

Communicating scientific concepts to non scientific audiences can be difficult. Often, scientists rely solely on the strength of empirical evidence as an appeal to reason in public scientific discourse. Unfortunately, in a world where 'truthiness' has become an accepted part of life, public understanding and attitudes do not develop solely on objective reasoning. From climate change to evolution, vaccines to nuclear power, the science community finds itself on the defensive as shifting perceptions of authority and the narratives that frame scientific communication undermine public understanding of science.

This project draws on social science, rhetoric, and communication design to develop and evaluate communication strategies that both compete with science denial narratives and stand on scientific evidence to make the truth more compelling than its alternative. These strategies are in turn made actionable and prototyped as a set of guidelines and exercises for scientists and those who communicate on their behalf.

demanufacturing doubt

a design strategy for science communication

THE PROBLEM

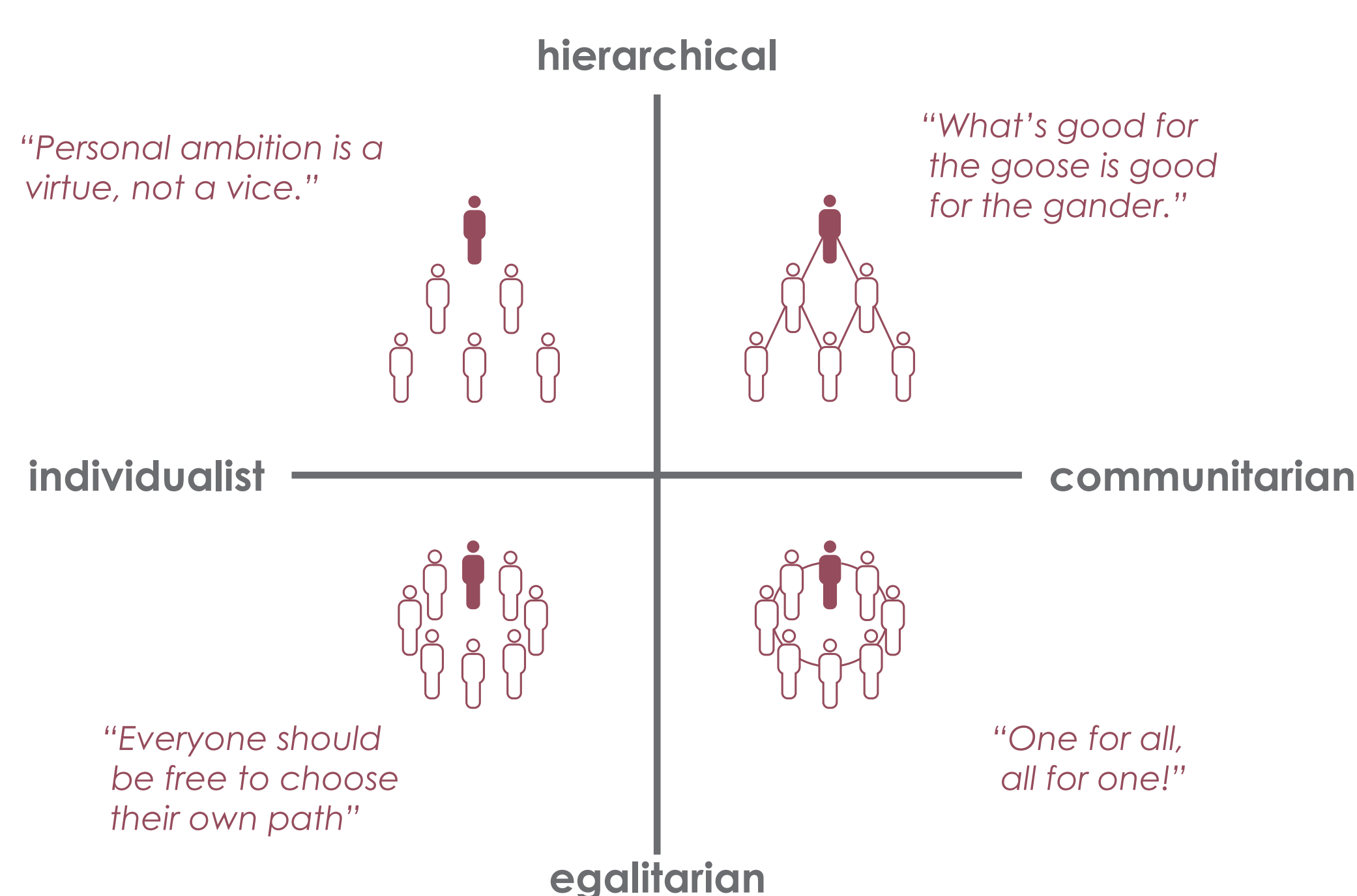
Hypothesis	Attempted Solution	Outcome	Why This Fails
people are:			
in denial	more data more logic	fail	people <i>do</i> trust scientists, but their values determine <i>who</i> they trust
misinformed	simplified information	fail	cultural worldview influences <i>how</i> people process information
irrational	marginalization	fail	people are willing to consider new info when it affirms their <i>values</i>

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RESEARCH

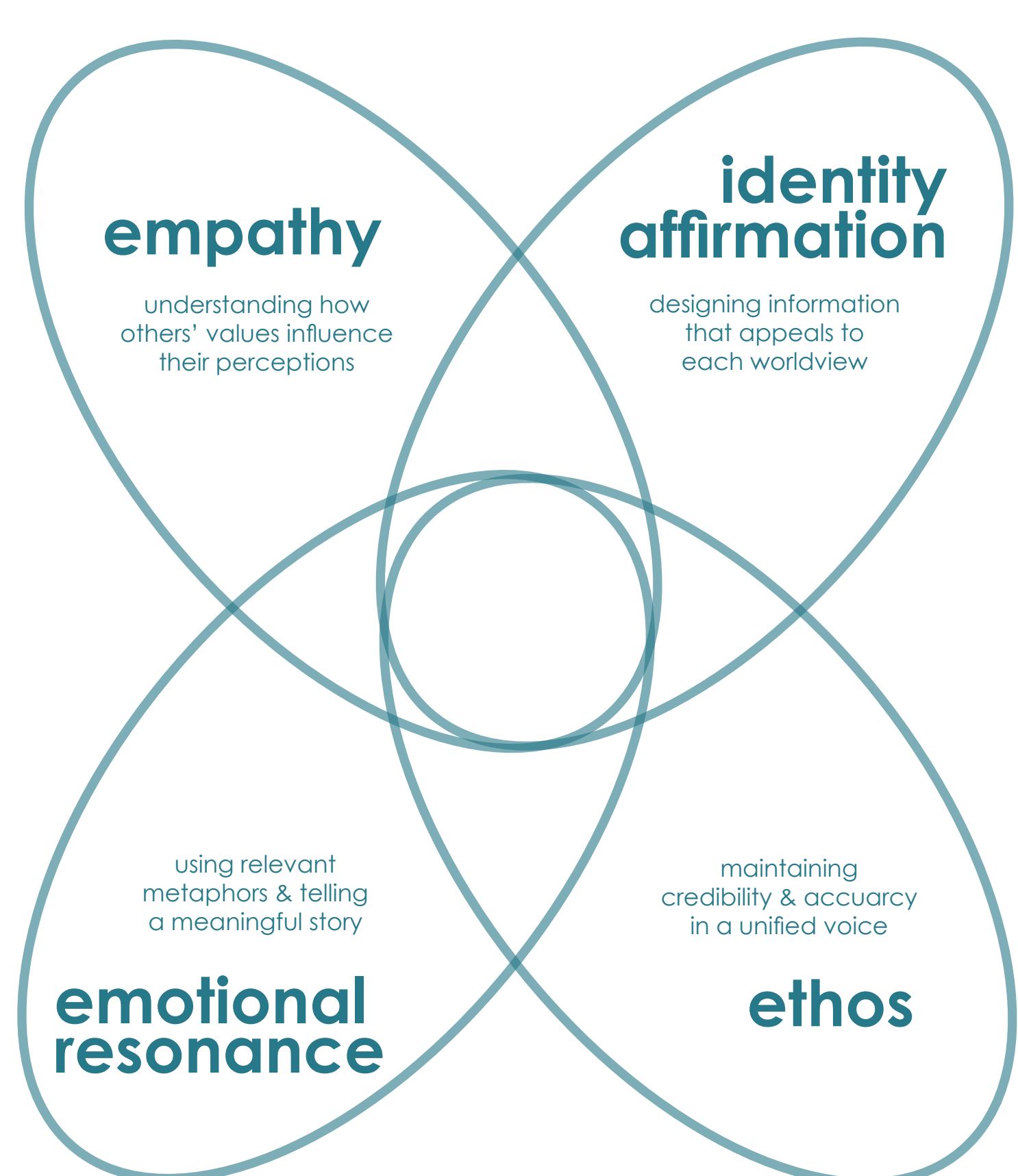
Social psychology and decision science provide a deep knowledge of how people interpret information. The concept of *cultural cognition* suggests that, more significant than education, gender, age, or any other characteristic, people tend to assess risk and interpret scientific information based on how that information fits or threatens our cultural worldview and values. This phenomenon influences how we assess consensus and who we deem credible enough to trust.

CULTURAL WORLDVIEW



When people deny scientific consensus or disbelieve a particular message, it's often because that information is framed in a way that threatens our particular values and worldview. In order to design within this context, we must first understand and *empathize* with different worldviews. Additionally, communication is most compelling and persuasive when it *affirms* cultural identity, is *emotionally resonant*, and communicated by people we perceive to share our values as *credible authorities*.

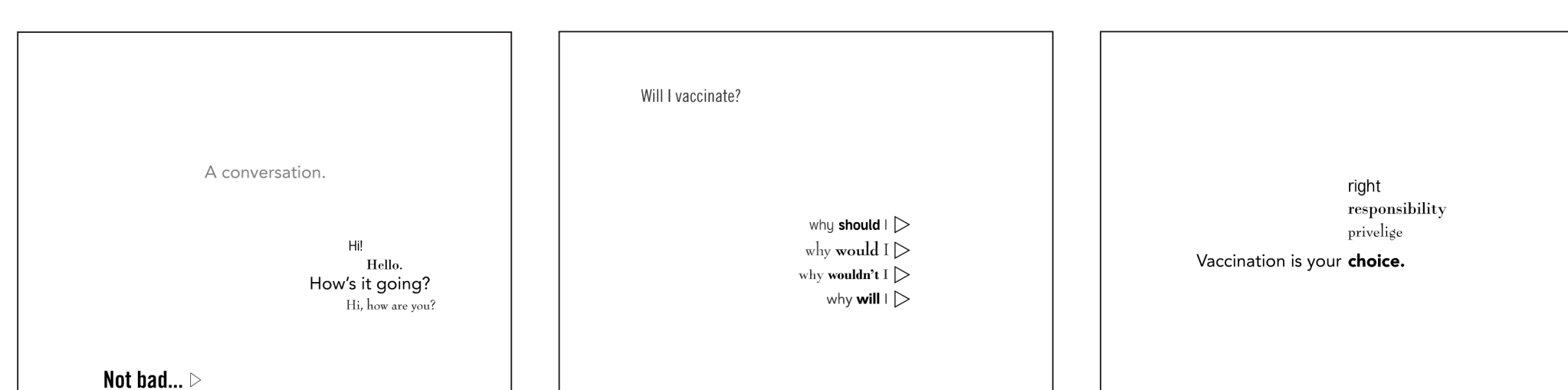
INITIAL FRAMEWORK



DEVELOP & EVALUATE

I applied this initial framework to the development of a communication prototype and solicited feedback from viewers about its effectiveness. This prototype, an informational piece about the benefits and risks of vaccination, produced insights about the effects of the communication artifact itself as well as the design process thereof, and informed a refinement of the framework.

APPLYING THE FRAMEWORK

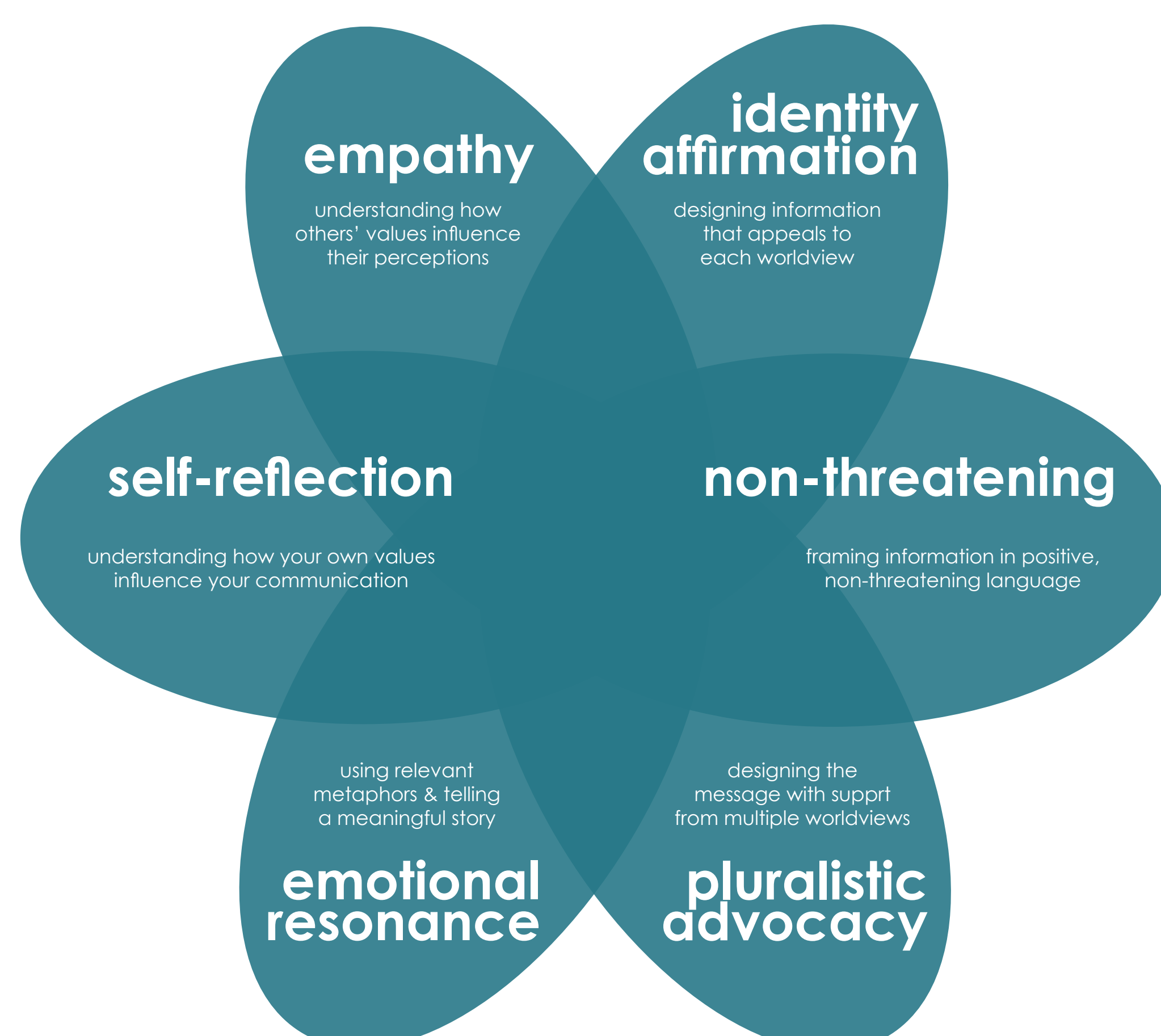


Vaccines: A Conversation About Choice

- empathy** for worried parents & anti-vaxxers
Research & survey to determine how values shape opinions and risk perceptions about vaccines
- identity affirmation** for different values
Design ways to communicate the risks and benefits of vaccines that speak to each worldview
- ethos** construction through a unified message
Include different tones and framing within a single vaccine message to maintain credibility
- emotional resonance** for those with concerns
Introduce the piece with a metaphor linking vaccines to seat belts.

Viewers with diverse values expressed a willingness to consider opposing views on the issue, many claiming they *"never thought about it that way before."* Evaluative feedback confirmed that framing information differently for each worldview successfully appeals to those worldviews; however, it was found that including several types of arguments *within a single unified piece* produces the greatest positive effect by affirming audiences' values and providing non-threatening access to alternative views simultaneously.

DESIGN STRATEGY FOR SCIENCE COMMUNICATION

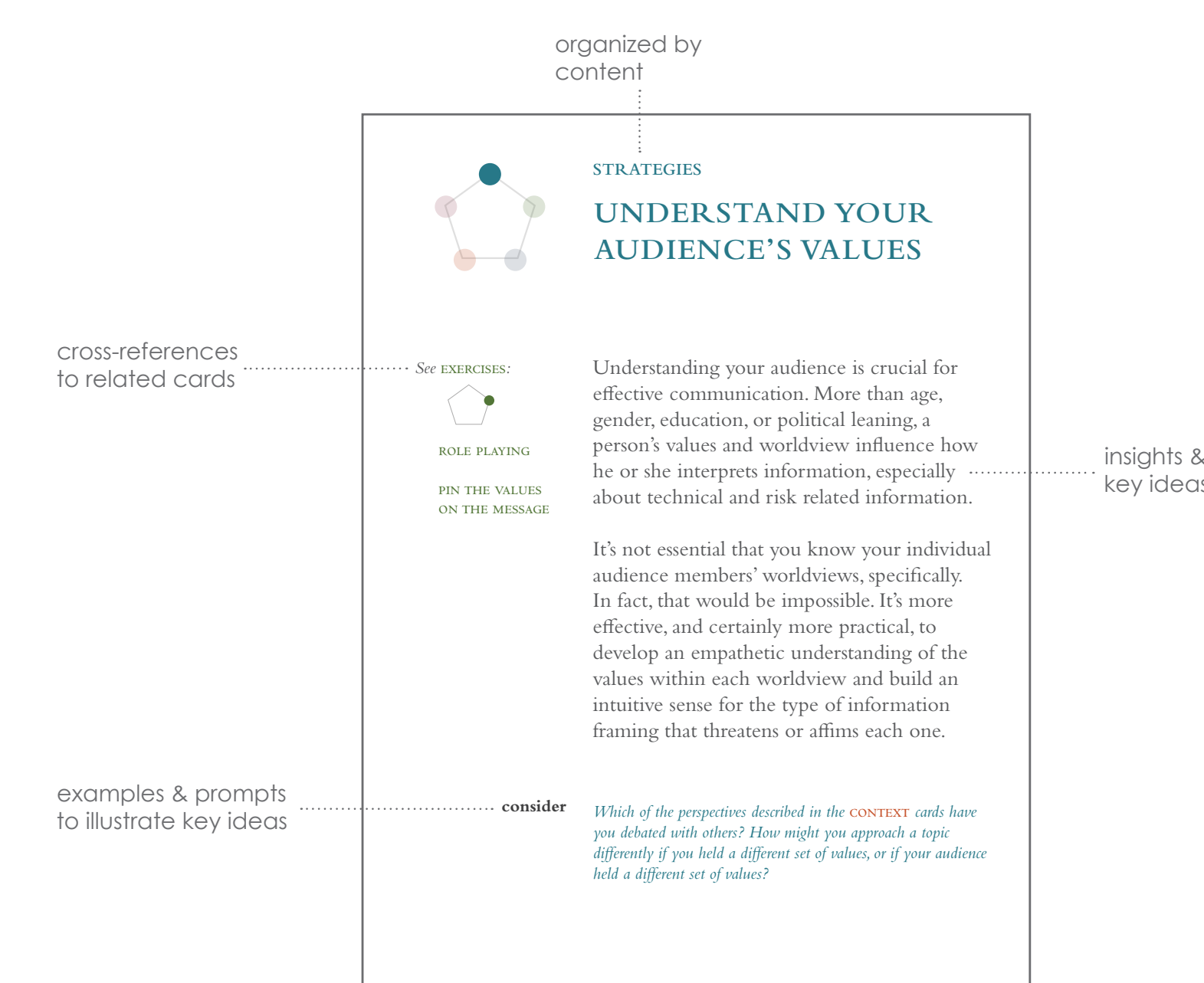


SOLUTION

With a refined communication framework in hand, the challenge became how best to share this design strategy as an actionable guide for the people most likely to use it. Working with Carnegie Mellon's *Public Communication for Researchers*, a campus group devoted to improving science communication education for graduate science students, I developed, prototyped, and evaluated a design tool for science communicators. This set of method cards accompanied a workshop and is designed to be used collaboratively in the process of science communication design.

DESIGN TOOLS

- VALUES**
explaining how values shape worldviews & influence attitudes toward scientific information
- STRATEGIES**
describing the six facets of the science communication framework & insights therein
- EXERCISES**
offering practical techniques that apply the science communication framework
- CONTEXT**
providing perspective with case studies & scientific papers that support the framework



Working with *Public Communication for Researchers*, I presented a workshop for two dozen students, researchers, and faculty to evaluate the communication framework and method cards as a practical design tool. After outlining the design strategies within the science communication framework and facilitating a handful of activities, I solicited feedback from 19 participants, who were asked to evaluate the framework based on its usefulness.

WORKSHOP EVALUATION

- 19 participants
- #1. "Can you see yourself using these strategies in the future?" YES
- #2. "What do you find challenging about science communication?"
- connecting to the audience & making things meaningful
 - being compelling without advocating
 - dealing with uncertainty & complexity
- #3. "What do you find most useful or relevant for your practice?"
- using metaphors to create a unified message
 - reflecting on my own values and my audiences' values everything!
- #4. "How do you think these strategies will impact your communication?"
- make it easier
 - more interesting
 - less frustrating
 - more deliberate
 - less emphasis on data & more on meaning

Thoughtfully crafted science communication can encourage understanding, discourage polarization, and defuse manufactured controversies when information is designed to **affirm diverse values in a unified message**.

Though journalists and other science communicators can benefit from this framework, scientists themselves are uniquely positioned to speak about their work and often least comfortable doing so. This science communication framework, ideally to be taught as part of a common curriculum for graduate science students, offers a design strategy that is **actionable and meaningful**.

6 people said these strategies **directly address** the concerns cited in #1.

14 people also said they look forward to using the cards **with colleagues**.