Media Literacy as a Key Strategy Toward Improving Public Acceptance of Climate Change Science

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Media Literacy as a Key Strategy toward Improving Public Acceptance of Climate Change Science

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Without public trust of climate change science, policymaking in a democratic society cannot address the serious threats that we face. Recent calls for proposals to increase "climate literacy" from federal agencies such as NASA, NOAA (National Oceanic and Atmospheric Administration), and the National Science Foundation illustrate the urgency of this crisis. Although more climate change education is certainly needed, focusing solely on climate literacy will not garner public trust and may leave out high-impact media literacy education. Climate change deniers have been more effective "educators" than scientists and science educators because their messages are (a) empowering, built on the premise that every individual can quickly learn enough to enter public discourse on climate change; and (b) delivered through many forms of media. A more effective strategy for scientists and science educators should include not only discourse approaches that enable trust, with emphasis on empowerment through reasoning skills, but also approaches that embrace the maturing discipline of media literacy education.

Keywords: informal science education, global warming, public understanding of science, public engagement with science, science literacy

For almost three decades, scientists have recognized the synthesis of research regarding current and projected threats that ecosystems face from anthropogenic global warming (NRC 1983, Walther et al. 2002, Parmesan 2006), as well as threats to national security, public health, and economies (IPCC 2007). Nevertheless, there is a lack of strong US policies to address climate change. This disparity between science and policy points to the existence of an urgent problem: Democracy-formulated policymaking cannot address climate change without public acceptance and trust of climate change science. The urgency of the situation is reflected in the recent calls for ways to increase "climate literacy," the public understanding of human influence on climate and climate's influence on humanity, from federal agencies such as NASA, NOAA (the National Oceanic and Atmospheric Administration), and the National Science Foundation (*www.asu.edu/lib/hayden/govdocs/docscite/docscite.htm*).

Do we need to improve climate literacy? At least a slight majority—and possibly a large majority (Krosnick 2010)—of the American public thinks that global warming is a serious issue (Maibach et al. 2009). Additionally, the majority of Americans trust scientists as the most reliable source of information on climate change (Maibach et al. 2009), and scientists continue to hold enormous clout with the public (Nisbet and Scheufele 2009). Although the strength of evidence for this varies among different survey results, it seems that the lack of political action is not a result of a lack of public knowledge about climate change. Even if a public knowledge deficit exists, scientific literacy historically has not been a necessary condition for public support of science and science-based policy (reviewed in Nisbet and Scheufele 2009).

Although additional climate change education is desirable, maintaining the current approaches to climate education is not the most effective strategy for gaining public trust in science. At least two features of the traditional informal science education (ISE; i.e., science education outside of schools) approach to climate change contribute to the gap between science and policy. First, traditional ISE relies on an educational model that fails to emphasize critical thinking and is aligned with a deficit perspective. A deficit perspective works on the assumption that those without scientific knowledge have a deficit that needs to be filled through the one-way transmission of information from experts to learners. Second, traditional ISE does not address, and may exacerbate, the policy gap as driven by intentional and unintentional influences at work in a media-laden world. An effective strategy for scientists and science educators involves a shift toward approaches that enable trust, emphasize empowerment through reasoning skills, and embrace the maturing discipline of media literacy education.

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The problems

Numerous problems have contributed to the gap between public knowledge and policy action. I outline several below.

The traditional ISE model. The prevailing approach to communicating science outside the classroom in the United States has been a model called the public understanding of science (PUS), also known as the science literacy model (Nisbet and Goidel 2007, McCallie 2009). This type of ISE is often described as “transmission” of content (and to a lesser extent, the process) from the scientific community to society with the stated intention of enhancing lives and solving problems (Durant et al. 1989, Rennie and Stocklmayer 2003, McCallie 2009). This transmission of scientific knowledge to the public typically is not through direct communication between scientists and the public but is instead through intermediaries such as informal science educators or charismatic scientists acting as spokespeople in one-way communication. Informal science education organizations have acknowledged their own slow response in addressing controversial scientific topics (Koster 2006, Semper 2007). Public displays at science centers often fail to describe emergent social and ethical issues associated with science issues such as climate change and genetically modified foods (Bradburne 1998), and neglecting to do so may be counter to their structure, mission, and approach to science education (Ogawa et al. 2009). Thus, the primary approach to science education has been a PUS model under which scientists and science educators fill the information deficit of the public and emphasize the “unlearning” of misconceptions (e.g., Fraknoi 2005). It has often been assumed that people with high science literacy (low deficit) are more likely to accept and support science, but recent research does not support this assumption (Allum et al. 2008). Research by ISE professionals shows that public acceptance of scientific knowledge requires a level of trust that can be garnered only through certain types of engagement with science (Lewenstein 2002, COPUS 2006). Therefore, education must be viewed more comprehensively instead of as the delivery of information to “fill” people with knowledge.

Furthermore, ISE often has focused on teaching scientific analytical reasoning limited to formulaic hypothesis testing and methodological concerns, without inclusion of other forms of reasoning also crucial to science, such as logic and identifying and analyzing arguments (Dick 1991, Sawyer 2006, Bell et al. 2009). Critical thinking, the ability to purposefully evaluate statements (Dick 1991), has not been prominent in public communication of science, but an authoritative tone has.

Intentional use of mass media by climate change deniers. The deficit perspective and limited forms of reasoning in the traditional approach to ISE have become major liabilities, exploited by climate change deniers (i.e., those who oppose policy changes to address climate change). Climate change deniers have consciously used an empirical understanding of their audiences to create media frames that reinforce partisanship and undermine public concern (Nisbet and Scheufele 2009). The global warming controversy can be viewed as a framing contest between those who support and those who oppose action to address climate change (McCright and Dunlap 2000). For example, the failure of the United States to ratify the Koyoto Protocol has been attributed to successful efforts by conservative think tanks aligned with prominent climate change skeptics (with fossil-fuel industry ties) to counterframe and redefine climate change as an insignificant societal problem (McCright and Dunlap 2003). Laypeople typically view all scientific viewpoints as equally valid, and therefore naturally value a “skeptical scientist’s viewpoint,” which also resonates with the desire to maintain the status quo until uncertainty is resolved (Corbett and Durfee 2004). In the context of climate change, many news sources have framed the science of climate change as a two-sided debate, creating bias in the name of media balance, which has greatly overamplified the voices of a relatively few climate change deniers (Boykoff and Boykoff 2004).

As with tobacco media campaigns several decades ago, there is an active effort to disseminate misleading information about scientific knowledge, processes, and integrity regarding climate science (McCright 2007, Oreskes and Conway 2010, Pooley 2010). Corporate financial contributions to think tanks such as the Competitive Enterprise Institute and the George C. Marshall Institute support the production of seemingly distorted “educational” media. For example, the Marshall Institute produced *The Cocktail Conversation Guide to Global Warming*, which provides quick answers to counterclaims by so-called climate alarmists. Even though the content does not accurately reflect climate science, the educational message is empowering, built on the premise that each individual can quickly learn enough to enter public discourse on climate change. Most interesting, however, is that the approach of climate change deniers often forgoes the PUS model, which assumes that disparities between science and policy can be attributed to public ignorance (Groffman et al. 2010). Instead, climate change deniers are succeeding by promoting the public’s application of critical thinking to the topic. When critical thinking skills are not taught honestly and comprehensively, teachers can fail to create healthy skeptics and can instead produce cynical and pessimistic thinkers (e.g., Mihailidis 2009). Moreover, the policy gap and opinion polls are consistent with the notion that the outreach approach of climate change deniers outcompetes the approaches of ISE professionals (PRCPP 2009a). Opinion polls show that public doubt about the importance of climate change is sufficient to prevent government action (e.g., only 30% hold the opinion that addressing climate change should be a top government priority; PRCPP 2009b). The public’s perception of controversy prevents action, not the science itself, as the majority of Americans (88%) are actually personally convinced by climate change evidence (Krosnick 2010).

Climate change deniers also bolster their effectiveness by using multiple media formats, including print press, television punditry, talk radio, magazines, journals, the blogosphere, and syndicated columns, as well as a diversity of messages (Moser 2007). An example of the effectiveness of this strategy is seen in the US media's coverage of climate change tipping points: Almost half of the information that appeared in the United States regarding tipping points consisted of opinion commentaries by syndicated columnists, illustrating the failure of the US media to reinforce messages from the scientific community (Antilla 2010). Thus, again, a highly visible minority viewpoint can cause disparity between mainstream science and public policy.

Unintentional influence of the media. Traditional ISE methods are unable to adequately educate the public about controversial topics such as climate change because numerous sources of information counter or distort, rather than reinforce or clarify, scientific knowledge. The amount of information citizens receive directly from scientists or science educators pales in comparison with the enormous amount of information received from media types constructed for intents other than science literacy or public engagement in science (McBean and Hengeveld 2000). Media for purposes of entertainment or persuasion, rather than education, may set cultural trends (e.g., consumerism, partisanship) in which information about climate change, as framed by scientists, does not resonate (Nisbet and Scheufele 2009). Also, as Nisbet and Scheufele (2009) pointed out, the massive amount of content in the media system plays on the human tendency to make decisions quickly and heuristically, rather than through in-depth reasoning (reviewed by Nisbet and Scheufele 2009).

Children get more environmental information (83%) from the media than from any other sources. Without direct instruction on how to critically analyze and question information from the media, students typically rely on the first or most abundant information they encounter and ignore conflicting or less abundant information (Stahl et al. 1996). For most adults, media, particularly local television news programs, are the only steady source of environmental information; these sources may improve their awareness of environmental issues but not their knowledge (Coyle 2005, PRCPP 2008).

If we examine the methods of climate change deniers, and not the content of their messages, we can better understand their success. To summarize, I hypothesize that climate change deniers have been effective "educators" because they (a) couch their messages in an empowering approach that avoids the pitfalls of a deficit perspective and (b) deliver their messages through many forms of media.

The solutions

The public engagement in science (PES) model was developed partly in response to the alignment of the PUS model with a deficit perspective and its ineffectiveness with topics relevant to public policy. To complement the PUS model's goal of improving science literacy (McCallie et al. 2009), the PES model places greatest emphasis on promoting public trust in order to motivate and empower citizens to make decisions about environmental issues (Groffman et al. 2010). To build trust, the PES model focuses on mutual learning by citizens and scientists (and policymakers). In contrast to the PUS model's adherence to a deficit perspective, the PES model attempts to create coconstructed knowledge (Sawyer 2006) or coproduced knowledge (Bucchi 2008) through discussions that combine scientific understanding with knowledge from other domains. Given that scientific knowledge is only one of many factors involved in policy decisionmaking, the PES model works on the explicit assumption that the contributions (perspectives, ideas, knowledge, and values) of nonscientists are integral to discussions and policy decisions about science and technology (Leshner 2003, Bucchi 2008, McCallie et al. 2009). Within the ISE field, the PES model operates through events, activities, interactions, or experiences that allow for two-way communications and deliberation following the premise that, as when discussing politics, deliberation with others enhances knowledge while getting people involved and invested in the issue (McLeod et al. 1999, Nisbet 2003). The PES model aims to empower people to value their knowledge and participate in the science process (ownership in science) rather than feel that science is inaccessible. Because the focus of PES is decisionmaking, PES experiences relate to subjects with strong socioscientific components, such as stem cell research, cloning, evolution and science education, genetically modified foods, nanotechnology, and climate change (AAAS 2008).

Public engagement approaches are most often implemented at local scales, for example with public screenings of documentaries paired with expert testimony and deliberation (Nisbet and Scheufele 2009). The movie *An Inconvenient Truth* used a deficit perspective (inherent in the PUS model); its primary mode of communication was instruction through a lecture-type format in which information is delivered to the audience. In contrast, the incarnation of *An Inconvenient Truth* as The Climate Project, a global network of individuals trained by Al Gore to give presentations in their local communities, has a strong potential to adopt PES approaches.

A future direction for PES approaches concerns national-scale citizen science, the involvement of the public in professional scientific research. Citizen science often accomplishes the dual goals of advancing scientific research and providing engaging informal science education experiences (Bonney et al. 2009). Although many undocumented citizen science efforts occur at the local scale as expressions of public concern over environmental degradation, there are also projects that demonstrate citizen science's capacity to operate at large, national scales, albeit usually with public involvement limited to data collection (Cooper et al. 2007). Combining interests in local policy decisions regarding global issues with national-scale citizen science could foster public engagement in science through the use of online participatory tools such as blogs and social media applications (e.g., Facebook and YouTube; Nisbet and Scheufele 2009).

Dropping the deficit perspective from the PUS model and promoting the adoption of PES approaches by scientists and science educators could go a long way toward improving public understanding of climate change. In addition, because all informal science education efforts occur within a broader context of the popular media, another critical piece of an effective education strategy is to embrace the maturing discipline of media literacy education (Hobbs and Jensen 2009).

In its common usage, literacy refers to the ability to read, write, communicate, and understand language. Literacy education can transform power relations (Street 1985) and is commonly viewed as a form of empowerment because literate people have more personal, political, and social freedom, as well as more economic mobility, than illiterate people (Freire 1970). It is easy to see how basic literacy is essential to success in modern societies.

Definitions of literacy continue to evolve because as society and technology change, so do the skills required to achieve the same competencies previously conferred by basic reading and writing skills. In recent decades, many have argued that the large influx of visual, electronic information to a public with low media literacy has had far-reaching effects, such as creating unrealistic expectations of beauty (Heinberg 1996), societal emphasis on consumerism (Schor 2004) and instant gratification (Barber 2007), and possibly increased adolescent sexual activity (Brown 2000, Escobar-Chaves et al. 2005). A media-literate person knows not just how to read and write but also how to interpret personal biases reflected in media, how to identify misinformation and propaganda, and that the media are constructed. The National Association for Media Literacy Education (NAMLE; 2009) perhaps put it best: "The purpose of media literacy education is to help individuals of all ages develop the habits of inquiry and skills of expression that they need to be critical thinkers, effective communicators and active citizens in today's world."

Media literacy is nonpartisan and aligns with the principles of the First Amendment and freedom of expression rather than with censorship. In many ways, media literacy education holds the same promises initially attributed to science education. The strength of media literacy is its ability to inspire independent thinking and foster critical analysis, with the ultimate goal of making wise choices possible. The principles of media literacy education are transferable across topics and are not content specific.

The foundation of media literacy education is developing the awareness of one's "media diet," that is, recognizing media in all of their forms in order to effectively evaluate different representations of reality (Thoman 1998). Once the foundation is understood, often through creating media messages, along with an understanding of common techniques (e.g., framing), the critique of media messages becomes possible.

Just as critical thinking and scientific reasoning can be taught through deliberation and Socratic questioning, media literacy education can be presented as a set of questions to be answered in investigating how we make meaning of information. The NAMLE (2009) summarized the key questions in media literacy grouped into three phases, which I review below.

Phase one: Audience and authorship

All media messages have bias, and the following questions regarding the audience and authorship help determine the extent and significance of the bias. These questions are highly relevant for learning to identify corporate information laundering: (a) Authorship: Who made this message? (b) Purpose: Why was this made? Who is the target audience (and how do you know)? (c) Economics: Who paid for this? (d) Impact: Who might benefit from this message? Who might be harmed by it? Why might this message matter to me? (e) Response: What kinds of actions might I take in response to this message?

Phase two: Messages and meanings

Media literacy education includes honing skills for critical viewing of the media frame, such as the explicit and implicit messages and its meanings: (a) Content: What is this about (and what makes you think that)? What ideas, values, information or points of view are overt? Which are implied? What is left out of this message that might be important to know? (b) Techniques: What techniques are used? Why were those techniques used? How do they communicate the message? (c) Interpretations: How might different people understand this message differently? What is my interpretation of this and what do I learn about myself from my reaction or interpretation?

Phase three: Representations and reality

Ultimately, media literacy involves examining social, political, economic, and personal issues surrounding the frame. (a) Context: When was this made? Where or how was it shared with the public? (b) Credibility: Is this fact, opinion, or something else? How credible is this (and what makes you think that)? What are the sources of information, ideas, or assertions?

These content questions are important, and identifying omissions is an essential skill for communicating climate change. Bias by omission (either intentional or unintentional) can take two important forms: attention to a topic with key information missing, and a cumulative lack of media attention to a topic. For example, in the 1990s, a common counterclaim of climate change deniers was that global warming would improve our agricultural output because higher levels of carbon dioxide enhance plant growth (McCright and Dunlap 2000); however, they omitted key information about the disruption of local climate and rainfall patterns, a change likely to harm agriculture. As an example of cumulative omission, the League of Conservation Voters found that only 3 of the 2000 questions asked during interviews of presidential candidates on Sunday morning TV programs in 2007 mentioned global warming (*www.democracynow.org/2008/1/10/study_of_over_2_000_Sunday*).

The questions related to interpretation are based on the key premise that individuals make meaning of messages on the basis of reactions and interpretations influenced by past experiences, knowledge, social norms, and cultural commitments. Thus, the public can disagree about facts or scientific consensus because acceptance or denial of facts is shaped by each individual's cultural cognition—that is, the tendency to accept information only when it or its obvious implications are consistent with positions taken by others who share the same cultural values (Kahan 2010, Kahan et al. 2010). Media facilitate the formation of groups around common values; thus, overcoming the negative consequences of cultural cognition requires a public skilled in critical evaluation of media, as well as scientists and ISE professionals skilled in effective framing of media.

Scientists and science educators cannot be effective communicators unless they are media-literate initiators of communication. Furthermore, scientists and science educators cannot be fully effective unless the public is media literate and contributes to communication. Thus, scientists and the public both need to understand the principles of media literacy, but for slightly different reasons.

Scientists and educators need to be media literate if they are to use media in all of their forms to increase the size of, and the connection with, their audiences. Scientists must be schooled in communication and public outreach (Kareiva 2010). Given the wealth of information and messages reaching the public, it requires savvy to craft messages that stand out, are understood, and are remembered. Storytelling through film, visual images, celebrities, and other forms of entertainment can be used to convey scientific content and can change minds (Olson 2009). Scientists and informal science educators should use empirical research to inform the design of media frames (Nisbet and Scheufele 2009).

In order to be climate change literate, the public must first be media literate. Fortunately, media literacy education fits seamlessly with the PES model for several reasons. First, both have a foundation in the principles of critical thinking. Second, both emphasize and confer power to enable participation in societal decisionmaking. Finally, PES and media literacy education fit together nicely because media literacy can be pursued through questions and deliberations that bring about understanding, similar to PES.

Media literacy education does not excuse journalists and others who create popular media from responsibility for proper conduct (Hobbs and Jensen 2009). A media-literate public also calls for renewed commitment of journalists to their established code of ethics. The code of ethics of the US Society of Professional Journalists (*www.spj.org/ethicscode.asp*) states that members "believe that public enlightenment is the forerunner of justice and the foundation of democracy [and that] the duty of the journalist is to further those ends by seeking truth and providing a fair and comprehensive account of events and issues."

In the numerous intersections of science and society—stem cell research, evolution, genetically modified foods, cloning, and climate change—a significant portion of the public is no longer receptive to communication from the deficit perspective that has dominated science education for decades. A new strategy to improve public acceptance of climate change science should include the following components: (a) expansion of education beyond science centers and museums to radio, television, and movie entertainment, as well to the blogosphere; (b) creation of (live and virtual) forums and events that facilitate discourse for mutual learning; (c) avoidance of a deficit perspective; (d) inclusion of critical thinking and reasoning skills in education, not just hypothesis testing; (e) additional means to provide the public with tools for critical analysis of media; and (f) additional means to help scientists and science educators become media savvy.

Despite the extreme investment—in the form of years and dollars—in researching global warming and estimating the uncertainty and risks associated with climate change, the United States has not made progress in mobilizing public support for policies to address climate change (Moser 2007). Science education efforts must be strategic and must expand courageously to provide the public with the critical thinking and media literacy skills that will help people recognize the barrage of media messages constructed to mislead, confuse, or predispose individuals to apathy or denial when engaging in dialogues about climate change. The data collected and conclusions reached by scientists do not carry their due weight if the public is not knowledgeable, engaged, and empowered (not deceived) through science literacy, public engagement, and media literacy, held together by the common thread of critical thinking.

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