2. Methodology	5
2.1. Evaluation Toolkit	5
2.2. Sampling and data collection	5
2.3. Analysis	6
3. Results	8
3.1. Feedback on evaluation toolkit	8
3.2. Participant Characteristics	10
3.3. Audience motivations and outcomes	12
4. Summary and Recommendations	16
4.1. Festivals as celebrations of science in society	16
4.2. Expanding for underserved audiences	17
4.3. Evaluating future festivals	17
5. Appendix - Evaluation Resources	19

1. Introduction

This report describes the UK Science Festival Network Pilot Evaluation 2017, exploring the feasibility of ongoing evaluations for science festivals. The pilot evaluation included three festivals from across the UK; Nottingham Festival of Science and Curiosity, Northern Ireland Science Festival and Bath Taps into Science.

1.1. Background

Live, in person events offer a unique opportunity for public engagement with Science, Technology, Engineering and Mathematics (STEM) topics. Even in an increasingly digital world, events play a special role in people's lives, with the social context at least as meaningful as the content and messages delivered¹.

Science festivals are growing in numbers and diversity, with 42 of those being members of the UK Science Festival Network². Previous research indicates that both event organisers (practitioners) and audiences assert that public science events provide powerful science engagement experiences: practitioners argue that there are many learning outcomes from events; and audiences report that they attend events with the intention of learning about science and cutting-edge research, along with engaging with scientists themselves^{3,4}.

However, research with practitioners indicates that the evaluation and evidence-based development of science festivals is difficult to prioritise in the fast-paced and competitive world of event production. Numerous other drivers can take precedence, including securing event funding, organising staff and volunteers, and the precarious short-term nature of science communication contracts or volunteering roles¹.

In order to develop the nascent sector into one with appropriate professional development, further support is needed to drive forward reflective practice and festival development utilising

¹ Durant, John; Buckley, Nicola; Comerford, Dane; Fogg-Rogers, Laura; Fooshee, Julie; Lewenstein, Bruce; and Wiehe, Ben. (2016) Science Live: surveying the landscape of public science events. Project Report. MIT, Cambridge, USA. Available from: <http://eprints.uwe.ac.uk/29112>

² <http://sciencefestivals.uk/list-all-members/>

³ Jensen, E., & Buckley, N. (2012). Why people attend science festivals: Interests, motivations and self-reported benefits of public engagement with research. *Public Understanding of Science*. doi:10.1177/0963662512458624

⁴ Fogg-Rogers, L., Bay, J.L., Burgess, H., & Purdy, S.C. (2015). 'Knowledge is power': a mixed methods study exploring adult audience preferences for engagement and learning formats over three years of a health science festival. *Science Communication*, 37 (4). pp. 419-451. ISSN 1075-5470 Available from: <http://eprints.uwe.ac.uk/25328>

existing evidence⁵. Several models of reflective practice exist, but the pedagogic model suggested by Schön^{6,7} may be the most useful for science communication practitioners. Here, reflection-in-action takes place during events in order to shape formative feedback. Observations of events may also help to generate this process. Reflection-on-action takes place following events in order to develop future practice, and is useful after summative feedback has been compiled.

1.2. Aims

This evaluation aimed to establish the feasibility of evaluating science festivals in an ongoing manner, appropriate for time-pressured practitioners. Central to this was establishing protocols for reflective practice in order for practitioners to better understand current audience make-up and motivations. It is hoped that by establishing this baseline understanding, further development can take place to meet the needs of underserved audiences in the sector.

Aims:

- Establish the feasibility of evaluation tools for science festivals
- Understand audience make-up and motivations for attendance at three pilot festivals
- Understand audience outcomes from attending three pilot festivals

⁵ Xu, D. (2009). *Evidence based practice and reflective practice in education*. The Open University.
http://www.academia.edu/4134099/Evidence_based_practice_and_reflective_practice_in_education

⁶ Schön, D.A., (1983). *The reflective practitioner: how professionals think in action.*, New York: Basic Books.

⁷ <http://dsmgt310.faculty.ku.edu/AdditionalMaterial/Donald%20Schon%20-%20learning,%20reflection%20and%20change.htm>

2. Methodology

This evaluation is situated within a critical realist epistemology, and so used a mixed methods approach to evaluation. Data collection was conducted using a cross-sectional convenience sampling approach, seeking maximum heterogeneity. While other methods of evaluation and sampling may be more rigorous, the practical feasibility of gaining feedback from practitioners and audiences at events was deemed to be the most important factor. The following sections outline the evaluation methods in more detail, and seek to be useful to practitioners.

2.1. Evaluation Toolkit

Multiple guides to evaluation are available to help practitioners wishing to assess the impact of their science public engagement activities. Many of these are listed as further resources in Appendix 5.1. In selecting evaluation methods, care must be taken to assess the reliability and validity of the tests used, but also the feasibility of sampling and data analysis. Some methods of evaluation may be more rigorous but cannot be applied within the time and funding constraints of many festival environments.

In this pilot evaluation, several methods were selected to help with the triangulation of data from different festivals and event styles. The evaluation forms used can be seen in Appendices 5.2-5.7. These included:

- Snapshot Interviews with audience members
- Focus Groups with audience members
- Questionnaires for audience members
- Observation Guides for practitioners at events
- Reflective Practice Form for event organisers
- Semi-structured interviews conducted with organisers (for triangulation with other methods)

Ethics approval was gained from the UWE Faculty Research Ethics Committee in order to gather, analyse and publish data from the public. In future, practitioners who wish to engage in event evaluation with an aim to publish their data need to adapt these resources and gain approval from local ethics committees before commencement of activity.

2.2. Sampling and data collection

Event organisers at three festivals were asked to self-complete reflective practice forms about their festival aims, audiences and events. The evaluators then completed telephone conversations with the organisers prior to the events to discuss these ideas. The festivals were:

- Nottingham Festival of Science and Curiosity 8-15th February 2017
<http://www.stemcity.co.uk/festival-of-science-and-curiosity-2017.html>
- Northern Ireland (NI) Science Festival 16-26th February 2017
<http://www.nisciencefestival.com/>
- Bath Taps in Science 11-18th March 2017 <http://bathtapsintoscience.com/>

The event organisers were asked to nominate events which they thought would attract a large audience of varied members of the public, along with those events which may attract new audiences. The evaluators then planned to visit those recommended events to collect data.

Three main evaluators undertook data collection, along with recruited volunteers who were trained in the evaluation methods. The evaluators visited the events and undertook observations throughout the time period in order to triangulate the audience responses and the organiser feedback. The evaluators were also trained to approach audience members randomly and ask them to take part in the snapshot interviews or focus groups. Questionnaires were also available for audience self-completion. This style of sampling is known as a convenience sample, whereby people are selected on the day at random. In order to achieve diversity, some purposive sampling was also undertaken (people from certain groups were recruited on purpose) with the aim of reaching maximum heterogeneity.

Following the events, the three event organisers were interviewed over the telephone using semi-structured interview guides. This was to find out their views about the festivals and to triangulate their perceptions with audience feedback.

2.3. Analysis

The interview forms and observations were collected from each event and then transcribed into a digital Excel sheet. Descriptive statistics were performed in Excel (v10) to provide information about audience demographics. A content analysis was performed on the open response questions (reasons for attendance, outcomes from attendance, future intentions) in order to count the compiled themes. The themes were pre-generated from the interview guide, although three were inductively generated through audience responses. Audiences could mention more than one theme, so the responses are not proportional; instead they represent how often a theme was mentioned. Interview data and observations were compiled in QSR nVivo (v11) and a thematic analysis was conducted to generate inductive themes⁸.

⁸ Braun, Virginia, and Victoria Clarke. (2006). "Using Thematic Analysis in Psychology." *Qualitative Research in Psychology* 3 (2): 77–101.

3. Results

The quantitative and qualitative results are integrated here under the relevant section headings.

3.1. Feedback on evaluation toolkit

Overall, the event organisers welcomed further development for evaluating science festivals. The three organisers concurred with previous research indicating that evaluation could be time-consuming, and that evidence generated from similar events may not be integrated into their own practice¹. As such, evaluation and reflective practice methods need to be quick and easy to conduct. They welcomed the support which a professional practice group such as the Science Festival Network provided. Peer support, observations and evaluation tools were highlighted as much needed and very useful.

"I mean the Network's been an invaluable resource for us, in terms of sharing ideas. [Also] providing guidance on evaluations and what we should be asking, and what we shouldn't be asking, and whether there's a standard template that you do for all festivals". Organiser 2

"It's been really useful having the Network, in having discussions, but also – I think on a slightly personal note – just getting me excited about the different things that can happen with the festival too". Organiser 1

The snapshot interviews were found to be the most effective method to sample audiences at events. In a free-flowing event like a science fair, it is very difficult to get audiences to sit down and find quiet space to conduct either a focus group or questionnaires. Snapshot interviews are therefore useful as they are easy to conduct, quick to complete, and relatively fast to transcribe and analyse. Also, people can be targeted to take part (removing reliance on self-completion), so this may help to reduce sampling bias. In this evaluation, some interview questions were found to be irrelevant at events which had not yet occurred (i.e. participants were waiting to enter the events), and as such the interview guide has been adapted accordingly (Appendix 5.3).

While the interviews were felt to be a good method of evaluation, further training and support may be needed to ensure practitioners can conduct the interviews in the future.

"I think that went really well: they managed to get quite a lot of follow-up snapshots, which I think worked really well as part of the way that the festival's set up this year. That was actually really useful feedback to get which I don't think we'd have got it any other way. ...[In the future...] Who's going to be running those, and how do we ensure that we're confident that we've got enough people

to collect data, but also that they're not skewing it, or they're aware of how data can be skewed?" Organiser 1

"I think in terms of somebody else coming in and doing it, it made everything a lot easier, because I didn't have to take members of my team away to go and do the evaluation, which makes my life a lot easier, and it means that I don't have to think about it, it's just going to happen. I think going forward we're always going to have to do that, and we'll have to have an external team – an external to the festival team – who come in and do the evaluation". Organiser 3.

All three science festivals did not want to use additional paper questionnaires as they felt many people would not complete them and that they distract from the festival experience. One organiser suggested that online questionnaires provide a better option than event questionnaires. This could be incorporated into the event booking form, or by using snapshot interviews at events to gather email data for follow-up online questionnaires.

Focus groups were conducted at the NI Science Festival at an adult-only evening event, but were not found to be useful in other events attracting family audiences. One organiser suggested that the focus group concept could be adapted into a festival advisory group, drawing on 'community involvement'⁹ principles.

"The focus groups thing was an interesting one, and we do like that, because you do get a bit more depth to a conversation, a bit more depth in the feedback. We know that there's a certain group of people that just keep coming back to the festival... so [my idea] was to sort of pull together a team of, like a focus group basically, food for your thoughts basically. Pay for a bit of food and some drinks, and have people giving brutally honest feedback to us of what they would like to see more of, and what would interest them." Organiser 2

Observations were completed at all three festivals and were useful to triangulate the interview data. In particular, they may help to verify the sampling undertaken with the snapshot interviews, as observation feedback can verify if the interview sample was a representative cross-section of the audience. Observations were also indicated as useful for practitioners, as they can help to generate further reflective practice.

⁹ Health Involvement <http://www.invo.org.uk/>

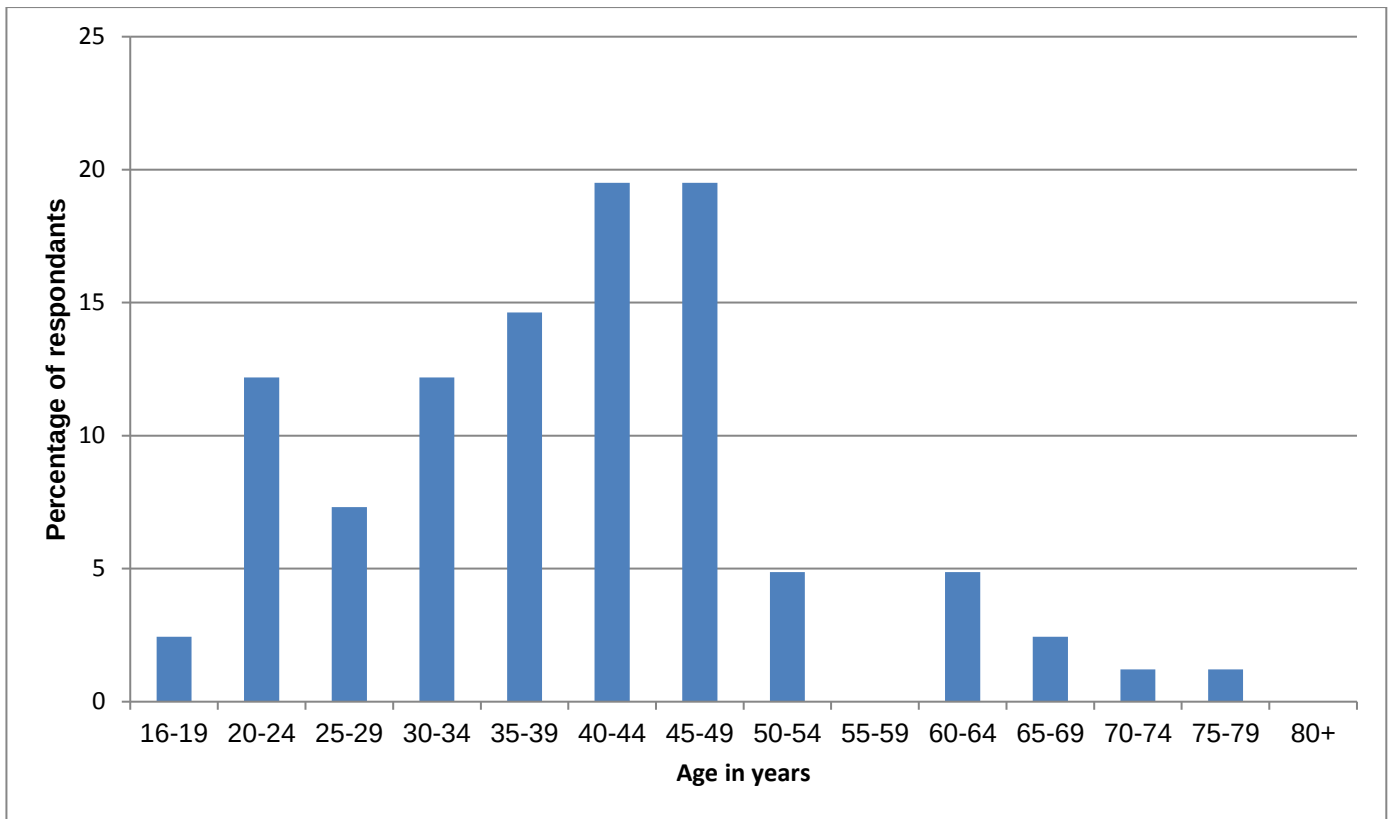
3.2. Participant Characteristics

In total, 90 adult audience members took part in snapshot interviews at the three festivals; 22 in Nottingham, 11 in Northern Ireland and 57 in Bath. This discrepancy in figures is due to the scale of volunteers at each festival, and indicates that an external team of evaluators can drive up sampling numbers (e.g. high N in Bath was due to three evaluators working at once).

The sample was 47% female (nearly 50/50 split), and featured a wide spread of ages, as indicated in Figure 1. Most audience members were with young children (71% of those sampled, equivalent to $N=109$ children), which is reflected in the age demographics of adults interviewed. The children were mainly in primary school education, with 57% of those reported being between the ages of 5-10 years. The ethnic diversity of the sample overall was quite broad, with 18% of people sampled being non-white, although this did vary between festivals - reflecting the local populations.

The audiences overall were already interested in STEM, with 72% of those sampled either studying STEM, employed in STEM, or previously studying or employed in STEM. However, this did vary between festivals and between events. Audiences at the Bath science fair event in a park were already highly interested in STEM, with 81% reporting this connection. A similar science fair event in Nottingham was held in a library and highlighted a higher 'drop-in' rate, with more people indicating that they didn't know the event was happening and had discovered it by accident; here 64% of people indicated a prior connection to STEM. An evening event for adults in NI (about alcohol) indicated that audiences had a much lower prior connection to STEM (45%), highlighting the importance of topic choice and venue for attracting new audiences.

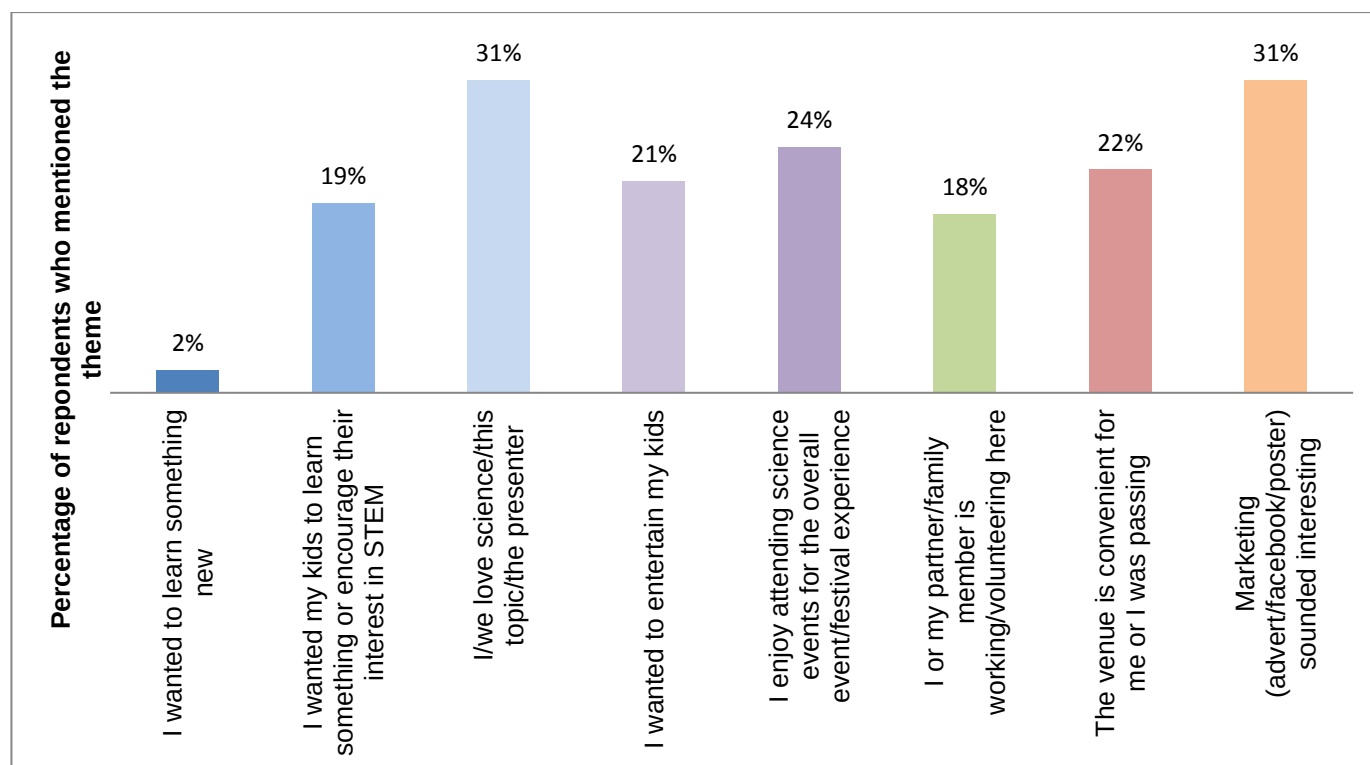
Figure 1: Age demographics of audiences sampled at three science festivals



3.3. Audience motivations and outcomes

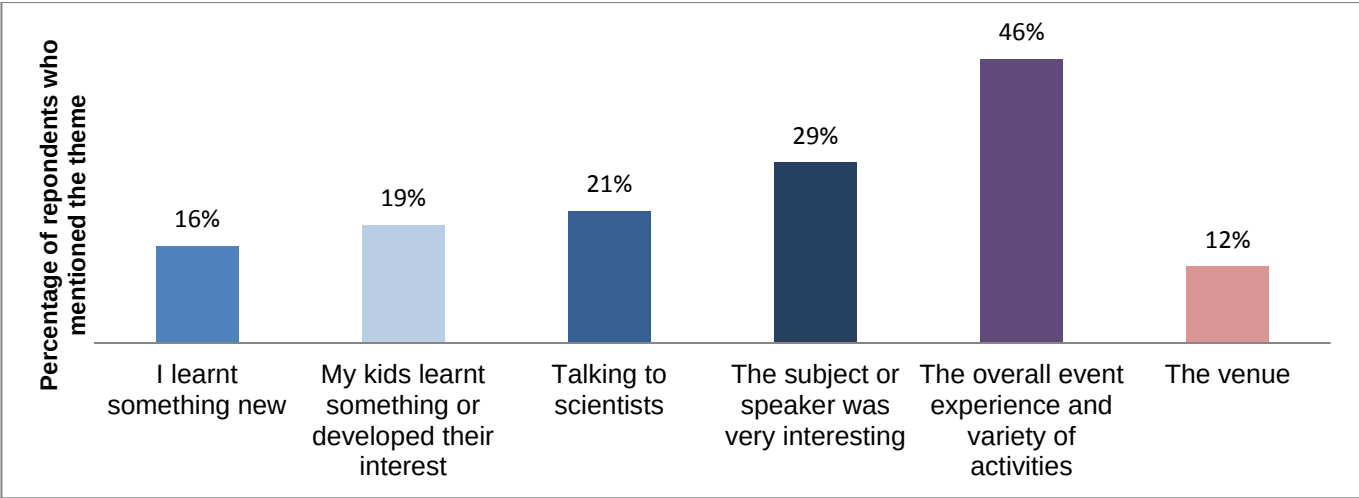
Results from the content analysis of audience responses proved very insightful into their motivations for attendance. Audiences could mention more than one theme, so the responses are not proportional; instead they represent how often a theme was mentioned by each respondent (percentages do not add up to 100%).

Figure 2: Audience reasons for attending science festivals



The themes generated from responses to the question ‘what made you come to this event today?’ are represented in Figure 2. A majority of the responses indicated that the audience deliberately attends science festival events to learn about STEM (compiled blue responses indicate learning = 52%). Nearly half of respondents also explicitly thought that attendance was entertaining for themselves or their family (compiled purple responses indicate entertainment = 45%). While one event was on a topic seemingly unrelated to science (alcohol), most of the events had science or scientific themes in their marketing and titles. This indicates that STEM topics are attractive to these audiences, and that they view learning about science as part of a wider interest in being entertained through learning about new elements of research in culture.

Figure 3: Elements of events which audiences found interesting

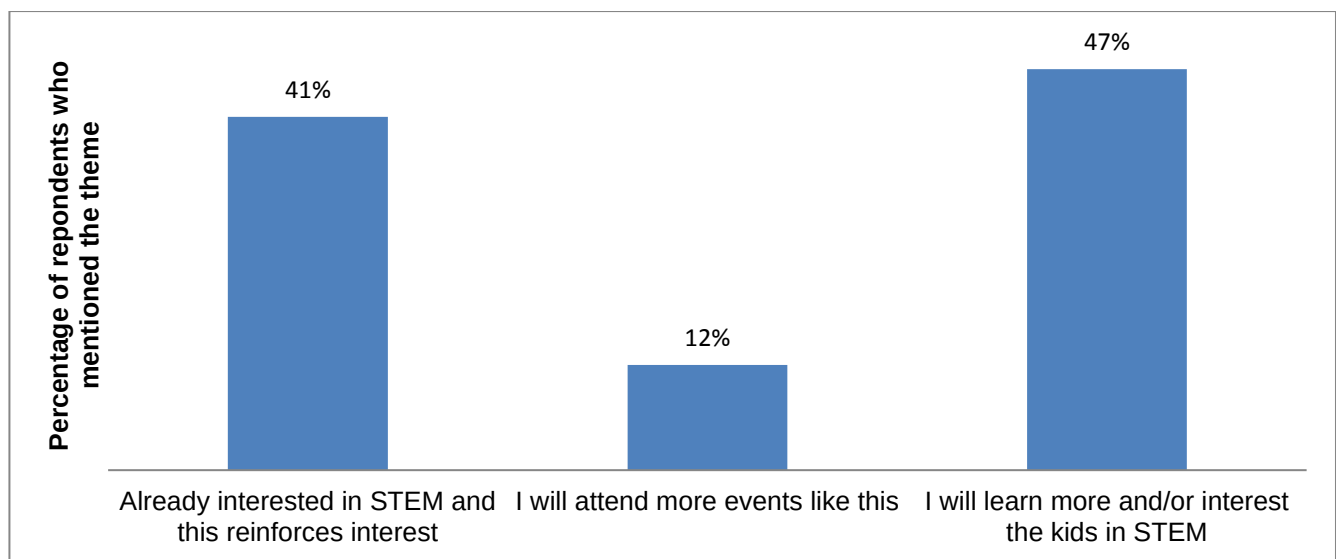


Free-choice learning about STEM was corroborated by the themes generated by respondents about ‘what did you find interesting about this event’? Similarly, 85% of respondents mentioned a theme related to learning, and 46% mentioned a theme related to the overall event experience (entertainment) as indicated in Figure 3. This reinforces previous research about audience motivations for attending science festivals ^{3,4} and leisure time free-choice learning¹⁰.

As discussed previously, venue choice is critical for attracting people who may not identify as being interested in STEM or who may not attend the event on purpose through marketing. This was borne out by responses at the science fair in Nottingham, which was held in a library during school half term; here 59% of respondents indicated that they entered the event as they were passing by. This is five times higher than at Bath science fair, where whilst the event is held in a park, only 11% of audiences report being passing trade (‘I was passing the venue’). This may be due to the park’s location or the weather on the day and time of year (it was cold and windy), or alternatively because Bath advertises their events more widely than Nottingham.

¹⁰ Falk, J.H., Storksdieck, M. & Dierking, L.D., (2007). Investigating public science interest and understanding: evidence for the importance of free-choice learning. *Public Understanding of Science*, 16, pp.455–469

Figure 4: Influence of event on feelings towards science



When asked whether 'has attending this event influenced the way you feel about science?', most respondents (59%) indicated that they had been positively influenced; either they would attend more events like this (12%) or would learn more (or help their children learn more) about STEM (47%). However, 41% of respondents indicated that they would not do anything differently; this was because they already felt a close affinity to science and the event simply reinforced this interest (Figure 4).

4. Summary and Recommendations

This pilot evaluation for the Science Festival Network indicates that science festival practitioners are keen to develop their professional and reflective practice. Working with three pilot festivals provided an insight into understanding festival audiences, as well as developing feasible evaluation tools for practitioners.

4.1. Festivals as celebrations of science in society

The data reported here reinforces existing literature about science festival audiences, and the value placed on festivals by the community. Science festivals are much-loved events in the local cultural calendar, providing an outlet for people interested in or connected to STEM to celebrate science with others. In this evaluation, 72% of audience members sampled stated a prior connection to STEM in some form; this statistic should be celebrated as an indication of a vibrant scientific and pedagogic community.

Viewing science festivals in this light reinforces the value of science as an aspect of culture, and situates science within society. People who are connected to STEM value this interest as an aspect of their identity, and so they welcome the opportunity to celebrate this with others¹¹. This reinforces their interest as a valuable contribution to society and connects them into the wider community. In this respect, science festivals provide a similar outlet for people interested in STEM as do music festivals for music lovers. Festivals are a central part of community life, and science-oriented festivals therefore situate science in society as a valuable cultural interest.

People who identify as being interested in STEM may not be practicing scientists, and as such, this interested audience should not be denigrated; instead they should be celebrated as advocates who can discuss topical science issues with wider publics. Indeed, 85% of the themes raised by participants about what they found interesting about the festival were related to learning about new ideas or topics in STEM; a further 46% of themes raised indicated that they found this event experience entertaining. Furthermore, 59% of respondents indicated that they would take positive action to continue this experience or convince others to do the same.

¹¹ Weihe, B. (2014). When science makes us who we are: known and speculative impacts of science festivals. *Journal of Science Communication*, 13(4).

4.2. Expanding for underserved audiences

Festivals also provide an opportunity to reach audiences who may not identify as being interested in science¹². Interviews and observations indicated that when events are held in mainstream cultural venues (generic venues¹³), such as a bar or library, they provide an opportunity to connect with audiences who may not have sought out a science-based topic. Indeed, 59% of respondents in the library event in Nottingham indicated that they were simply passing by, resulting in a relatively low figure (64%) of participants being already connected to STEM.

Topic choice is also an important factor, with only 45% of participants at an alcohol-related event held in a bar in NI indicating that they were connected to STEM. The science fair in Bath has this aim, but further thought may be needed to refine the location and timing, as 81% of respondents indicated they were already connected to STEM. The inclement weather in March and the timing during British Science Week may mean that it is people already interested in STEM who seek out this vibrant event.

However, interviews with event organisers indicated that most understand these general principles. Instead, what may be needed is training in reflective practice so that organisers can reflect on whether their events meet their stated aims. Peer sharing, advice and support through the Science Festival Network may also help event organisers to refine their events further, thereby enabling existing audiences to continue celebrating science in society, whilst also reaching audiences currently underserved by the informal science learning sector.

4.3. Evaluating future festivals

Event organisers appeared to welcome support and tools through which to further improve their own practice, as well as the science festival experience for audiences. As such, the Science Festival Network is playing a vital role in connecting and developing science communication professionals. This needs to be sustained in order to enhance the nascent sector and continue developing the practice of event organisers.

The evaluation toolkit developed through this pilot work may prove useful to practitioners, but should be utilised in conjunction with the evaluation resources listed in Appendix 5.1.

¹² Wellcome Trust. (2012). *Review of Informal Science Learning*. London, UK. Retrieved from web_document/wtp040862.pdf

¹³ Bultitude, K., & Sardo, A. M. (2012). Leisure and Pleasure: Science events in unusual locations. *International Journal of Science Education*, 34(18), 2775–2795.

Evaluation practice should be adapted for each audience and situation, and practitioners will need to take both rigour and feasibility of methods into account.

In particular, further training and support may be useful to develop the reflective practice and observational skills of practitioners, so that they can undertake both formative and summative assessment of their own events. Through this continual development, event organisers will grow in their professional identity as well as further develop this nascent sector.

Recommendations:

- Further develop science festivals as a model to celebrate science with wider audiences interested in STEM
- Consider venue, timing and topic choices at events designed to attract people who are not already interested in STEM
- Further develop the Science Festival Network to provide peer support and idea sharing for event organisers
- Provide tools and training to enable event organisers to engage in reflective practice and develop their professional identity.

5. Appendix - Evaluation Resources

Andersson, E., Fennell, E., and Shahrokh, T. (2011) Making the case for public engagement: How to demonstrate the value of consumer impact. London: Consumer Focus and Involve.

<http://www.involve.org.uk/wp-content/uploads/2011/07/Making-the-Case-for-Public-Engagement.pdf>

Informal Science. Evaluation. <http://www.informalscience.org/evaluation>

Informal Science. Evaluation Toolkits. <http://www.informalscience.org/evaluation/evaluation-tools-instruments>

NSF EvaluATE (2010). The 2010 User-Friendly Handbook for Project Evaluation.

http://www.evaluate.org/wp-content/uploads/formidable/Doc_2010_NSFHandbook.pdf

RCUK Practical Guidelines to Evaluation <http://www.rcuk.ac.uk/Publications/policy/Evaluation/>

The Evaluators Cookbook: Participatory Evaluation Exercises. A Resource for work with Children and Young People [http://www.bath.ac.uk/marketing/public-](http://www.bath.ac.uk/marketing/public-engagement/assets/the_evaluators_cookbook_participatory_evaluation_exercises_for_young_people.pdf)

[engagement/assets/the_evaluators_cookbook_participatory_evaluation_exercises_for_young_people.pdf](http://www.bath.ac.uk/marketing/public-engagement/assets/the_evaluators_cookbook_participatory_evaluation_exercises_for_young_people.pdf)

Wellcome Trust. Engaging with Impact: How do we know if we have made a difference?

https://wellcome.ac.uk/sites/default/files/wtp052364_0.pdf