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Challenges in Rhetoric of Science and Technology: ARST Report

Gauging Public Engagement With Science and Technology Issues

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Public engagement in science and technology, defined as citizens' active involvement in the development of socio-technical trajectories, especially in policy setting and decision making, is considered to be critical by researchers across the disciplinary divide. This is particularly true when the scientific-technological endeavor is innovative, pertains to risk or uncertainty, and has caught the attention of politicians and the public because of its importance and relevance. Two prime examples of these scientific technological endeavors are nanotechnology and the science behind climate change. There are some good reasons for actively engaging the public in such endeavors, including gaining legitimacy or public trust, achieving better results when it comes to implementing new policies related to endeavor, and adhering to the normative commitment of democratic societies to abide by free flow of information and open processes of decision-making.

While the necessity of public engagement in science and technology in democratic societies is beyond doubt, it still remains unclear *how* exactly to engage the public in terms of the rhetoric and persuasive strategies.

This report presents an analysis of several effective rhetorical strategies, based on research being conducted by the authors that focused on such diverse topics as neuroscience images, museum exhibits about global warming, information literacy strategies, and (to a lesser degree) science dissemination using new media such as YouTube.

Effective Strategies

The authors particularly focus on engaging with various publics when new science and technology are recognized as impacting public life and policy making. Generalizing across the contexts studied, the shared features of the most effective strategies appeared to be the following:

1. Activating cultural memory,
2. positive engagement,
3. interactivity and invitation,
4. aesthetics, and
5. variety.

We will say something about each of these resources.

Activating cultural memory

Shared cultural heritage is a major component of group identity, be it national or trans-national. As such, shared cultural heritage is an effective factor only in the form of cultural memory. Cultural memory is not found in archives, but is defined as that knowledge of the past and its major products that citizens of any culture share as a human group at a given moment. This shared background is also helpful in that it simplifies the shift linking knowledge and action. Belief in the effectiveness of action is important for most instances of persuasion, usually referred to in the literature as self-efficacy. For topics such as climate change and nanoscience, individual action alone is often less effective than joint action. To achieve a greater possibility of joint action, the emphasis on a shared cultural heritage provides that sense of communal efficacy as a persuasive resource.

Positive engagement

Each presentation in the panel on public engagement addressed the question of *positively engaging the public*, especially when that public is uncertain. Overall, the panel believed that fostering positive engagement is more productive for change than eliciting negative emotions such as fear. Positive feelings make people believe that their actions can help make a change, that new technology isn't all "scary," and that they can understand how the scientific information they hear in the media may be misrepresented. A cognitive dissonance model that encourages, for example, risk-aversion or fear seems less effective, at least in these cases. Much of the panel's conversation returned to the badly conceived presumptions of the "deficit model": a model of the public understanding of science which states the public has a deficient understanding of science and is incapable of understanding science. As a panel, we believe the public is, in fact, capable of understanding, but needs encouragement and help to do so.

Interactivity and invitation

People attending an exhibit about global warming will be those who can afford it and who have the time and interest to do so. Because this sector of the public is interested in the topic, it is particularly interested in *open active engagement* with the topic. The self-selection of the audience suggests that in many cases audiences who are most likely to encounter any given rhetorical discourse about science and technology are already engaged to some degree and at least familiar with basic science-related topics. Similarly, active learning and interactivity is key in nanoscience imagery, so that images that invite viewers to puzzle-solve or compare, like metaphors, received the most attention.

While interactive engagement and active learning may be the best approach, it is still important to realize that individuals have different learning styles and prior knowledge bases. It is therefore advantageous in an attempt at persuasion and education to engage different learning styles and to present the same types of information in different ways.

Aesthetics

We determined that *aesthetics* is an important consideration when using visual communication in order to engage the public. Aesthetics in classical rhetoric is related to *enargia* and *euphonia*, the principles of vivacity in imagery and harmony in sound and its analogues. In the Monterey Bay Global Warming Exhibit, analyzed by Katz-Kimchi, clever and attractive design was very important to audience reception. Furthermore, in Martin's investigation of audience reception to nano typologies, she found that "fine art" images created by artists were the most positively received. Recently, research in psychology and cognitive studies has revealed that emotions change the way humans solve problems. According to Norman (2004), if aesthetics can change our emotional state this would help answer how it is that aesthetics can make something more positively received or even easier to use. Lupton & Phillips (2008) argue that traditionally designers work to explore questions of a universal "language of vision," as first introduced by the Bauhaus in the 1920s. Even with the overwhelming shifts in technology and globalization, the idea is to search out a framework in which to invent and organize visual content. Though postmodernists disagree with a universal way of describing visual forms and their universal significance, many designers today make distinctions between the universality of design principals (arguing that in fact are some universals) and that of interpretation. Designers point out that form may be influenced by such quantifiable sciences such as ergonomics or economics, but final design choices are made to satisfy conscious and subconscious desires of both the designer and the audience (Heller, 2004). Therefore, in order to engage the public using high quality aesthetic displays, it may be advisable to approach the problem with an interdisciplinary team of design/visual

rhetoric/visual communication experts who are familiar with appropriate visual strategies.

Variety

In addition to the importance of interactivity in public engagement, variety in public engagement efforts is very important to the engagement's success. As Jones (2001) explains in a review of public exhibits by *The Public Historian*, the exhibits that best deepen the public's understanding of an event or issue are those with a good amount of variety in addition to the substantive content, function of design, and appropriateness of the displayed media. Katz-Kimchi noted in her study of the Monterey Bay Global Warming exhibit that visitors were not repeatedly shown the same distressing images but instead they also encountered replicas of energy-efficient kitchens and appropriated iconic posters and advertisements. The change in tone and approach grabbed visitors attention and kept it long enough to summon contemplation or scrutiny. Much critical scholarship in visual studies literature examines a theory of visual pleasure that draws from concepts of scopophilia and the gaze. However, many people encounter visuals from a different approach, an approach with a different power relationship and conscious experience, one that more closely relates to Aristotle's concept of eudaimonic pleasure that evokes human wellbeing. This approach would better be described as "looking" as opposed to "gazing." Like the visitors to the Monterey Bay exhibit, a public engagement effort with a good amount of visual variety in addition to thought-provoking content invites a more ongoing, deeper visual experience, a eudaimonic experience, rather than a brief hit of pleasure with a quick look away that the public will soon forget.

Characteristics of Audiences:

In reflecting on what strategies are effective in engaging with various publics, it is also necessary also to note certain characteristics shared across the rhetorical situations in each case. The rhetorical situation we examined was characterized by audiences with the following traits.

1. An audience that has self-selected
2. A topic in which the science is diffuse, not belonging within a single recognized academic discipline, and not represented by any particular institutional body
3. A policy discourse that is influenced by the "technical sphere" discourse, but is influenced equally (or perhaps predominantly) by other public sphere discourses, such as economic and ideological positions
4. A rhetorical history that connects without actually creating much coherence
5. Rhetors who are resolved to positively engage the public. There is a particular predefined end, for instance

establishing/creating legitimacy and public trust or support – defined as "instrumental rationality" by Delgado, Kjolberg & Wickson, 2010

The general observation that rhetoric is constrained by and constitutive of an exigence continues to be an important starting point in understanding why these five strategies for rhetorical intervention might be the ones that are observed as recurring and at least partially effective in each of the cases presented here.

Case #1

Katz-Kimchi looked at a museum exhibit. The audience members that attended the exhibit were necessarily financially well-enough off to be able to afford it, and already sufficiently interested in the topic of climate change to elect to spend their limited time at this particular exhibit, from all the entertainment possibilities in the city. The *self-selection process* is less obvious in most other cases. Martin, for example, selected audience members more-or-less at random and asked them to peruse a selection of images. Thus it might appear that the audience members were selected by the researcher rather than self-selected. Nevertheless, the audience consists of people who are prima facie interested in reading and learning. Similarly the audiences for the media from which those images were initially drawn is self-selecting; individuals choose which magazines to peruse and which web-sites to visit. The self-selection of audiences is an important consideration for all persuasive engagement because we know that selective exposure means that the audiences drawn in are those most likely to be already sympathetic rather than requiring strategies to address a hostile audience.

Case #2

The label "climate change" in scientific discourse refers to a great array of research that is occurring at the present time in all of the traditional science disciplines and many new configurations. Today there are departments of "environmental science" being formed at more and more universities, but that label is not accepted as meaning the same thing everywhere. *Interdisciplinarity* has consequences for knowledge production, both positive and less than positive. It means that climate change research is not "disciplined" in the same way that, for example, organic chemistry is "disciplined." In much the same way, nanoscience has no single disciplinary or institutional "home." The cause in the case of nanoscience is presumably the cutting-edge newness of the research areas, but the array of consequences seems likely similar.

Case #3

Thomas Goodnight's theorizing about technical spheres and public (political) spheres of argumentation can provide a useful starting point for doing and theorizing rhetoric of science, although of course we understand that the spheres are never fully separate

(Goodnight, 1982) The overlap is nearly complete in the case of climate change discourses. The overlap is less obvious in the case of nanoscience, partly because many relevant stakeholders are less engaged. The challenge for nanoscience is clearer in considering the economic and market-based spheres of argumentation that overlap with the technical sphere.

Each of the strategies recommended here focuses on enhancing an audience's capacity for critical thinking and information literacy. This is important for ethical reasons of course, but it is also a particularly strong need for rhetorical situations where the situation itself is less defined. The rhetorical history for nanoscience is complicated by our usual presumptions about technologies "evolving" or building upon one another, because it is not clear how to categorize the new developments in relationship to what has gone before. Similarly, there is no agreement about a "grand narrative" that environmental discourses can fit within to make sense more easily.

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