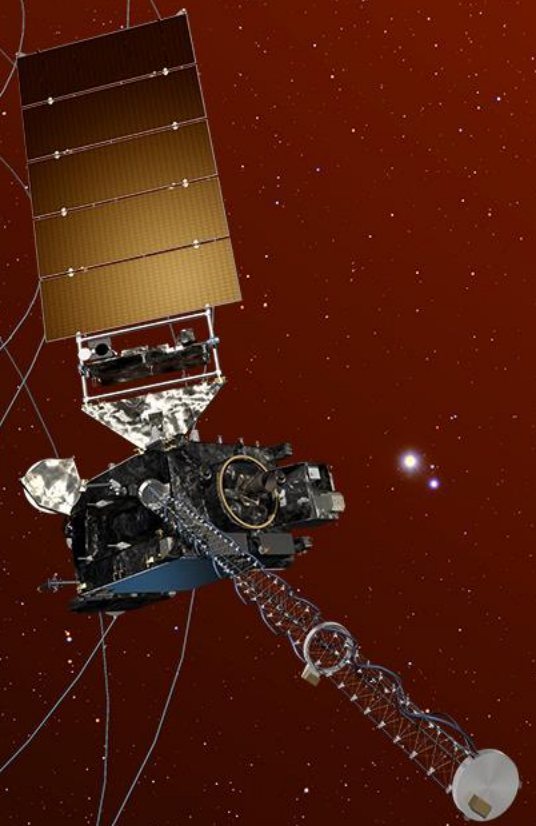
Demonstrating change from a drop-in engagement activity through pre- and post- graffiti walls:

Thematic analysis and quantitative linguistics applied to a soundscape exhibit



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

Drop-in engagement activities

QMUL Festival of Communities is an example of an engagement event built out of numerous drop-in 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

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

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BUT can you still demonstrate change?

Soundscape experience

Funded by Queen Mary University of London
Centre for Public Engagement

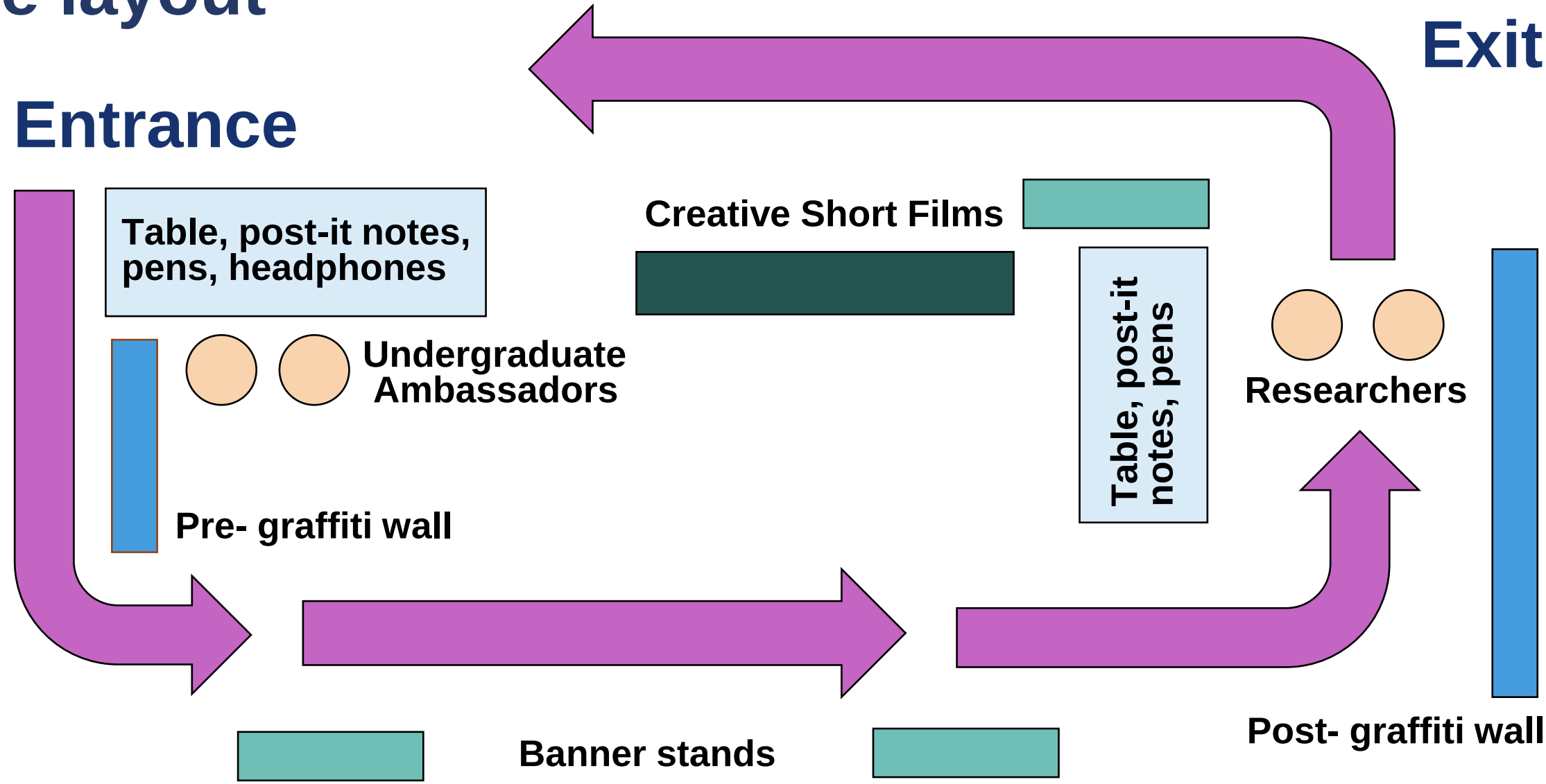
Aimed at young families during school holiday visiting the Science Museum in London, UK

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



1,003 participants over 4 days (75% children)

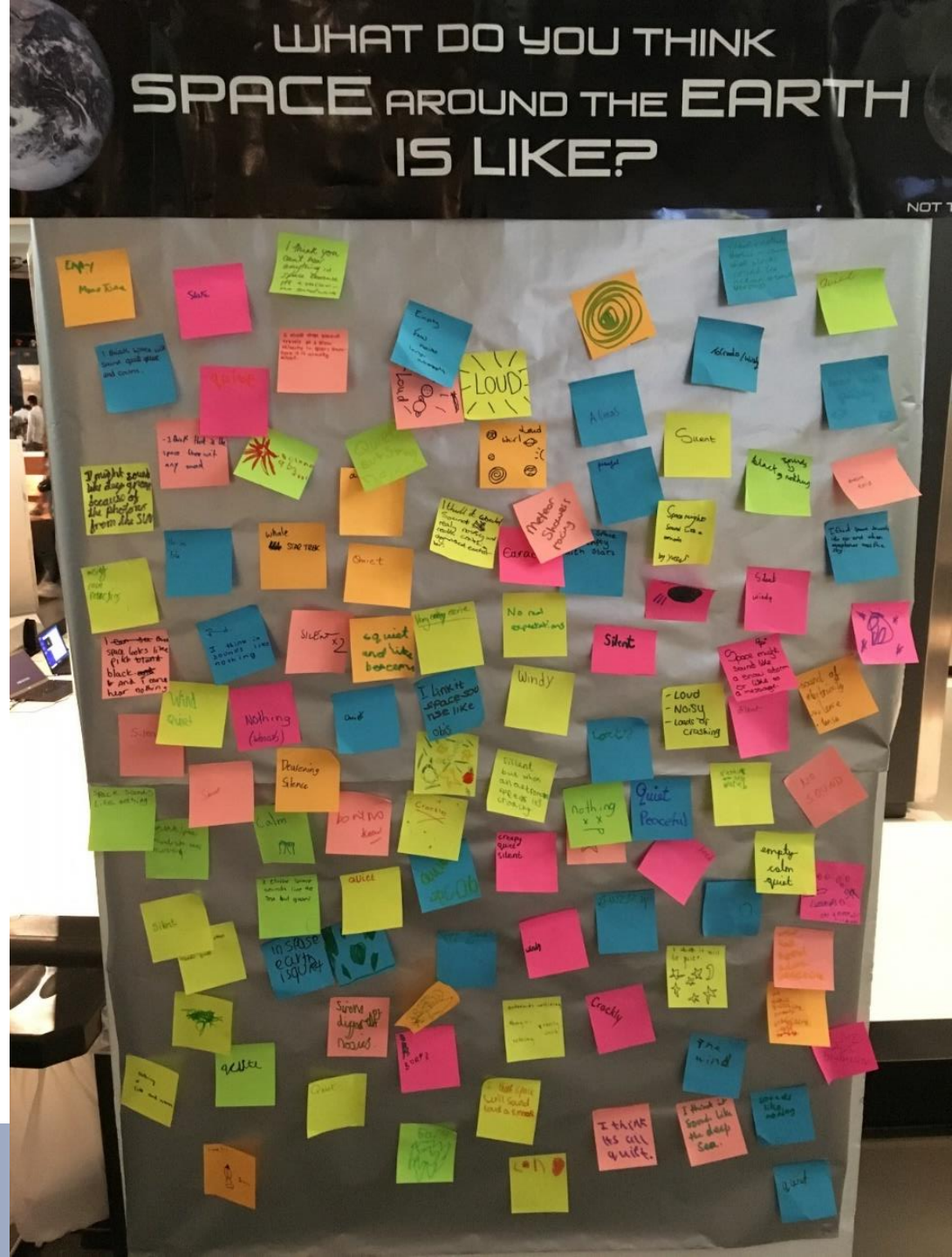
Pre- and Post- Graffiti Walls

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



Pre- graffiti wall at the end of one day's event

Word clouds

Whoosh
Windy
Silent
Calm
Quiet
Noisy
Loud
Nothing
Peaceful
Echo
Air
Creepy
Crashing
Humming
Spooky
Cool
Aliens
Fun
Waterfall
Dangerous
Busy
Static
Eerie
Cold
Big
Dark
Beeping
Scratchy
Weird
Empty
Black
Fuzzy
SIlent
Buzzing
Silence
Static noise
Rocks moving
Static Noises
Sudden Noises
Deafening
Metallic noise
Heavy Metal
Airplane flying
Interference
Popping
Crash Boom Bang
Meteor showers
Centrifuge
Loud Noises
Hole
Ethereal
Music
Ants moving
Rustling
Snow storm
Quiet buzz
Jumping
Screeching
Something
Black noise
Space Race
Mystery
Violent
Low thunder
Water
Boom
Crash
Monotone
Washing
Screaming children
Rocks moving
Electricity
Loud
Glitchy
Noisy
Static
Crackling
Fire
Scratchy
Windy
Popping
Popping candy
Electric
Crackles
Squeaking
Buzzing
White noise
Weird
Creepy
Quiet
Snap
Fireworks
Rattling
Crunchy
Squeaky
Whistling
Whooshing
Interference
High pitched
TV static
Aliens
Popcorn
Lazers
Insects
Pistols firing
Scratching
People talking
Falling
Creaky
Robot breaking
Fuzzy
Crackling Noises
Electrical Charges

Pictures


crash
Loud
Vooshy!!
Lots of rocks crashing around
Space
NOTHING
Silent


the Sfgs
Lazers
Wind deep Sound
Porcorn Sound
ALIENS
By Danielle
Leaves scrunching
Squeaky
Crack Fizz Snap
Pop
Electracle Wind.
Wind from the sun
Sounds so windy
Broken speaker
Playing the sound of Thunder

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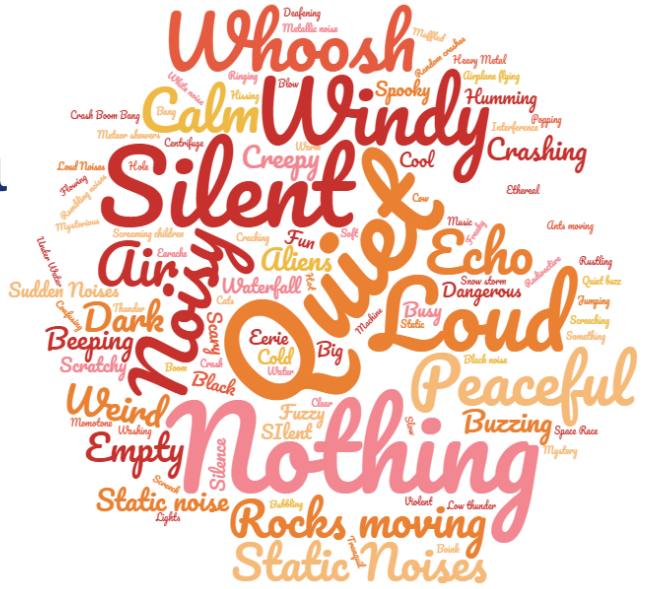
Needs ANALYSIS to demonstrate CHANGE

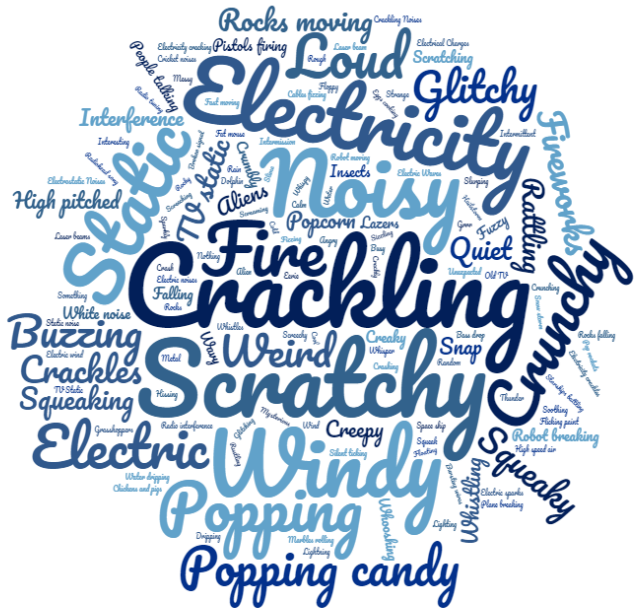
Thematic analysis

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)

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Other themes: common space objects, electricity etc.

Quantitative linguistics

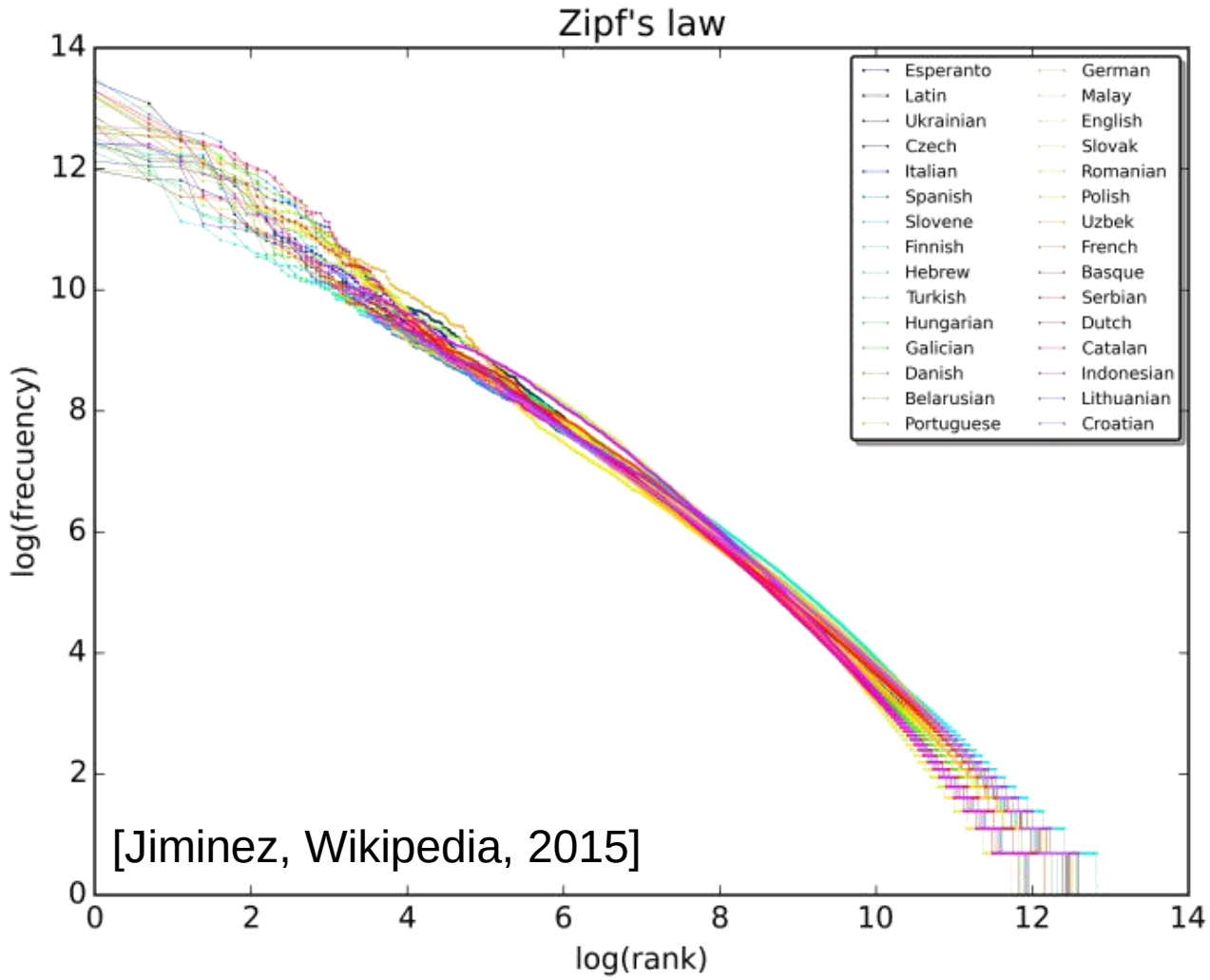
Investigating language using statistical methods

Zipf's law

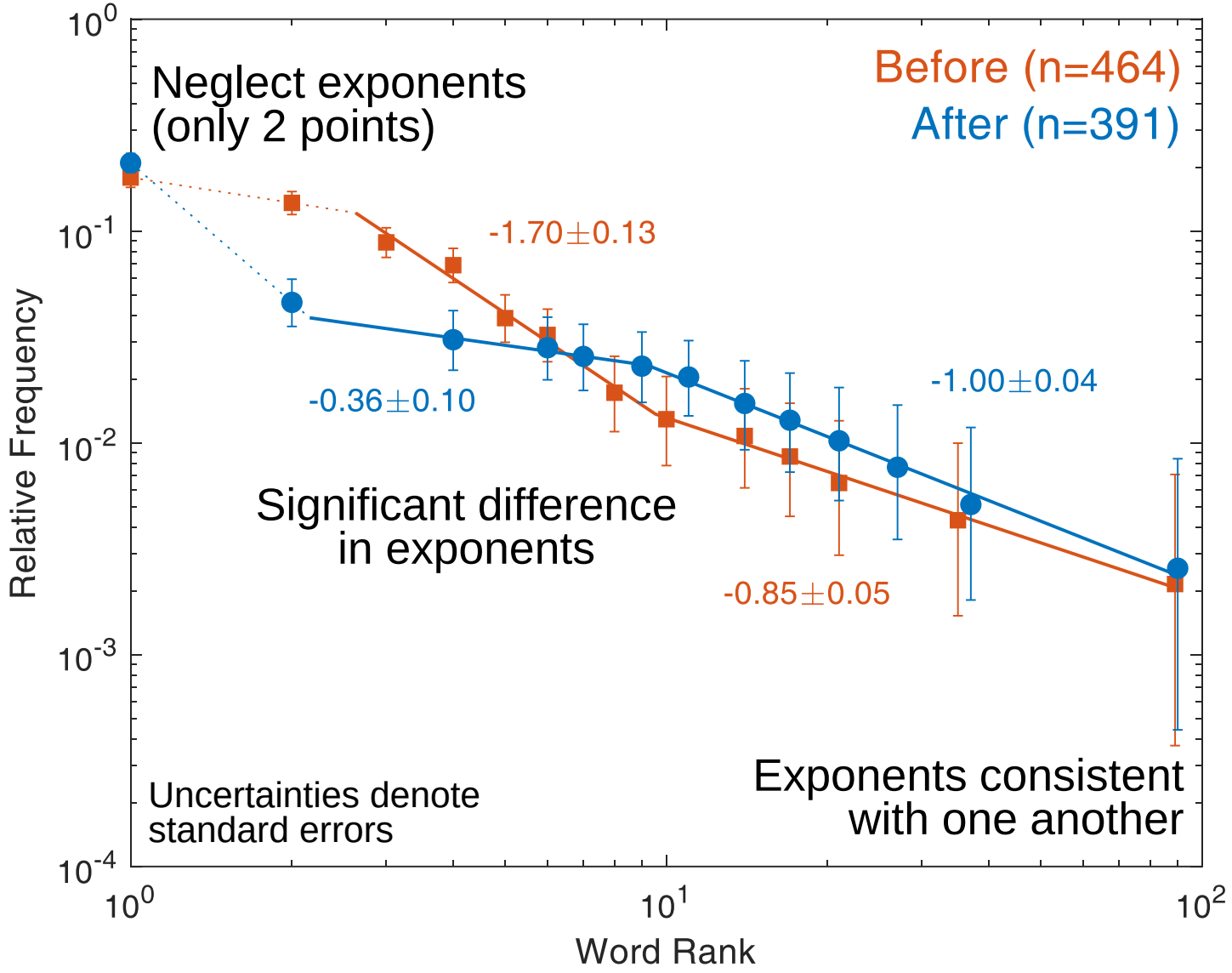
The frequency of words is inversely proportional to their rank, i.e. the statistical distribution is a power law with exponent -1

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)

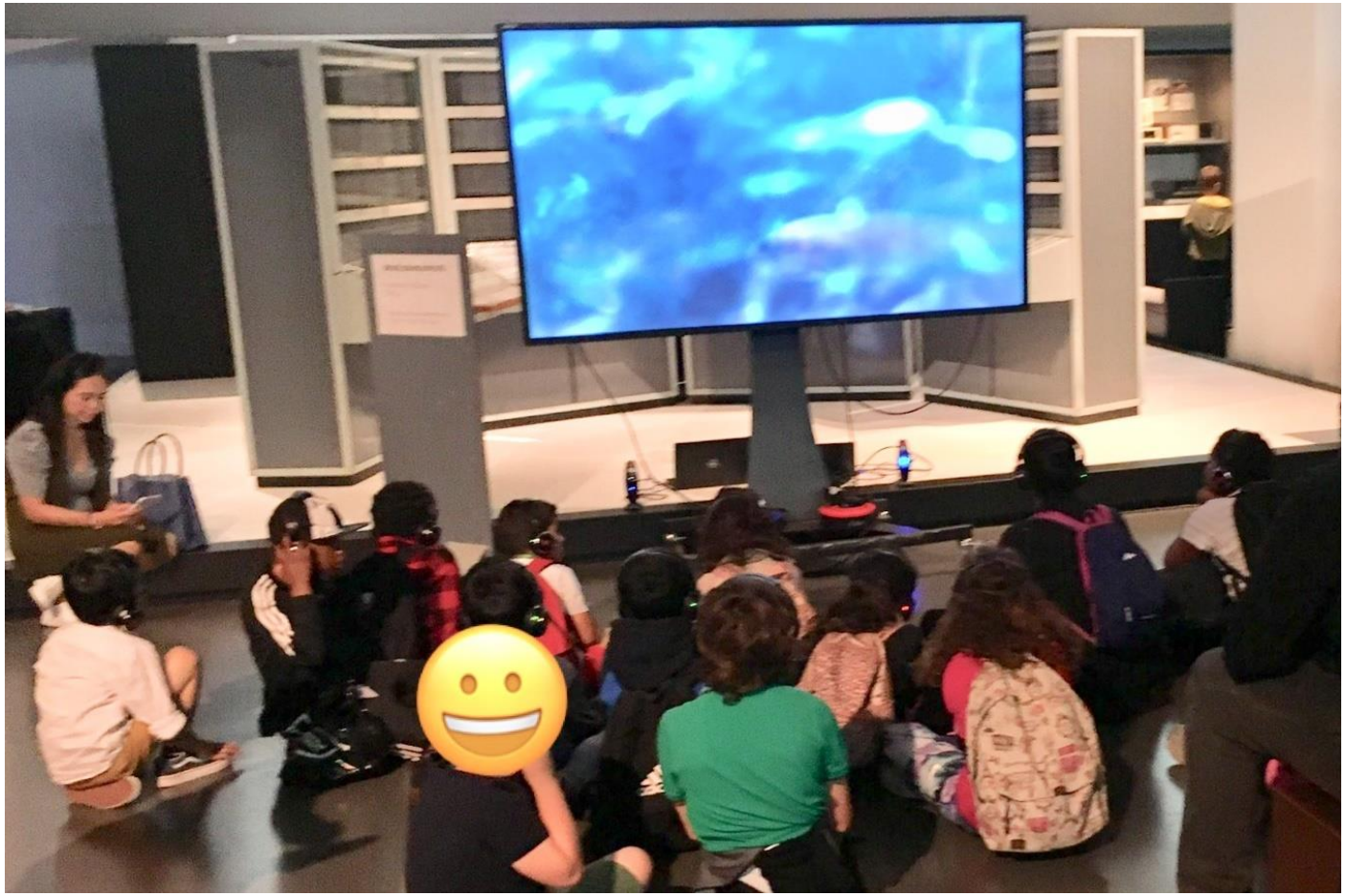
Both distributions follow broken power laws with breaks at similar ranks

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

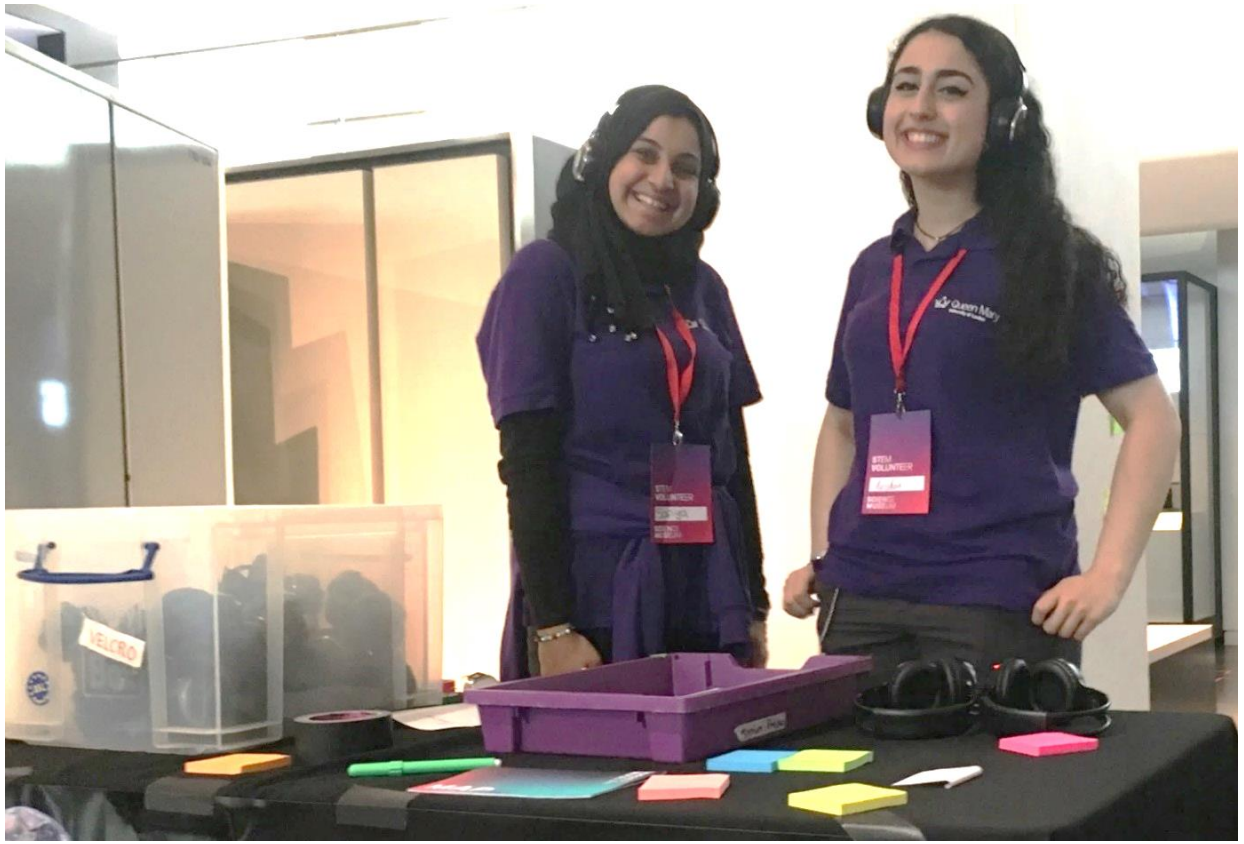


Few people read the banner stands along the marked path
Not interested? Focused on listening? Logistical factors?

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