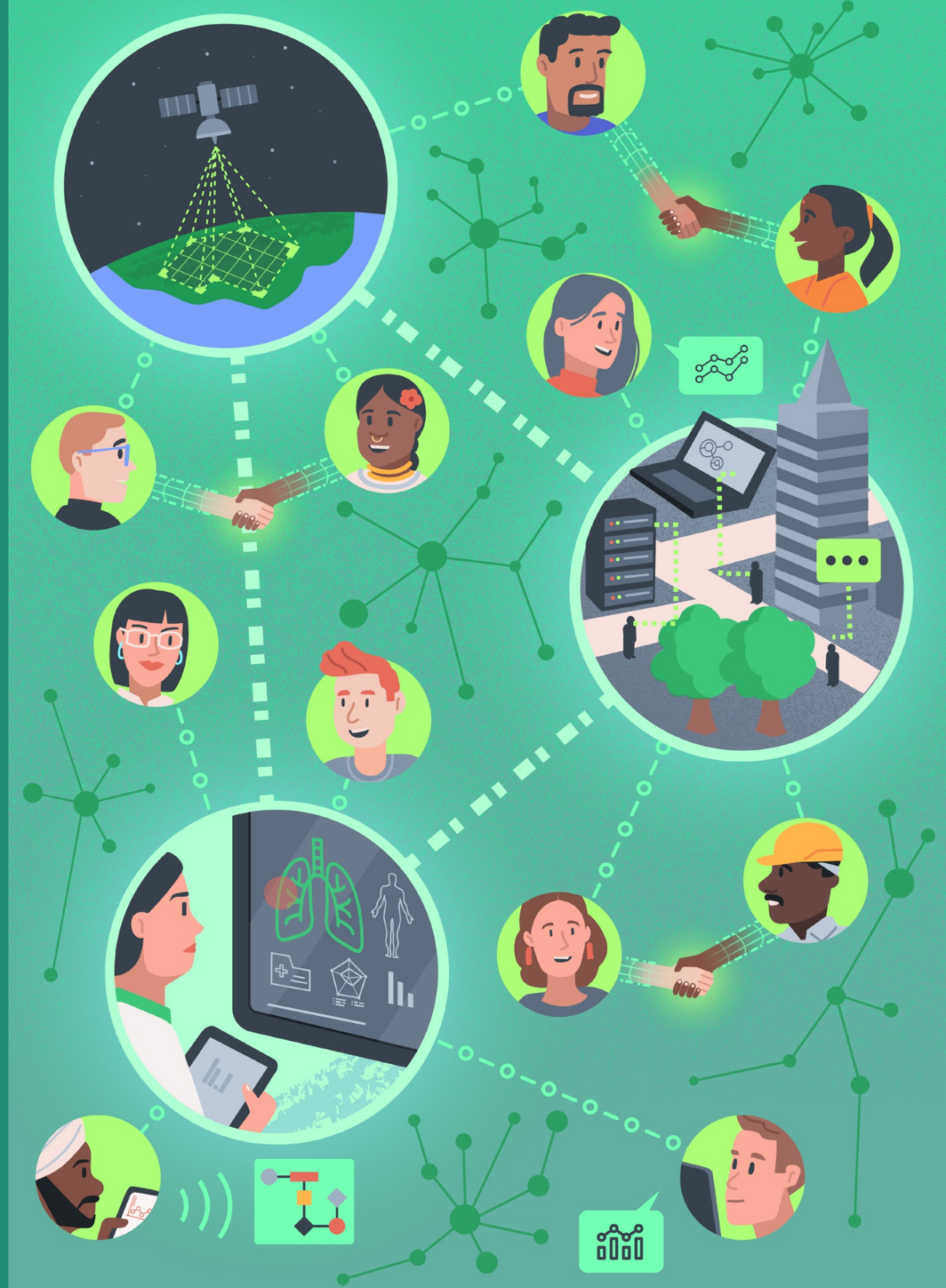
Practical Methods for Public Engagement

Visualisation and communication



The Alan Turing Institute

Recap

Day 3

- Facilitating public engagement
  - Who should you engage?
  - When should you engage?
  - How should you engage?

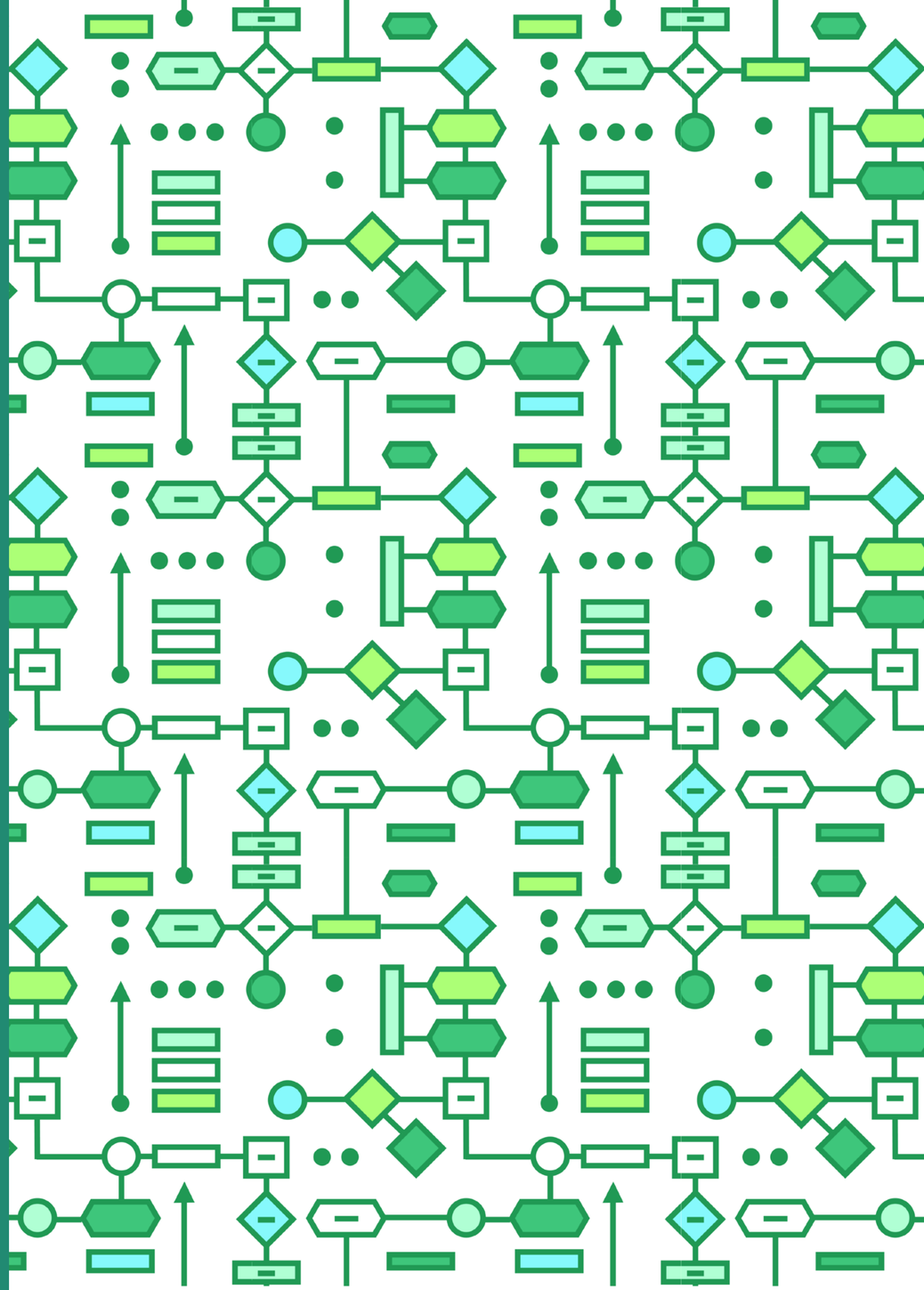
Overview

Day 4

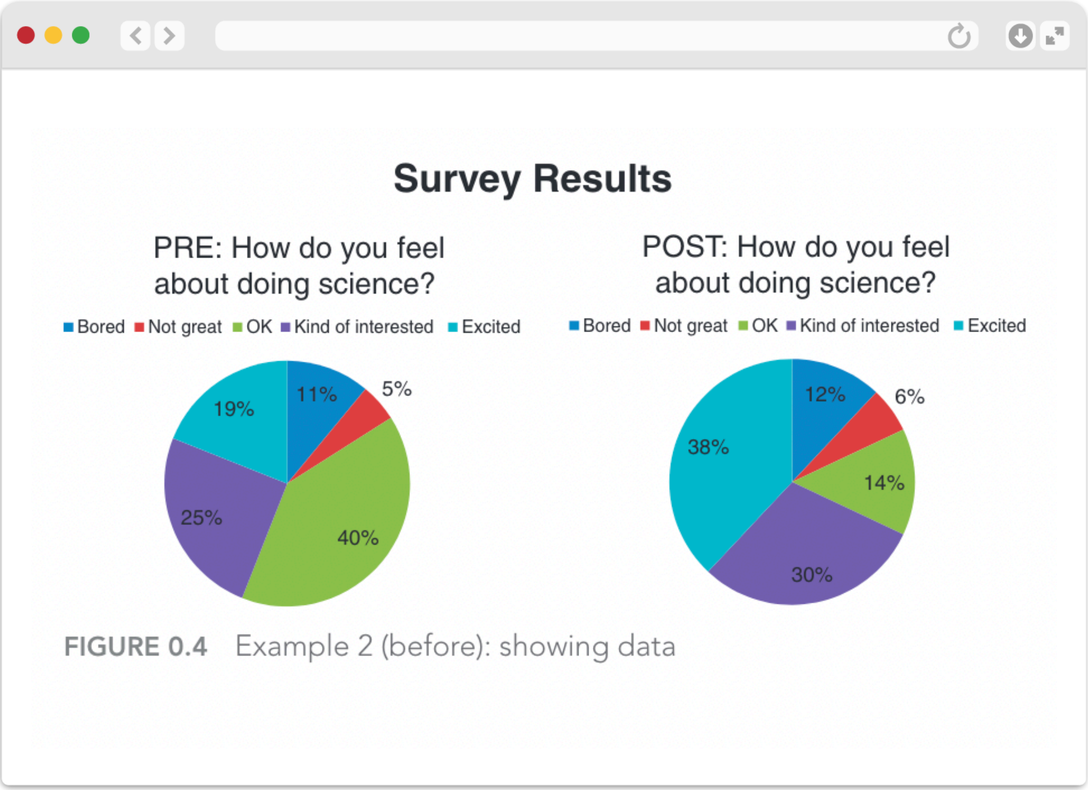
- Practical Guidance
  - Storytelling with data
    - Choosing the right tools and methods
    - ATTENTION!!!
  - Communicating Uncertainty
    - A Framework
    - Visualising Uncertainty

Presentation 1

Storytelling with data



“The data tell a story!



Cole Nussbaumer Knaflic (2015) Storytelling with Data

Storytelling

Data Visualisation

1. What story do you think this graph is trying to tell?
2. Which part of the graph caught your attention initially?

Question

Which part of the graph caught your attention initially?

https://www.menti.com/zfvcsk97db

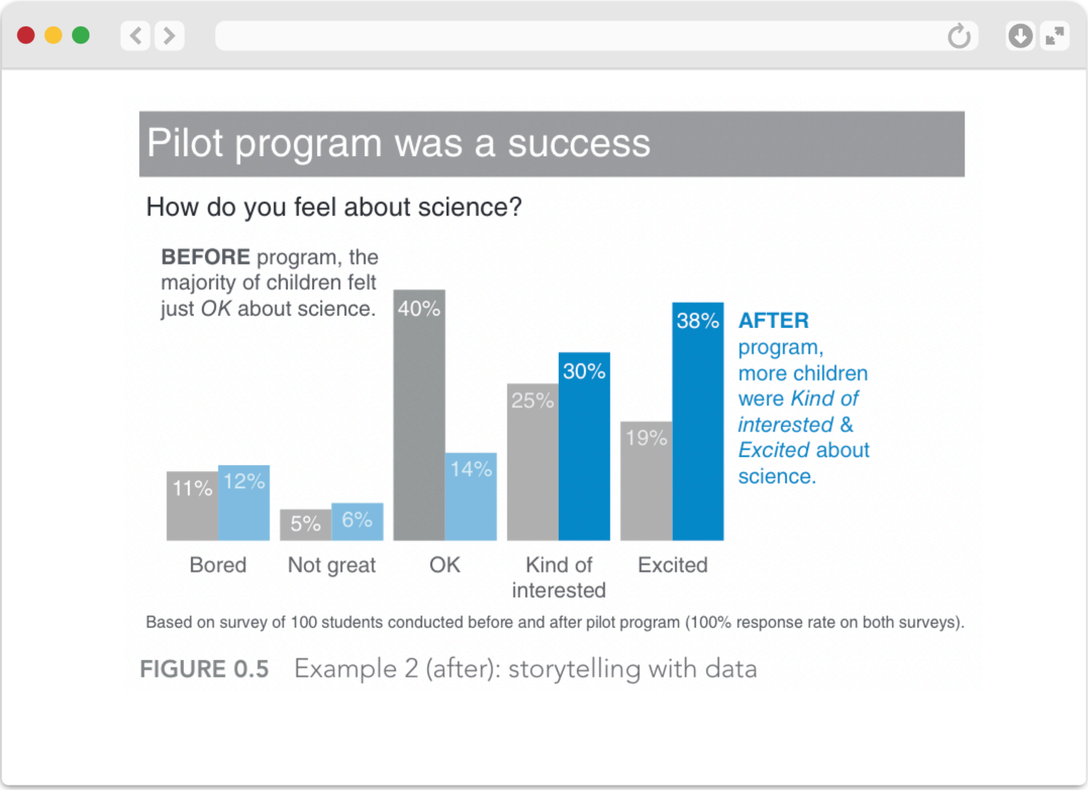


FIGURE 0.5 Example 2 (after): storytelling with data

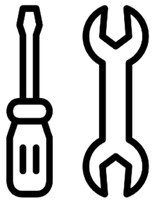
Cole Nussbaumer Knaflic (2015) Storytelling with Data

Storytelling

Data Visualisation

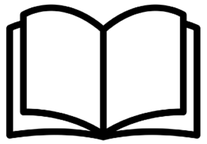
1. Does this graph tell the story more clearly?
2. Which part of the visual grabbed your attention this time?

Choosing the right tool

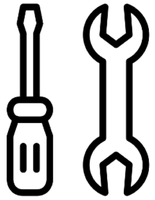


The limits of attention

Developing a clear narrative



Choosing the right tool



Digital Tools

Data Visualisation

There are many tools for data visualisation that are available to data scientists and researchers:

- Tableau: powerful tool for data analysis, BI, and visualisation
- Canva: an online graphic design platform with a simple interface
- D3.js: a javascript library well suited to web-based visuals
- Google Charts: another free option for embedding (many different) charts into webpages
- Datawrapper: a popular option among cvommunicators (e.g. journalists) with a good range of interactive and responsive charts
- Bokeh: an Python library for creating interactive visualisations with a variant for R
- And many more… **(share your recommendations in the chat)**

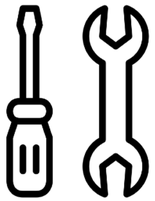
How do you choose the right tool for the job?

Engagement Objectives

Know your audience and your goals

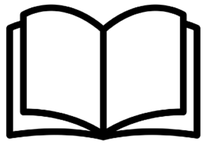
1. Who is your audience?
2. What matters to them (or, what do they value)?
3. Why are you engaging them?
4. What is your goal?

Choosing the right tool



The limits of attention

Developing a clear narrative



The limits of attention

Center

Limited attention

Dealing with attentional blindspots

- Your audience will have a limited attention span.
- They will attend to that which is most salient to them.
- How do you enable them to pay attention to what matters?

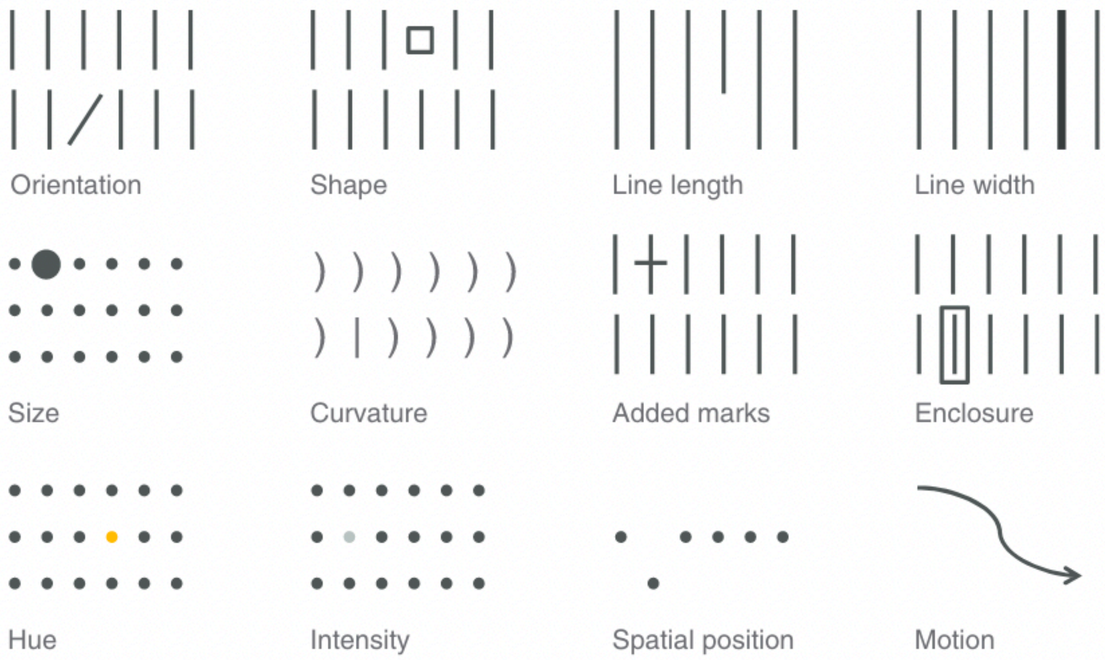


FIGURE 4.4 Preattentive attributes

Source: Adapted from Stephen Few's *Show Me the Numbers*, 2004.

Limited attention

Preattentive Atttributes

- Preattentive attributes are elements of visual design that are rapidly processed by the lowest levels of our visual systems
- They help signify something of salience to an individual
- The 12 to the left are well known among designers—and advertisers!

Example 1

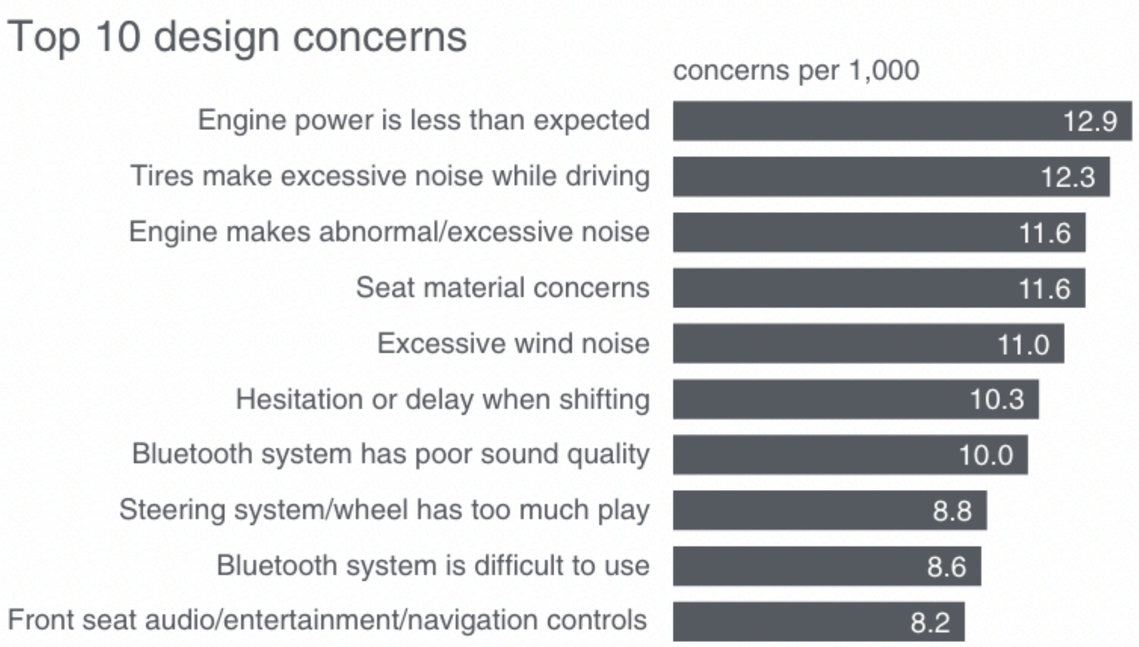


FIGURE 4.7 Original graph, no preattentive attributes

Example 2

7 of the top 10 design concerns have 10 or more concerns per 1,000.
Discussion: is this an acceptable default rate?

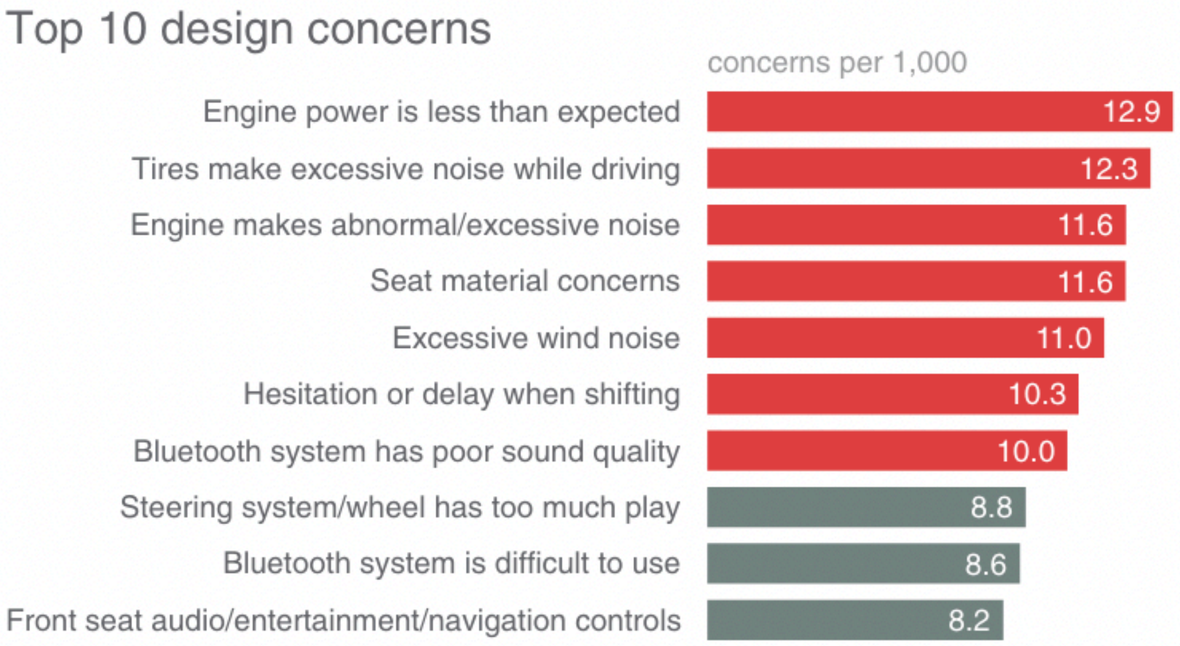


FIGURE 4.8 Leverage color to draw attention

Example 3

Of the top design concerns, three are noise-related.

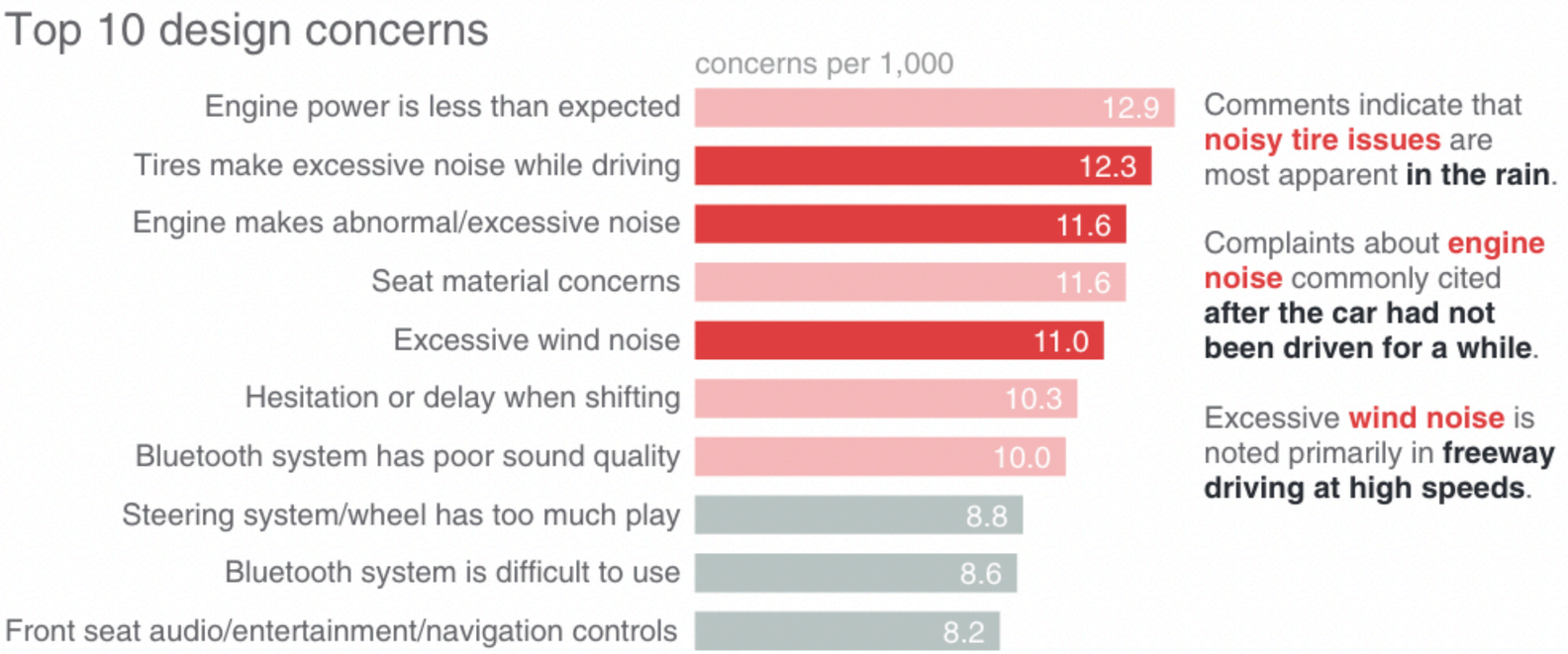
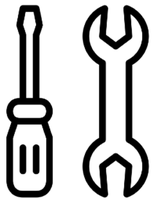


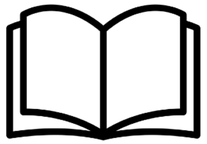
FIGURE 4.9 Create a visual hierarchy of information

Choosing the right tool

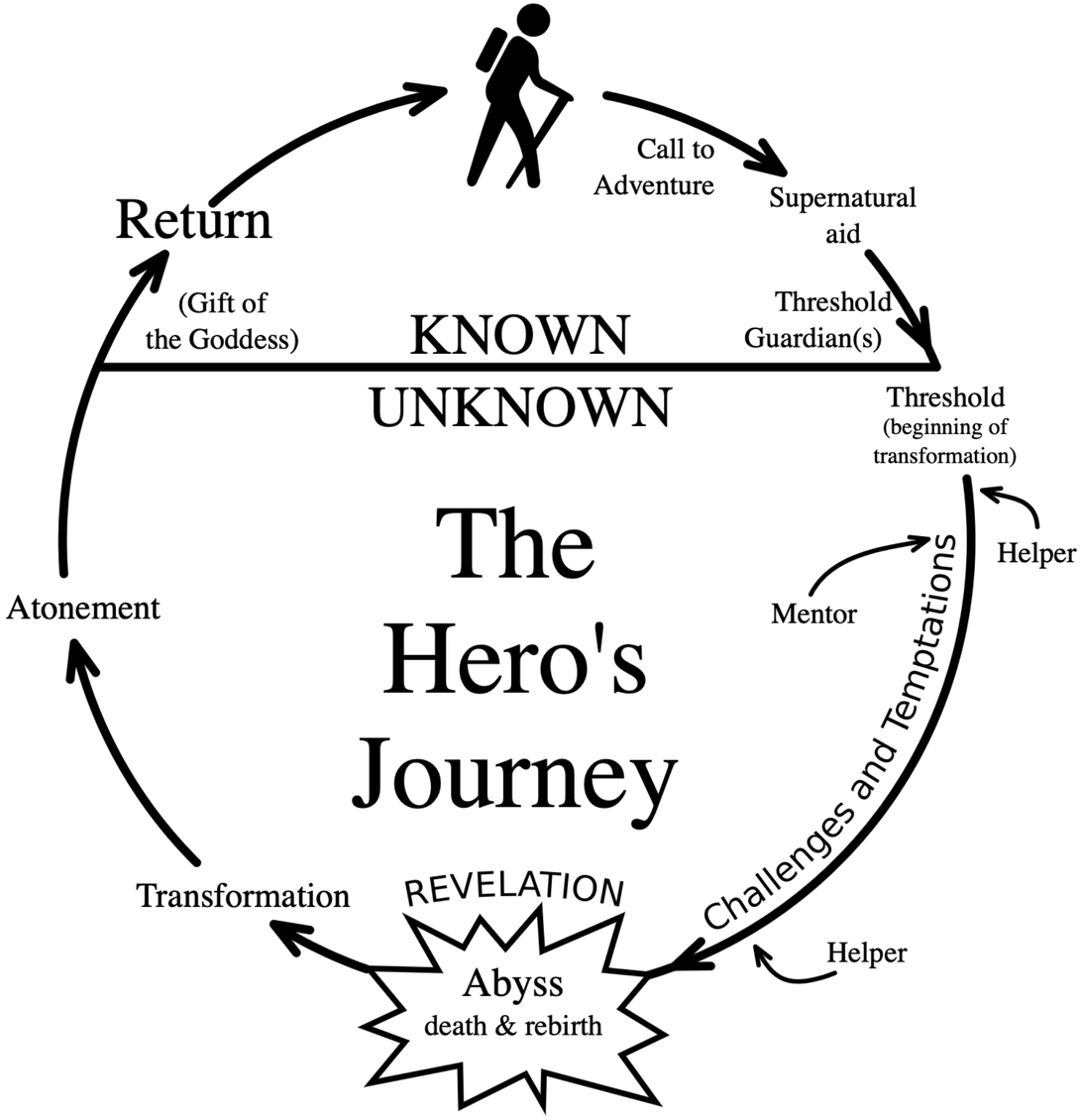


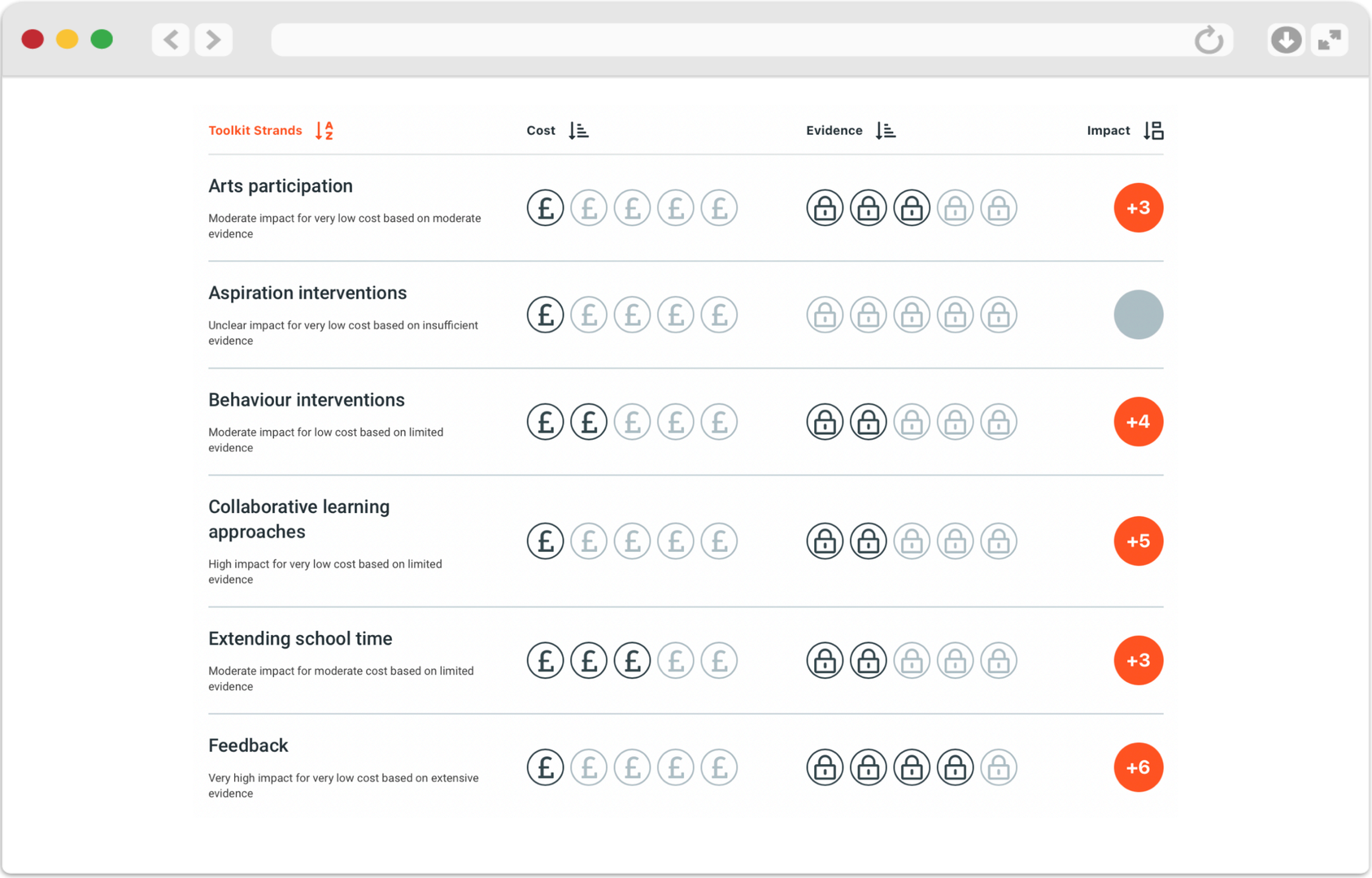
The limits of attention

Developing a clear narrative



Developing a clear narrative


Call to
Adventure
Supernatural
aid
Threshold
Guardian(s)
Threshold
(beginning of
transformation)
Helper
Mentor
Challenges and Temptations
Helper
REVELATION
Abyss
death & rebirth
Transformation
Atonement
(Gift of
the Goddess)
Return
KNOWN
UNKNOWN
The
Hero's
Journey



Understanding Narrative

Effective Engagement

1. Our research has uncovered a variety of interventions and policy options for improving education.
2. These options differ in three ways:
   - Their cost
   - The strength of their supporting evidence
   - The potential impact from implementing the chosen policy
3. The information we have gathered and organised can support evidence-based policy making

Know your audience

Identify the goals of communication

Start with the most important information

Avoid jargon

Be relatable

Provide visuals

Stick to three points

Talk about the scientific process

Focus on the bigger impact

Develop an elevator pitch

Identify the goals of communication

Start with the most important information

Stick to three points

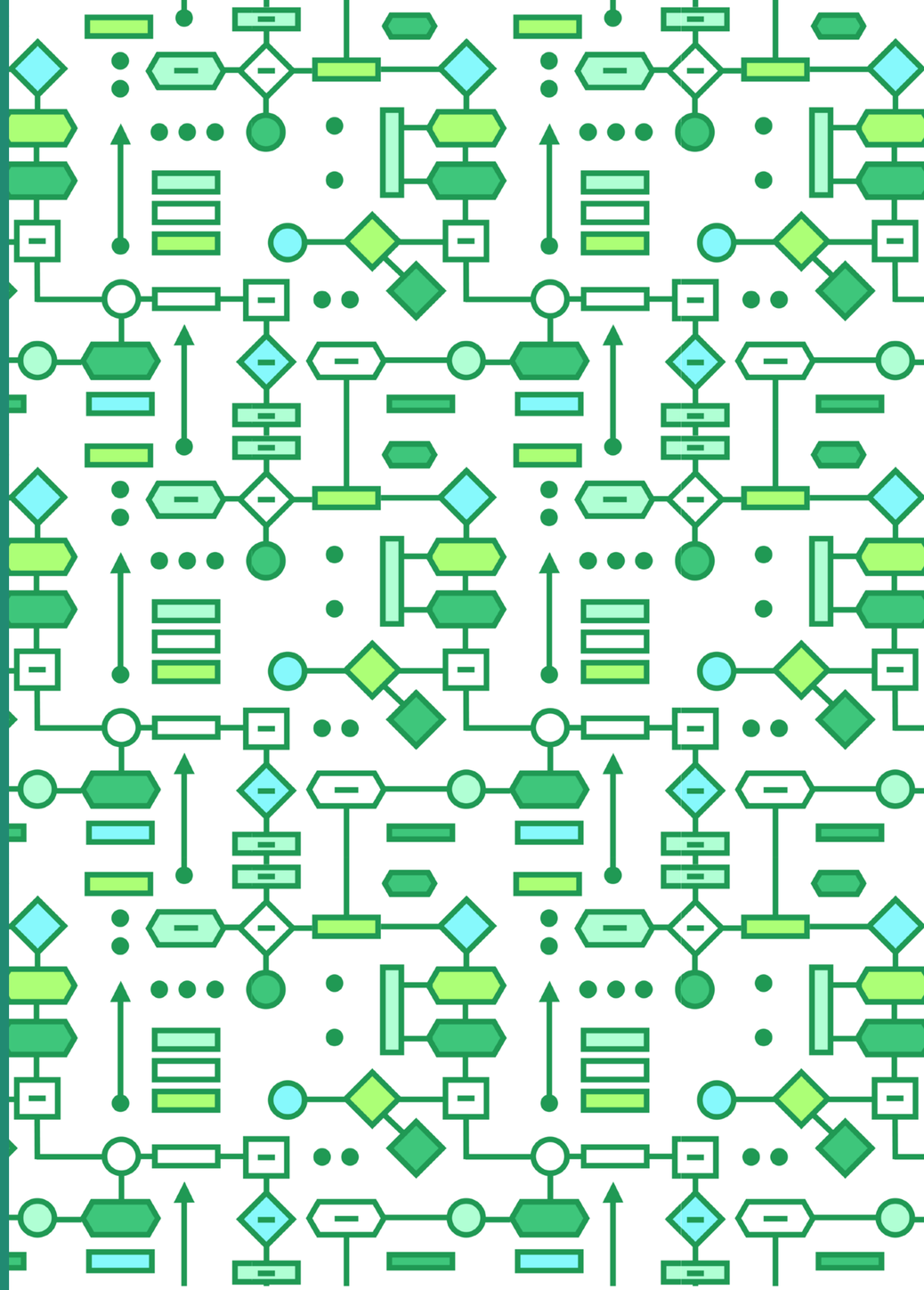
Talk about the scientific process

Focus on the bigger impact

Break

Activity

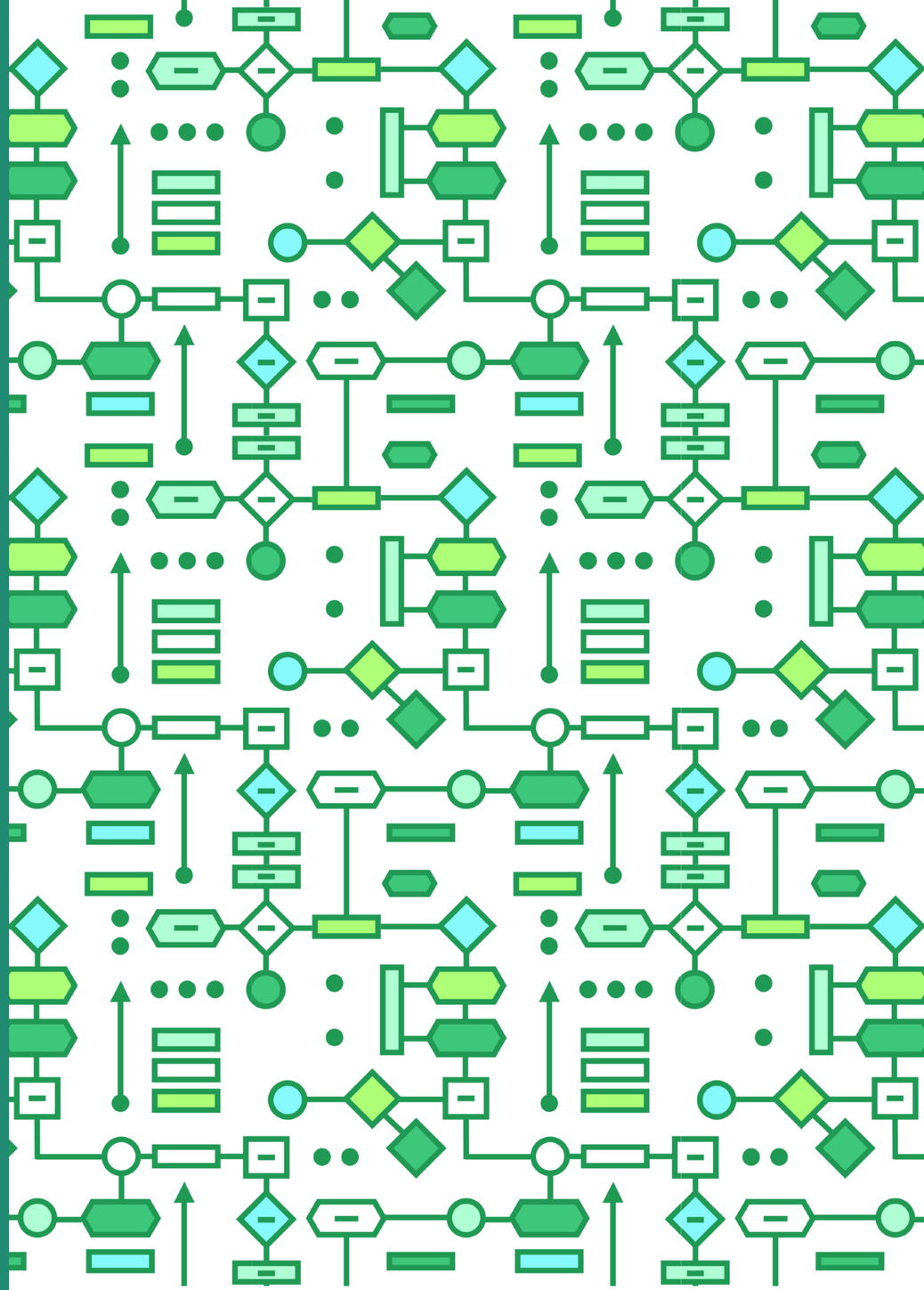
Case Study Development



Lunch

Presentation 2

Communicating Uncertainty



Dealing with Uncertainty

Thee Types of Uncertainty

- There are three types of uncertainty that are important in public engagement:
  - Conceptual Uncertainty
  - Normative Uncertainty
  - Scientific Uncertainty
- We will focus on the final one.

Are you comfortable saying “I don’t know”?

Scientific Uncertainty

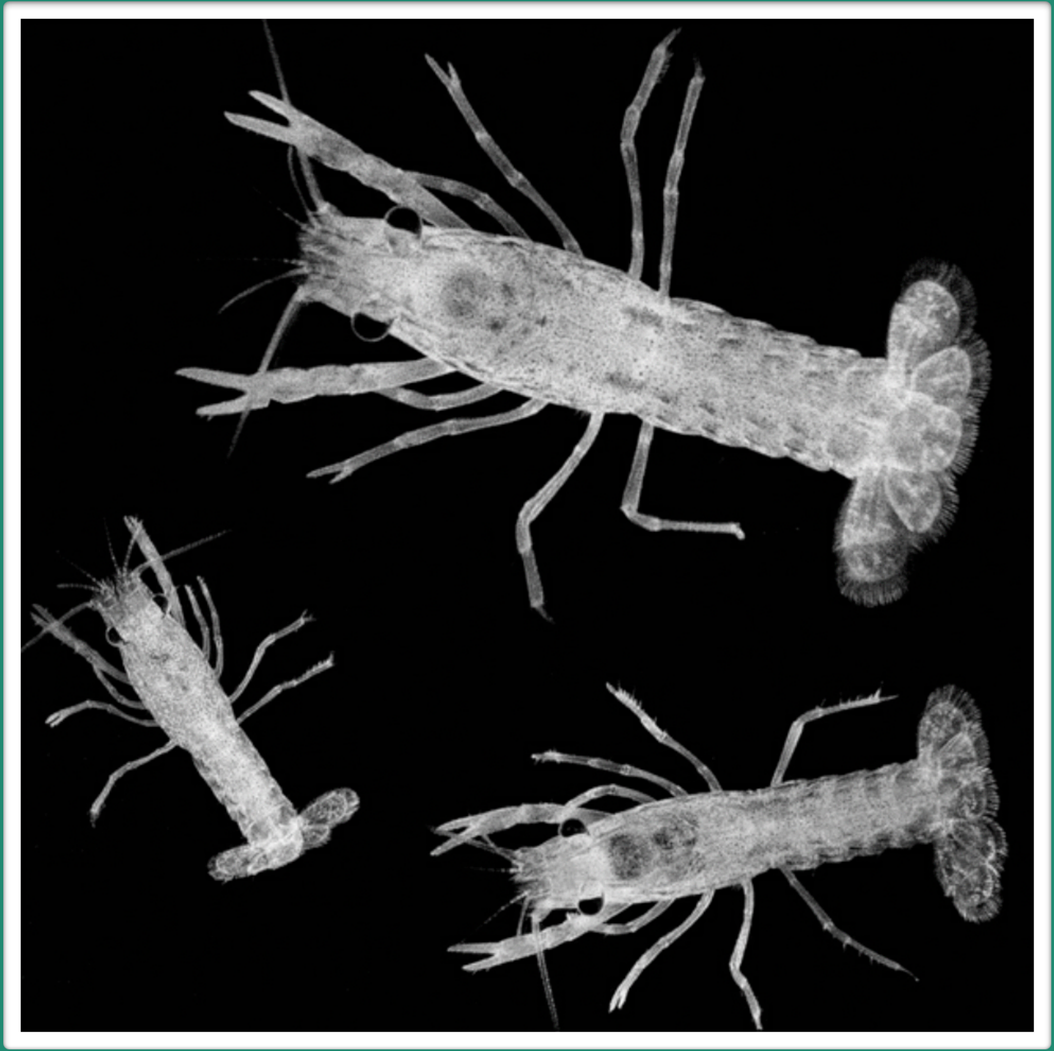
The Mysterious Marmorkreb

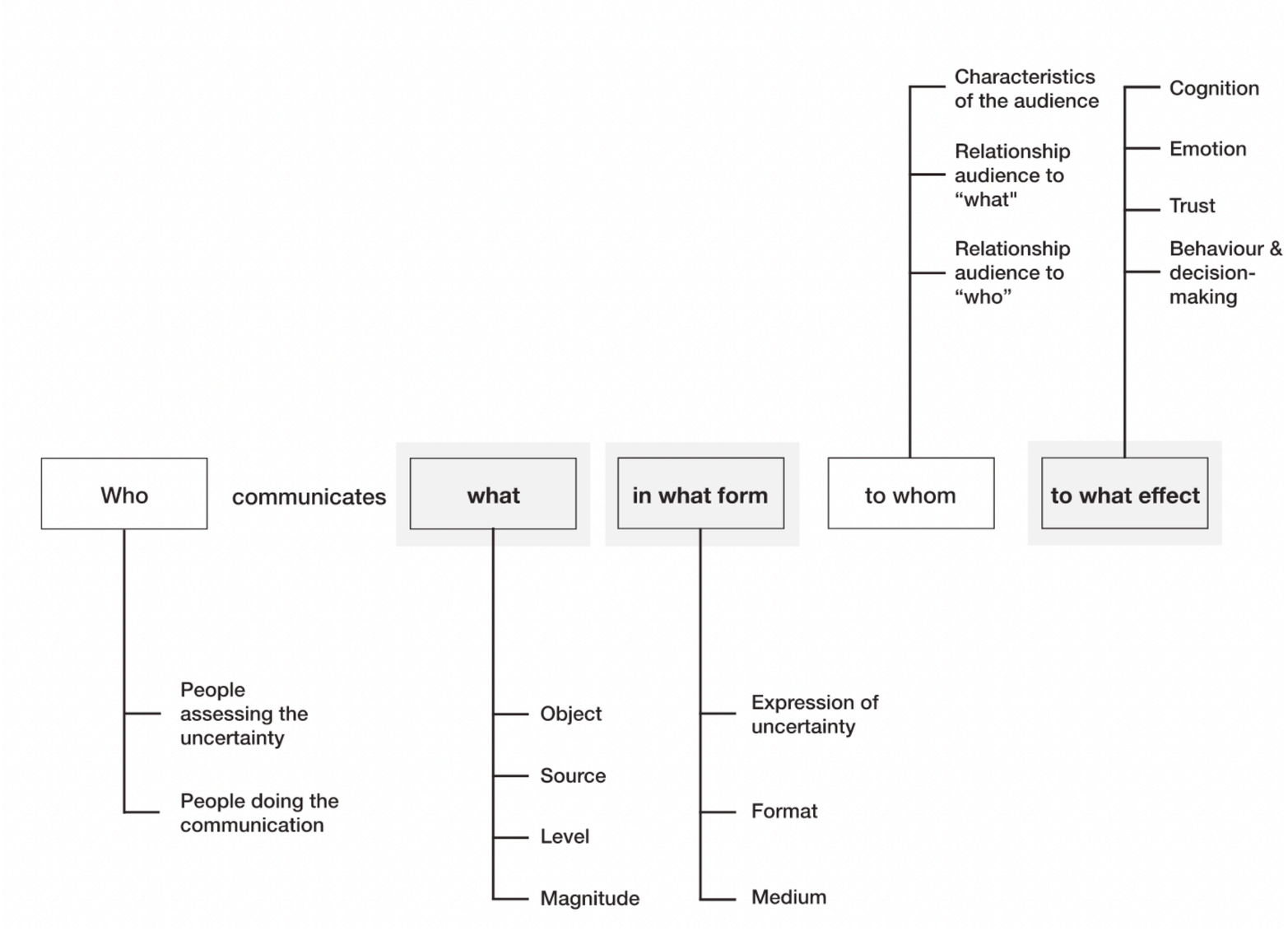
- Michael Blastland (The Hidden Half) recounts the strange case of the marmorkreb.
- In the late 20th Century, it was discovered that this particular species of decapods was parthogenic—the females could lay eggs without fertilisation.
- As natural clones, the marmorkrebs were ideal test subjects to explore the ongoing nature/nurture debate.
- An experiment raise two lineages in identical laboratory conditions.

Scientific Uncertainty

The Mysterious Marmorkreb

- There was significant variation between and within the populations, including size, colourings, and behaviour.
- Different explanations were put forward and tested—epigenetics, uncontrolled variation in starting environment or conditions—but were subsequently ruled out.
- Genetically identical organisms (nature) raised in identical laboratory conditions (nurture) still gave rise to phenotypic variation.



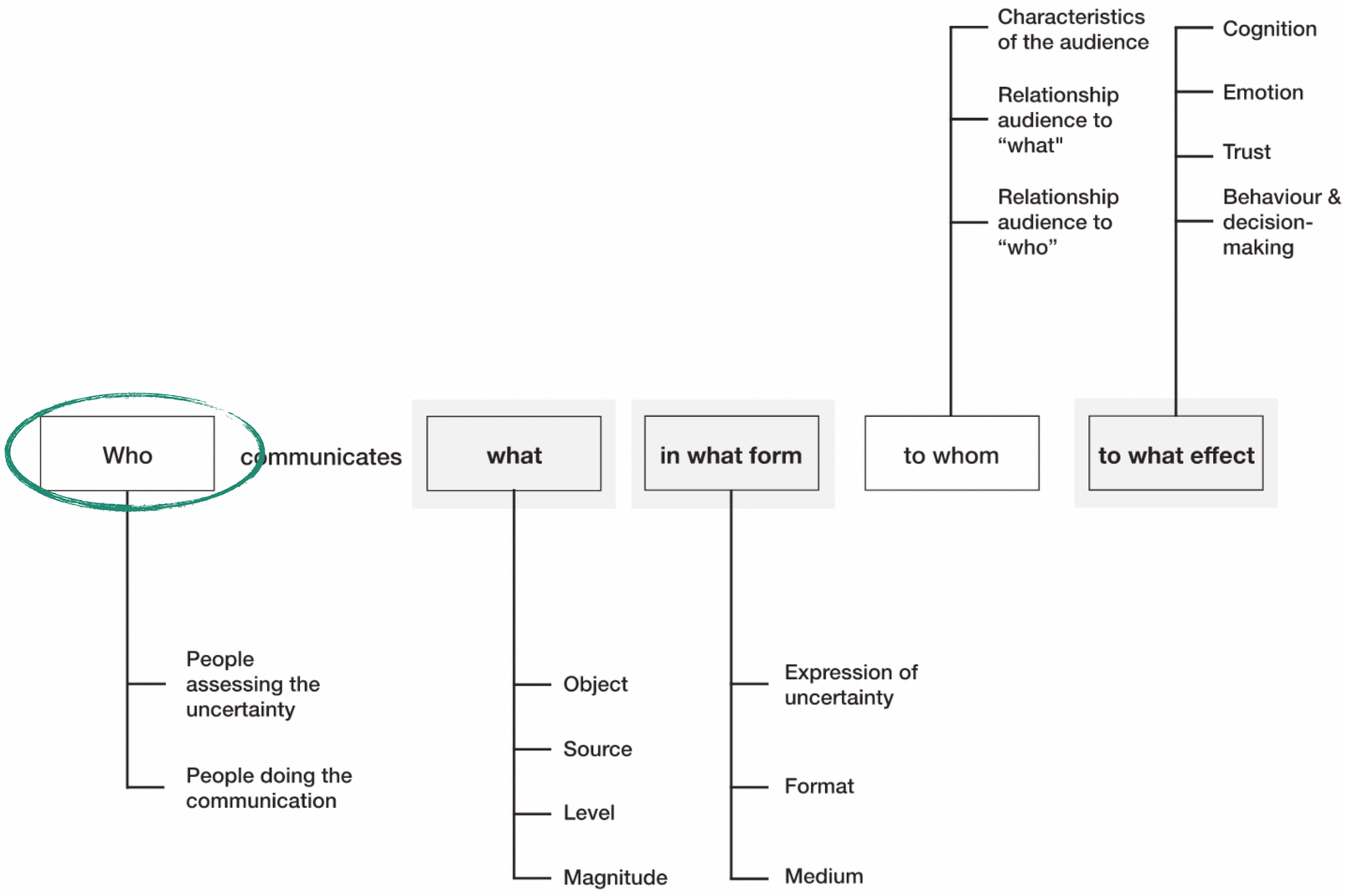


Communicating Uncertainty

A Framework

- Van der Bles et al. (2019) present a framework for communicating uncertainty
- Built from five main elements:
  - who
  - what
  - in what form
  - to whom
  - to what effect

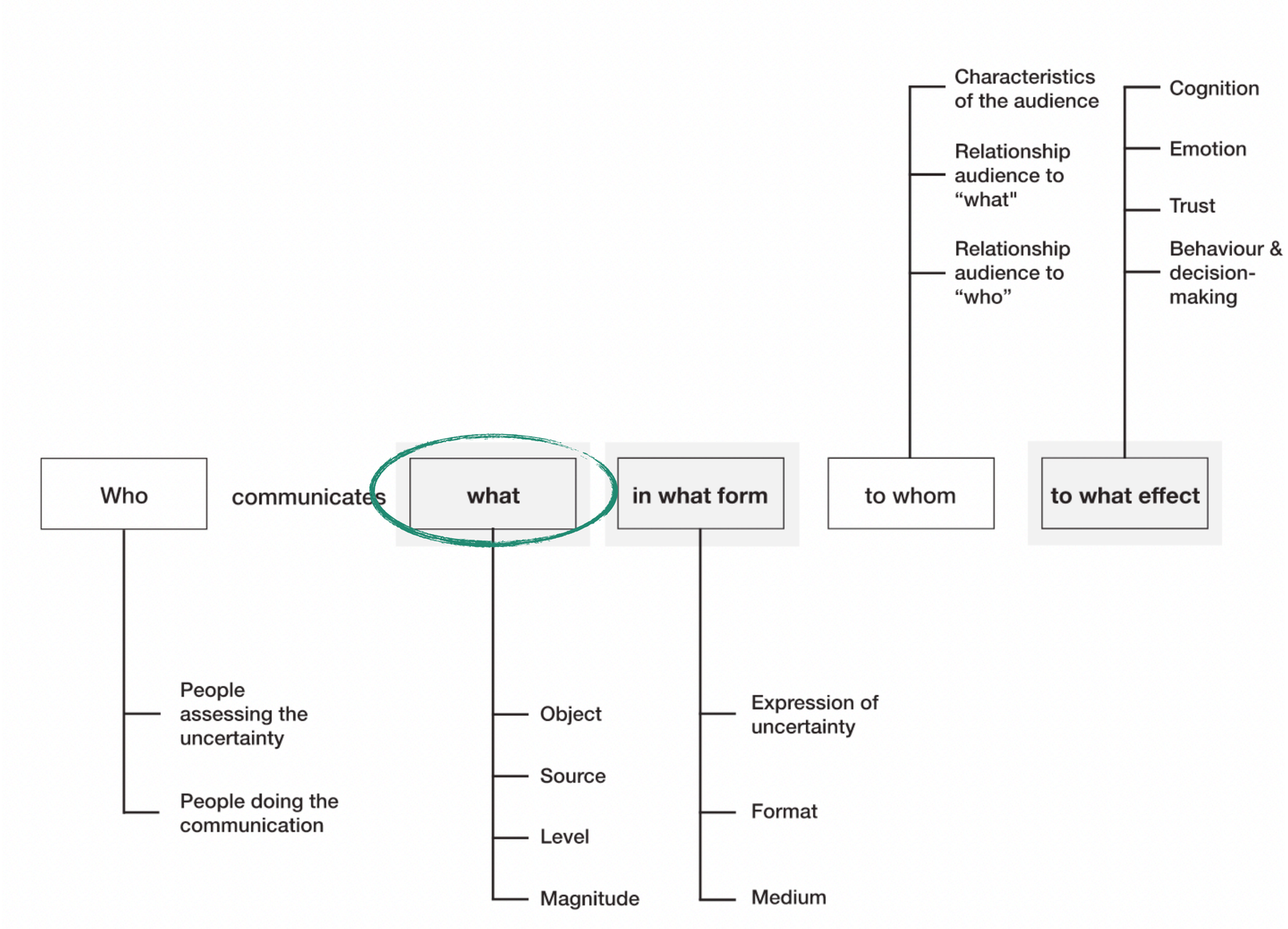
Van Der Bles et al. (2019) Communicating Uncertainty about Facts, Numbers and Science



Communicating Uncertainty

Who

- Who is assessing the uncertainty?
  - Are the audience technical experts or lay people?
- Who are the people doing the communication?
  - Issues such as source credibility are important.



Communicating Uncertainty

What

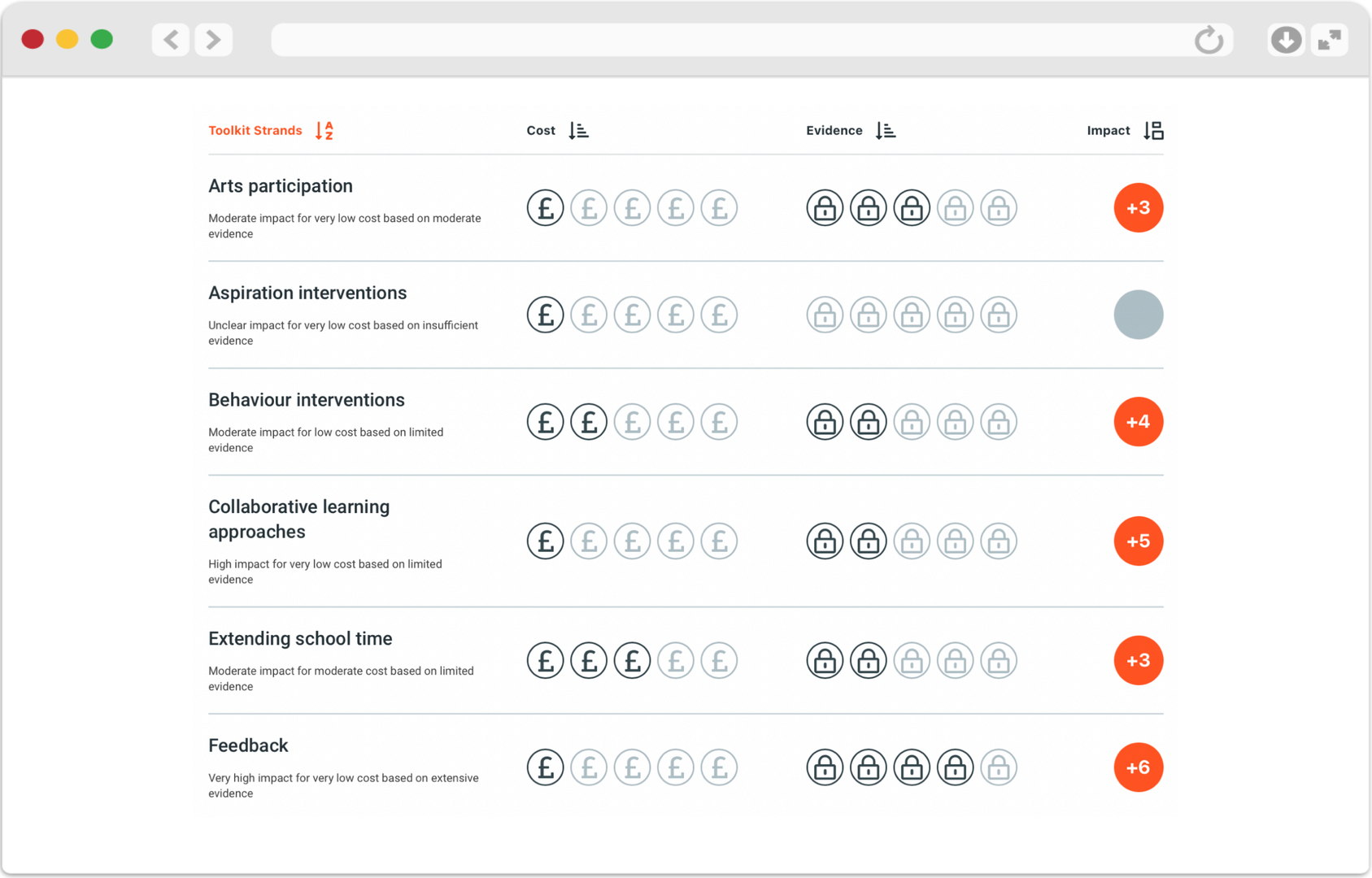
- Object:
  - Facts (e.g. whether there has been a security breach)
  - Numbers (e.g. quantities and parameters of a model)
  - Hypotheses (e.g. working assumptions about the state of the world)
- Source:
  - Variability in population
  - Measurement error
  - Limited knowledge
  - Expert disagreement
- Level:
  - Direct (i.e. about object)
  - Indirect (i.e. about quality of evidence)

In what form

Decreasing precision

i. A full explicit probability distribution
ii. A summary of a distribution
iii. A rounded number, range or an order-of-magnitude assessment
iv. A predefined categorisation of uncertainty
v. A qualifying verbal statement
vi. A list of possibilities or scenarios
vii. Informally mentioning the existence of uncertainty
viii. No mention of uncertainty
ix. Explicit denial that uncertainty exists

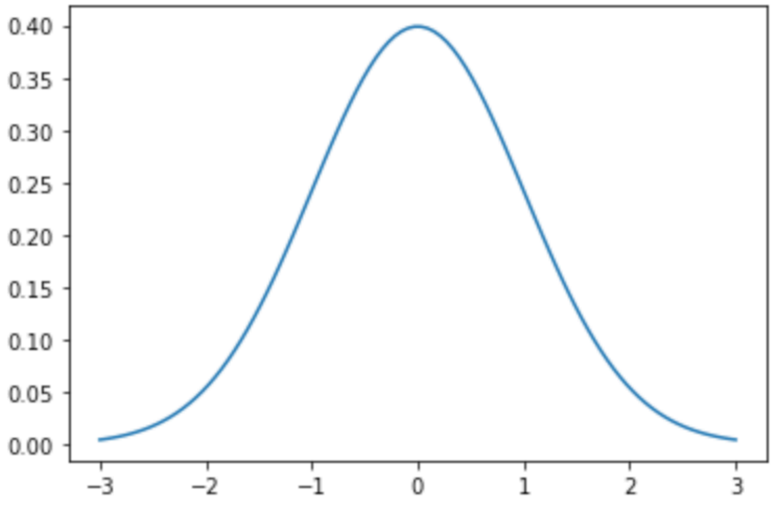
- The form of uncertainty can have a wide range of effects on communication.
- Simplifying can be an important aid for communication, but can also go too far and even spill into explicit denial.

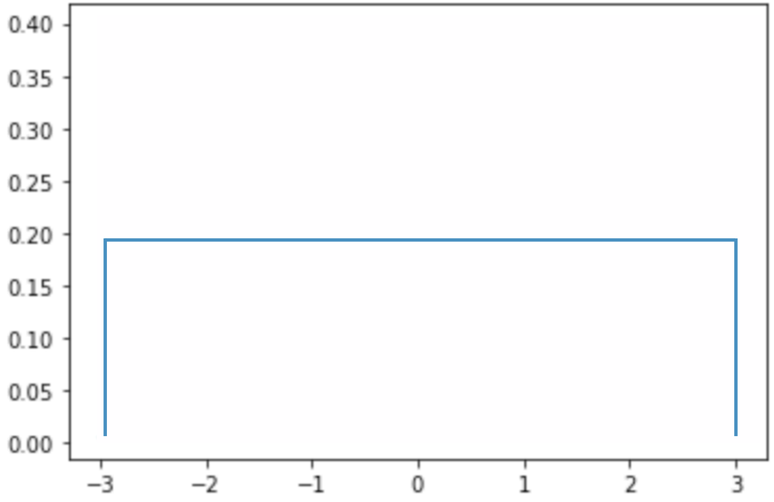


Communicating Uncertainty

Trade-Offs

- Recall this example from earlier.
- There is a trade-off we can see between the loss of precision and the ability to communicate effectively to the intended audience.





Communicating Uncertainty

To whom

- Uncertainty communicated to a skeptic can reinforce their existing beliefs (Dieckmann et al. 2017)
- Average global surface temperature: “perceptions of the distribution underlying ambiguous numerical ranges are affected by the motivations and worldviews of end users”
    - Climate change acceptance (normal distribution where higher values are more likely)
    - Climate change skeptics (uniform distribution where lower values are more likely)

Communicating Uncertainty

To what effect

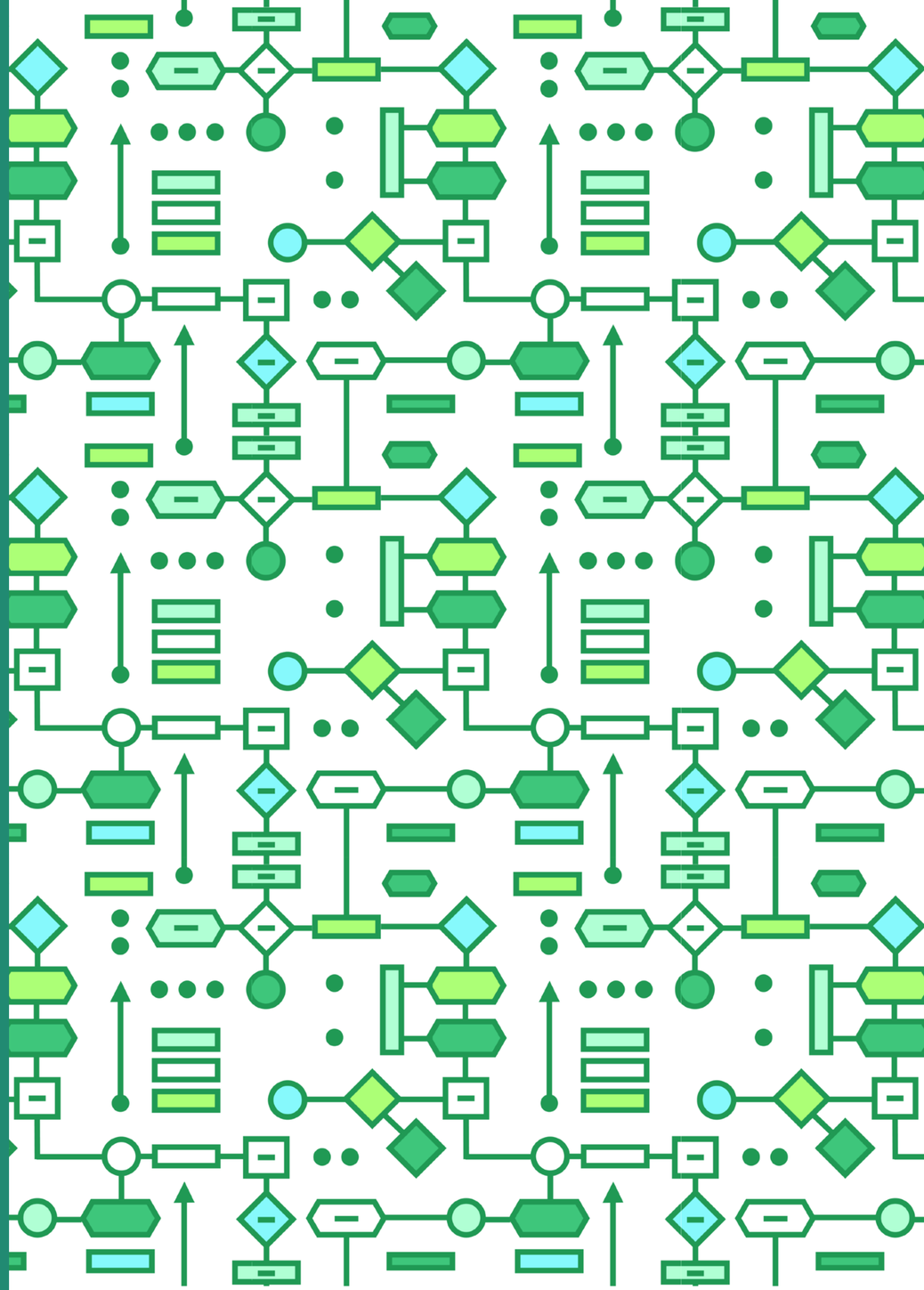
- What is the effect of ‘not knowing’?
- Scattered evidence:
  - Effect on cognition (e.g. consistent inferences or judgements from verbal statements)
  - Effect on emotion (e.g. ranges elicit higher anxiety than point estimates)
  - Effect on trust (e.g. over-confidence undermines credibility)
  - Effect on decision-making (e.g. uncertainty delaying decision-making)

Given the wide variety of factors, what should you do?

Given the wide variety of factors, what *will* you do?

Activity 2

Data Visualisation



Day 5

Tomorrow

- (Dis)trust in science and technology
- Showcasing your case studies
- Wrap-up and further resources

Thank you!

See you tomorrow!

The Alan Turing Institute

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