Demonstrating change from a drop-in engagement activity through pre- and post-graffiti walls: Thematic analysis and quantitative linguistics applied to a soundscape exhibit

Martin Archer (m.archer@qmul.ac.uk)
School of Physics and Astronomy, Queen Mary University of London, London, UK.
Drop-in engagement activities

Take many forms
• Hands-on activities
• Demonstrations
• Stalls
• Performances
• Exhibitions

Necessarily transient
• Engagement occurs over only a few minutes
• People arriving at different times

Sit within larger events
• People hooked to engage with activity there-and-then
• Fit within logistics of event

QMUL Festival of Communities is an example of an engagement event built out of numerous drop-in activities
Challenges with evaluating drop-in activities

Impact is all about change
Evaluation is used for evidence to demonstrate this change

Evaluation should be:
• Commensurate to the depth engagement
• Appropriate for the engagement experience

BUT drop-in engagement activities are transient

Methods like questionnaires are inappropriate

Integrate evaluation into the activity itself

BUT can you still demonstrate change?
Soundscape experience

Aimed at young families during school holiday visiting the Science Museum in London, UK

Participants experience the ultra-low frequency sounds of near-Earth space made audible via wireless headphones

Click to listen

For more on these space sounds (ULF waves) and their sonification: Archer+ [2018, Space Weather] and Archer [in review, Geoscience Comm.]
The layout

Entrance

- Table, post-it notes, pens, headphones
- Undergraduate Ambassadors
- Pre-graffiti wall
- Banner stands

Creative Short Films

- Table, post-it notes, pens
- Researchers
- Post-graffiti wall

Exit

1,003 participants over 4 days (75% children)
Pre- and Post- Graffiti Walls

For both graffiti walls participants asked to reflect on their thoughts about what space is like (though some required further prompting) by writing or drawing.

Undergraduates attracted participants, posed the question, and explained the soundscape activity.

Researchers posed the same question at the end and talked to participants about their reflections and the science.

Integrated evaluation with potential to demonstrate change.
Needs ANALYSIS to demonstrate CHANGE

UM, SO WHAT IS YOUR POINT?
Thematic analysis
Identifying/interpreting patterns in qualitative data

Rather than pre-existing ‘codes’ allow them to emerge from data, so-called ‘grounded theory’

• Identify codes and group by concepts (themes/dimensions)
• Iterate, collect, theorise
• Refine to final conclusions
• Mixed methods researchers quantify codes [e.g. Sandelowski, 2001, Research in Nursing & Health]

Example theme: VOLUME (73±2% pre, 71±2% post)
Codes 1. Quiet, 2. Loud (including synonyms)
Theory Mostly quiet beforehand (64±3% within theme, others perhaps second-guessing due to activity/phrasing) whereas afterwards loud overwhelmingly dominates (96±1% of theme)

Other themes: common space objects, electricity etc.
Quantitative linguistics
Investigating language using statistical methods

Zipf’s law
The frequency of words is inversely proportional to their rank, i.e. the statistical distribution is a power law with exponent -1

Holds for all languages as well as other systems (e.g. city size, wealth)

Zipf exponent is a measure of diversity of words and can show evolution of complexity of language in children [Baixeries+, 2013, PLOS ONE]
Zipf’s law for soundscape

Piecewise linear regression in log-log rank-frequency plots with optimal number of breaks (maximises fit’s adjusted $R^2$)

Both distributions follow broken power laws with breaks at similar ranks

Higher rank segments show a greater statistical diversity of words afterwards via change of exponent – participants engaged and reflected

Caveats: Does not apply to the 1-2 highest ranking words
Observations

Many parents opted out (not taking headphones) considering activity just for their children → Remove barriers to entry, e.g. using ambient sound

Few people read the banner stands along the marked path
Not interested? Focused on listening? Logistical factors?

Families surprisingly engaged by artistic film interpretations of sounds, contrary to previous experience with science event programmers and audiences

Archer [in review, Geoscience Comm.]
Perhaps gained this attention because it was quite different?
Conclusions

Challenges in appropriately evaluating drop-in activities, especially trying to demonstrate change, largely due to their transient nature.

Space soundscape using pre- and post-graffiti walls

Thematic analysis show change in conceptions of space from before to after, e.g. quiet → loud.

Quantitative linguistics (Zipf’s law) demonstrates increased diversity of responses after activity – reflection upon and engagement with space.

Novel implementation of common evaluation tool.