Pathways to impact from outreach
Session outline

• Why evaluate outreach?
• What to measure?
• How to do it?
• Pathways to impact from outreach
My experience: engineering our future

https://blogs.uwe.ac.uk/engineering
Education outreach is varied
What is outreach?!
Gender gap in the engineering pipeline

GCSE Physics: 49% Female
A level Physics: 22% Female
Engineering and technology undergraduates: 15% Female
Engineering jobs: 13% Female
Engineering apprentices: 7% Female
ASPIRES
Young people’s science and career aspirations, age 10–14
“By ‘public engagement’ we mean interaction with people outside academia, in their capacity as citizens and members of communities of place or interest. We differentiate public engagement from engagement with policy making, business and the professions, but recognise that in practice they often overlap.”
Education outreach landscape
Education outreach

Education outreach is one form of public engagement whereby non-teaching professionals engage with young people in informal or formal learning environments. (Fogg-Rogers, Edmonds, & Lewis, 2016)

Engaging with scientists and engineers in person has been shown to improve children’s learning and attitudes towards STEM subjects and professionals (Callahan & Nadelson, 2011)

Undertaking education outreach also benefits scientists and engineers themselves, enabling the mastery of generic skills such as communication and teamwork (Direito, Pereira, & Duarte, 2012; Pickering, Ryan, Conroy, Gravel, & Portsmore, 2004)
Why evaluate outreach?
Who is coming to our events?

Which activities are popular with which ages and schools?

What are the children learning?

Are the events we put on popular/enjoyable/educational?

Reflective practice - are we achieving our aims?
Why evaluate?

Formative
• Are the levels of explanations right?
• Are the children understanding the terms or activities?

Process
• Is our approach working for this age group?
• Is the learning environment right for this subject?

Reflective practice – reflection IN action (Schon 1983 onwards)
Why evaluate?

Summative

• Who took part in the activities?
• Did they find the activities enjoyable?
• Did they learn anything?
• Did they learn what we wanted them to learn?
• Are they planning to do anything with this information after the session?
• Did they do anything with this information after the session?

Reflective practice – reflection ON action (Schon 1983 onwards)
Evaluation cycles

- Analyse
- Plan
- Data collection
Reflective practitioners

Plan

Data collection

Analyse
Data lovers collect data for data’s sake...
# How to evaluate – know your aims!

<table>
<thead>
<tr>
<th>Transmit</th>
<th>Collaborate</th>
<th>Receive</th>
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</thead>
<tbody>
<tr>
<td>Inspiration</td>
<td>Collaboration</td>
<td>Insight</td>
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<tr>
<td>Raise awareness</td>
<td>Partnership</td>
<td>Information gathering</td>
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<td>Engender support</td>
<td>Co-design</td>
<td>Extractive research</td>
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<td>Outreach</td>
<td>Conflict resolution</td>
<td>Market research</td>
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<td>Education</td>
<td>Meditation</td>
<td>Social research</td>
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<td>Capacity building</td>
<td>Multi-party agreement</td>
<td>Consultation</td>
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<tr>
<td>Understanding communication</td>
<td>Negotiated agreement</td>
<td>Influencing decision making</td>
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<td>Behaviour change</td>
<td>Consensus</td>
<td>Democratic</td>
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<td>Campaign</td>
<td>Co-inquiry</td>
<td>Accountability</td>
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<td>Marketing</td>
<td>Co-governance</td>
<td>Giving a voice to...</td>
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<tr>
<td>Promotion</td>
<td>Sharing decision making</td>
<td>Understanding strength of feeling</td>
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<tr>
<td>Opinion forming</td>
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<tr>
<td>Dissemination</td>
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British Science Association, 2010
How to evaluate – know your aims!

Enjoyment
Attitudes to STEM
Aspirations
STEM skills
Short-term knowledge

Reach (outputs)

Initial outcomes

Longer-term learning

Knowledge retention
Behaviour
Follow-through in STEM subjects

Fogg-Rogers, Wilkinson and Weitkamp 2015
What to measure?
## Evaluation data collection

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
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</thead>
<tbody>
<tr>
<td>• Demographic data</td>
<td>• Perceptions</td>
</tr>
<tr>
<td>• Gender</td>
<td>• Opinions</td>
</tr>
<tr>
<td>• Ages/years</td>
<td>• Attitudes</td>
</tr>
<tr>
<td>• School SES data</td>
<td>• Current behaviour</td>
</tr>
<tr>
<td>(postcodes)</td>
<td>• Intentions for behaviour</td>
</tr>
<tr>
<td>• School results</td>
<td>• Things you hadn’t even thought of!</td>
</tr>
<tr>
<td>• Perceptions</td>
<td></td>
</tr>
<tr>
<td>• Likert scales</td>
<td></td>
</tr>
<tr>
<td>• Rank list</td>
<td></td>
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<tr>
<td>• Closed yes/no</td>
<td></td>
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</tbody>
</table>
# Evaluation data analysis

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
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</thead>
<tbody>
<tr>
<td>• Descriptive statistics</td>
<td>• Descriptive quotes</td>
</tr>
<tr>
<td>• Mean</td>
<td>• Content analysis (numbers/percentages)</td>
</tr>
<tr>
<td>• Percentages</td>
<td>• Thematic analysis</td>
</tr>
<tr>
<td>• Standard deviation/confidence intervals</td>
<td>• Comparisons between groups</td>
</tr>
<tr>
<td>• Analytical statistics</td>
<td></td>
</tr>
<tr>
<td>• Comparisons</td>
<td></td>
</tr>
</tbody>
</table>

- Descriptive statistics
  - Mean
  - Percentages
  - Standard deviation/confidence intervals
- Analytical statistics
  - Comparisons
Don’t write off qualitative data...

“Not everything that counts can be counted; not everything that can be counted, counts”

Einstein’s favourite maxim

= 8?
Don’t write off qualitative data...

Quantitative data only tells you what is, it doesn’t tell you why...

Qualitative research allows you to speak to the people you want to hear from directly (purposive sampling)...

And hear the answers in their own words, not your pre-determined boxes.
Mixed methods

A richer picture
Mixed methods: audience reasons for attending science festivals

I wanted to learn something new: 2%
I wanted to encourage their interest in STEM: 19%
I love science this topic the presenter: 31%
I wanted to entertain my kids: 21%
I enjoy attending science events for the overall experience: 24%
I or my partner family member is working volunteering here: 18%
The venue is convenient for me or I was passing: 22%
Marketing (advert Facebook poster) sounded interesting: 31%

http://eprints.uwe.ac.uk/33602/
Mixed methods: intentions following the event

Connections to science

- Bath: 88%
- Northern Ireland: 45%
- Nottingham: 64%

Percentage of respondents who mentioned the theme:

- Already interested in STEM and this reinforces interest: 41%
- I will attend more events like this: 12%
- I will learn more and/or interest the kids in STEM: 47%

http://eprints.uwe.ac.uk/33602/
Evidencing outreach
Outreach vs Recruitment

If you *only* look for evidence of success, *everything* will look like it has succeeded...
Secret of success

Answer these questions, in this order:
1. What do I need to find out?
2. From whom do we need to collect data?
3. What challenges will we encounter doing that?
4. How much time, money, staff do we have?
5. Which methods should we use?
6. How will we make use of the data?
What is impact?
REF 2014 – Impact case studies

Impact: A convincing account of the significance of the research and why it matters beyond academia.

NCCPE: Nearly half of the submitted case studies made some mention of public engagement as a route to the claimed impacts. (3108 of the 6640 case studies - 47%)

Disciplinary differences
The extent and nature of engagement with the public differs significantly between the four main panels, and within them:
• Panel D dominates the overall sample of 3108 engagement case studies
• There is significant variety of engagement with the public reported in the other panels
• The Units of Assessment in Panel B show the greatest variation in the extent to which they featured PE

Public engagement appears to be more prevalent in the arts and humanities. However there was surprisingly little public engagement reported in areas like medicine and public health, where there has been a long standing expectation that researchers should engage patients. This merits deeper analysis but may be related to REF 2014 encouraging a linear model of impact, which is not consistent with patient and public involvement.

‘Engaging the public’ case studies as a proportion of total submitted case studies %
The distribution of search terms by panel

Panel A
‘Public awareness’ and ‘Media coverage’ feature strongly, where there appears to be an emphasis on getting the word out. ‘Behaviour change’ is also common, as is patient engagement, although perhaps less so than might have been anticipated, given the panel’s focus on health.

Panel B
‘Outreach’ features strongly; ‘Public debate’ much less so, reflecting perhaps a preference for activities which seek to promote science and nurture curiosity about it.

Panel C
‘Public debate’, as a term, is common, as are ‘media coverage’ and ‘dissemination’, suggesting a strong focus on disseminating research findings through the media, to stimulate public discussion. Panel C also reveals relatively frequent use of terms like ‘community engagement’ and ‘lifelong learning’, perhaps reflecting researchers’ in the social sciences familiarity and commitment to these long standing approaches to involving the public.

Panel D
‘Public discourse’ and ‘public understanding’ are particularly common, reflecting a strong interest in how ideas and meanings animate the public sphere, and a distinctive way of framing how research can generate impact. Museums also feature significantly.

Different ‘flavours’ of public engagement feature in different discipline areas. As such, guidance should take into account these varied forms, and articulation, of impact.
Clarifying the kinds of impact that arise from public engagement

In many of the 2014 case studies, the evidence of impact provided was often weak, usually limited to a list of the outlets they used and the numbers of people engaged. By adapting the ESRC's categorisation of impacts (conceptual, instrumental and capacity building\(^1\)), we identified six broad outcome areas and various indicators of impact which help to capture why engaging the public with research matters, and to describe the types of impact that are typically generated.

<table>
<thead>
<tr>
<th>Type of impact</th>
<th>Typical outcomes arising from public engagement</th>
<th>What kinds of impact can be realised?</th>
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</thead>
<tbody>
<tr>
<td>Conceptual</td>
<td><strong>Enlightenment</strong>: inspiring wonder, curiosity and learning; affecting meaning &amp; sense-making; challenging conventional wisdom</td>
<td>• Changed understandings&lt;br&gt;• Enhanced learning and reflection&lt;br&gt;• Increased empathy</td>
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<tr>
<td></td>
<td><strong>Criticism</strong>: provoking challenge, scrutiny &amp; debate; holding to account</td>
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<tr>
<td>Instrumental</td>
<td><strong>Innovation</strong>: prompting new ways of thinking &amp; acting; creating new products and knowledge; galvanising change</td>
<td>• Changed standards / regulation&lt;br&gt;• Changed accountability regimes&lt;br&gt;• Products and services are influenced and changed&lt;br&gt;• Changed policies&lt;br&gt;• Changed planning processes&lt;br&gt;• Changed / enhanced public realm and environment</td>
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<tr>
<td></td>
<td><strong>Reflexivity</strong>: prompting dialogue &amp; deliberation; exploring risk; informing decision making</td>
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<tr>
<td>Capacity building</td>
<td><strong>Connectivity</strong>: building networks; encouraging participation &amp; involvement</td>
<td>• Increased participation and progression&lt;br&gt;• New skills&lt;br&gt;• Changed behaviours&lt;br&gt;• New or strengthened networks&lt;br&gt;• Enhanced collaboration&lt;br&gt;• Enhanced well-being</td>
</tr>
<tr>
<td></td>
<td><strong>Capability</strong>: building skills; influencing behaviours and practices; empowering; well-being</td>
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For the next REF, it is important that a more coherent and robust framework is developed for articulating the outcomes and longer term impacts of engaging the public with research. The ESRC's guidance provides an excellent place to start. Significant resource also needs to be invested to support researchers to plan and evaluate their engagement activities using such a framework, to allow more evidence to be provided.

NCCPE - Impact from outreach

• What? A convincing account of the significance of the research and why it matters beyond academia.
• Where? The potential contribution of the research to influence thinking, practice and people’s capabilities beyond academia
• Who with? Explain the key publics and partners involved and a rationale for their involvement
• When? Explain the timing to maximise potential impact, with activities differentiated by the phase of the research
• How? Drawing on appropriate methods, tailored to purpose, context and the publics they are seeking to engage
• With what impact? A convincing account of the difference it has helped to generate, and credible claims for the contribution made by the research to that impact
Impact evidence

Reach
• Record the number of activities and who was present
• Outputs are important BUT not the only evidence

Outcomes/Experiences
• What happened or changed as a result of your outreach?
• Quantitative statistics
• Qualitative testimonials

Impact
• Narrative for aims
• Conceptual/Instrumental/Capacity building
Thank you!