Position Paper

Education, Communication, and Science in the Public Sphere

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Abstract: In the 1920s, John Dewey and Walter Lippmann both wrote important books examining whether the public was capable of playing a constructive role in policy, particularly when specialized knowledge was involved. This essay uses the Lippmann–Dewey debate to identify new challenges for science education and to explore the relationship between science education and science communication. It argues that science education can help foster democracy in ways that embody Habermas’ ideal of the public sphere, but only if we as a field pay more attention to (1) the non-scientific frames and narratives that people use to interpret news about science, (2) the “second shaping” of scientific facts by the media, and (3) emerging platforms for public engagement. © 2015 Wiley Periodicals, Inc. J Res Sci Teach 52:145–163, 2015.

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In 1922, John Dewey published a review of the book *Public Opinion*, by Walter Lippmann. Lippmann has since been called the founder of American Media Studies (Carey, 1989), but during his life he was more of a public figure than an academic one—a prolific columnist, skilled editor, and widely respected intellectual whose advice was sought by policy-makers at the highest levels of government (Steel, 1980). In *Public Opinion*, Lippmann posed a crucial question for democratic society: Is it realistic to expect ordinary, non-expert citizens to contribute to complex policy debates in an informed and creative manner? Lippmann’s answer was a resounding “no.”

Dewey found *Public Opinion* fascinating. “To read the book is an experience in illumination,” he wrote. Although Lippmann was writing for a broad audience, Dewey thought he had produced “a more significant statement of the genuine ‘problem of knowledge’ than professional epistemological philosophers have managed to give” (Dewey, 1922 p. 286). Yet Dewey was also troubled by the implications of *Public Opinion*, calling it “perhaps the most effective indictment of democracy as currently conceived ever penned” (Dewey, 1922 p. 288). Although most educational researchers know him for his work on schooling and pedagogy, Dewey wrote extensively about the principles of democracy. His own theories emphasized an active and creative role for citizens, and he found Lippmann’s challenge impossible to ignore. In 1927, after Lippmann had followed up on the success of *Public Opinion* with an even grimmer sequel, *The Phantom Public*, Dewey finally produced his measured but optimistic response: *The Public and Its Problems.*

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Although nearly a century has passed, the “Lippmann–Dewey Debate” still echoes through political theory (Bernstein, 2012) and media studies (Schudson, 2008). It has had less of an impact on education. Despite Dewey’s status as the patron saint of progressive education, relatively few education scholars have explored this piece of his legacy (e.g., Ljunggren, 1996; Meadows & Blatchford, 2009; Waddington, 2010). Furthermore, the Lippmann–Dewey debate is almost entirely absent from the science education literature. Neither Public Opinion nor The Public and Its Problems has ever been cited in the pages of this journal, for example.

Why does this matter? At its core, the Lippmann–Dewey debate is about citizens and expertise. Both authors ask whether it is possible for citizens to take part in complicated civic debates that require specialized knowledge. This is a central concern for science education, one that arises every time we invoke the importance of scientific knowledge for citizenship (Hodson, 2003; Jenkins, 1999; Shen, 1975). When we ask what citizens need to know to participate in debates about climate change, or genetically modified organisms, or public investment in scientific research, we are posing the sort of question that Dewey and Lippmann would find very familiar. Far too often, we unquestioningly accept that school science can prepare people for such debates (Feinstein, 2011). Other thinkers have arrived at very different conclusions, and it is important for us to learn from those outside our immediate field who have grappled with this question. Dewey and Lippmann are certainly not the only theorists in this category, but they gave the problem of knowledge and democracy one of its most memorable treatments.

There is also another reason why the Lippmann–Dewey debate matters for science education. Walter Lippmann and John Dewey are towering figures in the fields of communication and education, respectively. Each helped define the questions that continue to preoccupy their intellectual descendants. Anyone concerned with the relationship between education and communication stands to benefit from a close reading of this early and celebrated interdisciplinary conversation. It may be of particular relevance today, as the two fields converge once again under the vast umbrella of “public engagement with science.” After years in which education researchers focused primarily on classrooms and communication researchers focused primarily on the media, both fields are turning their attention toward informal venues such as science museums (Bandelli & Konijn, 2013; Bell, Lewenstein, Shouse, & Feder, 2009) and citizen science projects (Bonney et al., 2009; Powell & Colin, 2008).

In this essay, I discuss a few key points from the Lippmann–Dewey debate that I believe will stimulate useful conversations about science, education, and democracy. The Lippmann–Dewey debate has many nuances and dimensions, and has been dissected many times in the scholarly literature (e.g., Carey, 1989; Marres, 2007; Schudson, 2008). I do not pretend to offer a comprehensive account of the debate; instead, I focus on the pieces that are most relevant to the present state of science education, including its relationship with science communication. To foster dialog between related fields, I use each point to suggest lessons that science education might learn from science communication as it wrestles with the challenges that Lippmann and Dewey reveal. Because the Lippmann–Dewey debate hinges on a particularly political understanding of the word “public,” I begin by discussing the very particular sense of “public” that defines the terms for the debate. I then explore Lippmann and Dewey’s surprising agreement about the limits of individual citizens before outlining two of Lippmann’s central arguments, concerning stereotypes and the self-interested media, and examining the crux of Dewey’s response. In the conclusion, I briefly consider one last element of the debate: the role of experts in a democratic society.

Before launching into the main argument, however, a word of caution is required. In the interest of describing what I believe to be longstanding trends and tendencies about the large and epistemologically diverse research field of science education, I have at times paid less attention to
disagreements and differences within the field. Every one of the generalizations I make about science education in the following pages is in some measure debatable, and every description of the field has notable exceptions. I have chosen to leave these generalizations and descriptions in, in hopes that they might elicit reflection and response from those who feel that their perspectives are not adequately addressed.

The Citizen and the Public Sphere

Before plunging into the Lippmann–Dewey debate, it is important to clarify what both authors meant by “the public,” and how this differs from typical uses of the term in science education. Science education researchers rarely define “the public” explicitly, but the recurrence of phrases such as “public understanding of science” throughout the history of the field (DeBoer, 1991) suggest that the public is negatively defined: it refers to those who are not scientists, and who therefore interact with science as outsiders (for one notable exception, see Layton, Jenkins, Macgill, & Davey, 1993). Members of the public, so conceived, may be interested in science for many reasons, including personal need and sheer curiosity. They may encounter science in the context of politics and governance, but their role as citizens is not privileged above their role as consumers, or employees, or people with health concerns—it is not what makes them a public.

For both Dewey and Lippmann, the idea of the public was inherently political. Although it may seem strange, the quickest way to explain how Lippmann and Dewey saw the public is to step forward in time to 1962, when Jurgen Habermas published *The Structural Transformation of the Public Sphere*. Habermas traced the rise of civic political discourse through the pamphlet printers and coffee houses of Europe in the 18th century. He coined the term “public sphere” to describe the idea of “society engaged in critical public debate” (Habermas, 1962/1991, p. 52). In his words,

A portion of the public sphere comes into being in every conversation in which private individuals assemble to form a public body. They then behave neither like business or professional people transacting private affairs, nor like members of a constitutional order subject to the legal constraints of a state bureaucracy. Citizens behave as a public body when they confer in an unrestricted fashion—that is, with the guarantee of freedom of assembly and association and the freedom to express and publish their opinions—about matters of general interest. (Habermas, Lennox, & Lennox, 1974, p. 49).

For Habermas, the public sphere was a counterweight to the established branches of government and a complement to formal political mechanisms such as elections. He saw it as neither belonging to the state nor to private interest, but rather “a sphere which mediates between society and state, in which the public organizes itself as the bearer of public opinion” (ibid., p. 50).

It is important to distinguish between Habermas’s idea of a public sphere and the related idea of a social movement or interest group. Much of the research on public engagement with science in social contexts has focused on the role of social movements and other, similar entities with shared interests and more or less well-defined objectives (Hess, 2004; Irwin 1995). Habermas was particularly concerned with a stage of public discourse that often precedes the formation of defined interest groups—the stage in which private citizens with diverse interests meet to debate those interests in an unrestricted manner (Habermas, 1962/1991).

Today, this sort of discourse still takes place in community settings like those that Habermas originally discussed (e.g., Roth & Lee, 2002), but changes in technology and the media also offer new opportunities, and new obstacles, for open and informed public debate (Dahlgren, 2005). Although some scholars have suggested that new media technologies and institutions might

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enable more open and democratic debate (Coleman & Blumler, 2012), Habermas himself remained deeply concerned about the ability of established political interests to control the mass media, referring to contemporary news coverage as a highly choreographed process whose entrenched biases corroded rather than enhanced public deliberation (Habermas, 1962/1991). Other scholars have expressed similar skepticism about the role of the internet and online forums (e.g., Barney, 2007), and there are numerous studies demonstrating that online platforms change political participation in complex and sometimes troubling ways (e.g., Albrecht, 2006). Although the scholarly debate over the influence of the internet and new media technologies on the public sphere is beyond the scope of this article, it is reasonable to say that contemporary technologies provide no simple solution to the challenges that Habermas (1962/1991), and Dewey and Lippmann before him, identified (Coleman & Blumler, 2012).

Habermas did not directly cite Lippmann or Dewey in The Structural Transformation of the Public Sphere, but his definition of the public sphere maps closely onto the way that both authors thought and wrote about “the public.” Rather than being negatively defined (e.g., people who are not scientists), Lippmann and Dewey saw the public as positively defined by what it is and does. Both authors saw “publics” as groups of people who share a common political interest and participate in civic discourse with the goal of influencing policy. If citizens do not or cannot form groups like this, if they cannot embody Habermas’s public sphere, they are not, in Dewey and Lippmann’s terms, a public. This is why Lippmann could claim, first in Public Opinion and then, more stridently, in The Phantom Public, that the public doesn’t really exist. He was not arguing that non-specialized citizens do not exist, only that they are unable to form a collective with shared political interests that can contribute to policy discussions in a constructive manner—a public sphere.

The Inevitable Inadequacy of Individual Citizens

...every one of us is an outsider to all but a few aspects of modern life...

– Walter Lippmann, Public Opinion, 1922, p. 251

If we accept the anachronism of using Habermas’s phrase, then the Lippmann–Dewey exchange focused on the ability of citizens to form a public sphere. But the debate was not about the knowledge or ignorance of individual citizens, per se. Here, Dewey and Lippmann agreed. Both accepted that individual citizens do not, and cannot possibly, possess the specialized knowledge required to understand the issues facing a modern democracy. This is not because citizens are foolish or poorly prepared. Indeed, Lippmann (1925) confessed,

...although public business is my main interest and I give most of my time to watching it, I cannot find the time to do what is expected of me in the theory of democracy; that is, to know what is going on and to have an opinion worth expressing on every question which confronts a self-governing community. (pp. 20–21)

Instead, they agreed that the ignorance of individual citizens was an inevitable byproduct of specialization, on the one hand, and the distracting demands of everyday life, on the other. In Lippmann’s words, “every one of us is an outsider to all but a few aspects of modern life. ... [with] neither time, nor attention, nor interest, nor the equipment for specific judgment” (Lippmann 1922 p. 400). Although it may surprise some educators to hear it, Dewey also rejected the possibility that individuals could know in advance, or learn on the spot, all that they needed to know as citizens. In his review of Public Opinion, he emphatically agreed that it was time to abandon “the

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dogma that individuals can of themselves get the knowledge required to render democratic
government effective and competent” (Dewey, 1922 p. 286). He joined Lippmann in dismissing
the treasured ideal of the “omnicompetent citizen,” observing in memorably homely terms that
“this particular Humpty Dumpty can never be put back together again for anyone who reads
[Public Opinion] with an open mind” (p. 287).
This premise, which is the starting place of the Lippmann–Dewey debate, is a profound
challenge for science education. For its entire history as a scholarly field, science education has
acknowledged two purposes: preparing future scientists for their professional roles and preparing
citizens for life in a society where science impinges upon private and civic decisions (e.g.,
Fensham, 1992). Science educators often address the latter goal under the heading of science
literacy (though it is far from the only goal addressed under that heading). Roberts (2007) sorted
definitions of science literacy into two types: those that emphasize science content, with the idea
that a carefully chosen set of facts and principles will be applicable across a wide range of
situations (e.g., American Association for the Advancement of Science, 1993); and those that
emphasize skills and dispositions that might help citizens learn what they need to know or make
savvy judgments base upon limited knowledge (e.g., Norris, 1997; Prewitt, 1983). Lippmann and
Dewey are united in their rejection of the first type of definition, and seem to cast doubt on the
second type as well.
Of course science literacy has no shortage of critics. The chemist and educator Morris Shamos
(1995) offered a stark indictment of the omnicompetent (scientific) citizen in his book The Myth of
Scientific Literacy, concluding that “there is not the slightest possibility of achieving the level of
scientific literacy needed to make such decisions independently in an appreciable fraction of the
adult population” (p. 94). And the eminent philosopher of science Philip Kitcher (2010) openly
scorned the idea that individual citizens, lacking knowledge of a field, might remedy their
ignorance through just-in-time learning, calling it
an absurd fantasy to believe that citizens who have scant backgrounds in the pertinent field
can make responsible decisions about complex technical matters, on the basis of a few
5-minute exchanges among more-or-less articulate speakers or a small number of articles
outlining alternative points of view. (pp. 1232–3)
Other scholars have taken the position that science literacy is a defensible goal, but may need
to be reconceptualized before it can be achieved. Norris (1997), for example, argued that the
intellectual independence of citizens relies primarily on “the disposition to question, and to seek
other opinions on scientific issues that matter in their lives and in their community” (p. 256). Ryder
(2001) concluded that citizens can, under some circumstances, apply a surprisingly sophisticated
knowledge of the social process through which scientific knowledge is created—what Duschl
(1990) called understanding about scientific knowledge. And Feinstein (2011) suggested that
science education should replicate the experience of competent outsiders: people whose repeated
exposure to science in personally meaningful contexts helps them “recognize the moments when
science has some bearing on their needs and interests and to interact with sources of scientific
expertise in ways that help them achieve their own goals” (p. 180).
For both Lippmann and Dewey, however, the question was closed: individual citizens simply
could not know enough, as individuals, to take part in policy discussions across a wide range of
topics. The question that remained—the real subject of the debate—was whether the limits of
individual knowledge and attention were an insurmountable obstacle to enlightened and
influential public discourse (in Habermas’ terms, the formation of a public sphere). Could a group
of citizens, encumbered by their inevitable limitations, nonetheless come together to make

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informed judgments about matters of public concern, and through their judgments exert pressure on the levers of policy? This question matters for science education because even those who are optimistic about science literacy acknowledge that we are not there yet (e.g., Feinstein, 2011). From our field’s perspective, the Lippmann–Dewey debate can be recast in these terms: is the limited sort of science literacy that our students currently achieve enough to facilitate the formation of a public sphere? Without achieving a goal that still seems out of reach, is there any hope that our students will be able to engage with science in this crucial citizenship role?

Lippmann’s Two Key Arguments and Their Implications for Science Education

Stereotypes, Prior Knowledge, and Frames

The heavens are not the same to an astronomer as to a pair of lovers...


Lippmann marshaled many arguments against the likelihood of citizens forming a real public sphere. I focus on two here—the two for which he is perhaps most famous. The first, and in some ways the most vivid, centers on the powerful filters we apply to new knowledge, and our tendency to fit anything we learn into narrow preconceived ideas about the world. It was in *Public Opinion* that Lippmann invented the modern usage of the word *stereotype*, which had up to that point referred to a duplicate printing plate used to copy printed material. Drawing on the relatively new field of psychology, and citing none other than John Dewey (1910) as a reference, Lippmann (1922) argued that

most facts in consciousness seem to be partly made. A report is the joint product of the knower and the known, in which the role of the observer is always selective and usually creative. The facts we see depend on where we are placed, and the habits of our eyes. (p. 54)

This idea, which evokes subsequent work on social construction (e.g., Hacking, 1999) and theory-laden observation (e.g., Hanson, 1958), was not new to the philosophical world, but it was a rather radical notion for a mass-market book. Yet Lippmann went further still. What matters, in his view, isn’t just that we bring our own filter to every learning experience, but rather that the filters we apply aren’t really ours. “In the great blooming, buzzing confusion of the outer world,” he wrote, “we pick out what our culture has already defined for us, and we tend to perceive that which we have picked out in the form stereotyped for us by our culture” (pp. 54–5). These stereotypes come not from our direct experience but “from our moral codes and our social philosophies and our political agitations” (p. 56).

Although Lippmann was more concerned with politics than science, he did not think science was immune from stereotypes. Several times in *Public Opinion* he described the popular reception of news about science and technology, noting how scientific and technological events could be seen in light of their social consequences, grafted onto readily available moral and political narratives. “A pattern of stereotypes is not neutral,” Lippmann cautioned, but rather “the projection upon the world of our own sense of our own value, our own position and our own rights” (Lippmann, 1922; pp. 63–4). In the United States, science and technology often benefit from positive emotional associations, but this is not inevitably the case. Lippmann quoted from the writing of Increase Mather, a puritan leader who saw smallpox as “an arrow from God,” punishing wicked colonists for the establishment of alehouses. Then, leaping forward in history, he quoted a turn-of-the-last-century physics professor who linked general relativity—a disturbance of the
carefully ordered celestial clockwork—with Bolshevist uprisings in Russia. In both cases, news that could have been described in purely natural or scientific terms was re-situated in a social narrative where natural consequences could be connected to human motives.

Science education has long been concerned with the way that facts exist “partly made” in our minds before we encounter new evidence for or against them. Until fairly recently, however, our field has examined “partly made” facts primarily through the lens of prior knowledge, exploring how the things we know and the way we think about natural phenomena shape opportunities to learn. One characteristic example of this approach is conceptual change, a theory which synthesized earlier work on prior knowledge (e.g., Piaget, 1974) into a framework for explaining how and why concepts might be resistant to change, and under what circumstances change could be facilitated (Posner, Strike, Hewson, & Gertzog, 1982). More recent research on prior knowledge challenges the stability of mental models and offers a more fluid and dynamic picture of conceptual development (e.g., Sherin, Krakowski, & Lee, 2012).

Although our field’s focus on prior knowledge and conceptual structure continues to be fruitful for organizing science instruction (e.g., Gadgil, Nokes-Malach, & Chi, 2012), it has created a substantial blind spot in our approach to public engagement with science—a blind spot that Lippmann would recognize instantly. Simply put, we assume that people who encounter science think of it in terms of science—that they interpret a news story on climate change through the lens of scientific evidence, or that their decision to protest Genetically Modified Organisms is grounded in an understanding of genetics. When people respond to these situations in ways that seem to contradict the best science, we therefore assume that they misunderstand the science, or that a better understanding of the underlying science would change their response. Yet, as Lippmann (1922) astutely pointed out, people instinctively embed news in familiar social narratives. This is how Increase Mather could see smallpox as an arrow from god, and a hidebound physics professor could read Bolshevik tendencies into the theory of general relativity.

In paying attention to prior knowledge, science educators and science education researchers have not given enough thought to these other narratives and other ways of thinking that so-called science news or science-inflected political issues engender (for two notable exceptions, see Aikenhead, 2006; and Lee & Roth, 2003). We often express the desire for students, and for citizens, to think like scientists, but fail to consider that they are also, and already, thinking and acting as citizens, consumers, and members of various cultural groups. As we consider prior knowledge, we must also learn to think about prior mindset, and if we wish students to bring scientific practices to bear on their interpretation of science news (e.g., National Research Council, 2012), we should think carefully about the other sorts of practices that are already at work. “The heavens are not the same to an astronomer as to a pair of lovers,” Lippmann reminds us (p.76), and it is no small thing to get star-struck lovers to think in astronomical terms.

This leads to the first lesson that science education researchers can learn from the field of science communication: how to see “science news” from the perspective of people who are not primarily concerned about science. For many science education researchers, scientific ideas are embedded in a larger disciplinary structure that explains how they were generated and how they relate to other scientific ideas (Schwab, 1969). Thus, antibiotic resistance appears in science education research as an example of grander biological ideas such as evolution by natural selection (e.g., Furtak, 2012; Opfer, Nehm, & Ha, 2012). Although antibiotic resistance is interesting to scientists in its own right, science education treats it as a hook that pulls up bigger and, from a disciplinary perspective, more fundamental scientific ideas.

Communication researchers, on the other hand, see scientific ideas as embedded within contemporary social concerns, the themes and topics that pique an audience’s interest. In the science communication literature, the articles that discuss antibiotic resistance are about health
and illness (e.g., DeSilva, Muskavitch, & Roche, 2004; Evensen & Clarke, 2012). Lippmann observed that “the news does not tell you how the seed is germinating in the ground, but it may tell you when the first sprout breaks the surface” (1922, p. 216). Just as the sprouting seed is news of the farmer’s harvest to come, antibiotic resistance is interesting to the communication researcher for the public problems and challenges it portends. For a science communication researcher, underlying scientific principles such as natural selection are important only insofar as they inform public concerns (Bubela et al., 2009).

Communication researchers also go beyond universal human concerns like health and illness to examine how particular groups of people understand “science news” from different perspectives. For example, Kruvand and Hwang (2007) employed narrative analysis to examine how a fraud scandal involving a prominent South Korean scientist played out differently in US and South Korean media outlets. In the South Korean newspaper Chosunilbo, a narrative of national triumph and scientific heroism gave way to an emotional tone of “sadness, emptiness, and denial,” while the New York Times first played up the ethical controversy surrounding stem cells and then indulged in outraged schadenfreude over the scientist’s, and South Korea’s, embarrassment. Throughout their analysis, Kruvand and Hwang carefully ground each narrative in its national context, demonstrating how the two newspapers reflected, as well as shaped, civic discourse in their respective cultural contexts.

Science communication research often explores these culturally specific narratives using a strategy called frame analysis. The sociologist Erving Goffman (1974) originally defined a frame as an unspoken theory or connected set of concepts that people use to interpret their experiences. For most communication researchers, frames are defined more narrowly as narrative devices that organize central ideas, defining a controversy to resonate with core values and assumptions. Frames pare down complex issues by giving some aspects greater emphasis. They allow citizens to rapidly identify why an issue matters, who might be responsible, and what should be done. (Nisbet & Mooney, 2007, p. 56)

Frames reflect public concerns, but they also help to define them. An issue like antibiotic resistance can be a looming threat, an exciting scientific challenge, or a political and regulatory crisis (Gauthier, 2011). Science communication researchers examine how science-related news is framed in the media and how those frames affect public perceptions (Druckman, 2001; Gauthier, 2009). They also study how people advance their own frames in order to persuade others to think about issues in a particular way (Dragojlovic & Einsiedel, 2013).

Although research tools such as narrative and frame analysis are useful for explaining how the producers of media choose to present a science-related story, and how the people who read that story make sense of it, one might reasonably ask what science education should do with this information. Clearly, science educators have some interest in preparing students to understand and respond to the ways that science is framed in the media, as well as the fact that some politically sensitive issues are framed in terms of science while others are not. Within this broad goal, however, there are a number of possible objectives, not all of which are mutually compatible. Science educators might, for example, encourage people to identify and prefer frames that emphasize scientific evidence over those that emphasize moral, cultural, political, or economic concerns. Yet research in sociology and communications consistently shows that narrow evidentiary frames fail to capture the full scope of public concern, and insisting on them results in the undemocratic suppression of other valid social interests (Hornig, 1993; Wynne, 1992). Another alternative would be to acknowledge that frames and narratives serve important social purposes, and to help identify a more limited sense-making role for judgments of
scientific evidence and credibility within them (Hulme, 2010). We might, following this logic, seek to develop a variety of critical consciousness in our approach to frames, pushing our students to reflect on the origins and implications of the widely accepted cultural frames and narratives that surround them so they can understand and resist the dominant forces shaping public debates related to science (Dos Santos, 2009). Yet we must also recognize that students navigate different social worlds, in which different frames are likely to predominate (Aikenhead, 2006). Can science educators truly be conversant with all of these frames? And how can we prepare them—both educators and students—to recognize and challenge dominant frames while simultaneously respecting the cultures and value systems from which those frames emerge? These questions are challenging, and we can expect them to engender a rich and fruitful line of scholarship. The only obvious error, having acknowledged the importance of frames and narratives, would be to continue excluding them from our studies and to persist in the narrow conviction that people interpret science news with only the science in mind.

Making the News and Understanding How It Is Made

The facts of modern life do not spontaneously take shape in which they can be known. They must be given shape by somebody...

– Walter Lippmann, Public Opinion, 1922, p. 218

Only half of Lippmann’s argument rested on the inability of citizens to reach deeper than the powerful interpretive devices of their cultures. The other half focused on why media outlets produce news prepackaged in particular interpretive boxes. Lippmann himself learned important lessons about the shaping of facts during the First World War. As an employee of the Committee on Public Information, he wrote propaganda intended to convince reluctant Americans to support a major overseas campaign (Steel, 1980). This experience undoubtedly contributed to Lippmann’s cynicism about the media, but in Public Opinion he is careful to point out that the news media doesn’t, by and large, use stereotypes and simplifying narratives in a deliberate attempt to deceive and manipulate. Instead, they use such devices because they are constrained by the harsh commercial realities of advertising revenue and the need to secure and maintain an audience. Drawing on his experience as a journalist and editor, Lippmann pointed out that

the pressure on the newspaper to adhere to this routine comes from many sides. It comes from the economy of noting only the stereotyped phase of a situation. It comes from the difficulty of finding journalists who can see what they have not learned to see. It comes from the almost unavoidable difficulty of finding sufficient space in which even the best journalist can make plausible an unconventional view. It comes from the economic necessity of interesting the reader quickly, and the economic risk involved in not interesting him at all, or of offending him by unexpected news insufficiently or clumsily described. All these difficulties combined make for uncertainty in the editor where there are dangerous issues at stake, and cause him naturally to prefer the indisputable fact and a treatment more readily adapted to the reader’s interest. (Lippmann, 1922, p. 221)

In short, the news media caters to our tendency to see situations in familiar moral and political terms, thereby reinforcing that tendency and hastening the reduction of complicated situations to simple narratives. This argument neatly complements Lippmann’s earlier argument about stereotypes. On one hand, citizens are primed to respond to new information with pre-formed interpretations of its meaning. On the other hand, new information comes packaged with
suggested interpretations—social narratives that media producers believe will capture the attention of readers.

Just as science education has its own traditional interpretation of “partly made” facts, it also has a traditional approach to the idea that facts “must be given shape by somebody” (Lippmann, 1922, p. 218). Rather than focusing on the shaping of facts in the media, though, science education focuses on the way that facts are given shape by scientists—the epistemic processes through which observations become evidence and evidence is woven into scientific knowledge claims (e.g., Duschl, 2003). From older portrayals of a simplified scientific method (Rudolph, 2005), this research has expanded to include research on model-based reasoning (e.g., Windschitl, Thompson, & Braaten, 2008), as well as the idea that science is a fundamentally social endeavor that requires collaboration and is subject to human biases (e.g., Allchin, 2011).

There is also a small but growing body of research devoted to understanding how students make sense of scientific claims that have been shaped a second time by the media. Anderson (2009) observed that “understanding science in the news” is a timeworn goal of science education policy-makers, but it is not until more recently that researchers began to explore how students make sense of media reports. Some researchers explore the psychological demands of learning science from various sorts of text, including but not limited to the news media (e.g., Britt, Richter, & Rouet, 2014; Goldman & Bisanz, 2002). Others focus more narrowly on science in popular media. In this latter category, Thomm and Bromme (2012) examined the features of simulated news reports that led university students to judge them as more or less scientific, and whether or not the “scientific-ness” of these texts led the students to find them more credible. Polman and Hope (2014) took a different approach, immersing students in the production of science news as a way of magnifying their interest in science and expanding their capacity to think critically about science media (see also Polman, Newman, Saul, & Farrar, 2014).

As science education researchers continue to investigate how students interpret science in the news, they should take care not to re-invent what is, for science communication researchers, a very old wheel. Communication researchers have studied how credibility is represented in the media, and how the public judges it, for the better part of a century (Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). In that time, they have developed a well-articulated theoretical language for describing how factors such as the medium (e.g., a newspaper), the channel (e.g., the New York Times), the sources cited, the emotional tone, and the use of metaphors all affect public interpretations of science news (Metzger et al., 2003; Weigold, 2001). They have increasingly come to see perceptions of expertise as closely related to trust, which in turn is influenced by many factors beyond the apparent strength of the evidence (Jungermann, Pfister, & Fischer, 1996; Nisbet & Scheufele, 2009; Slovic, 1999).

Science communication research also offers considerable insight into the daily norms that drive this second shaping of “the facts of modern life” once they leave the lab and enter public discourse. For example, it is probably impossible to understand public engagement with climate change without understanding the longstanding norms of journalistic objectivity, quite different from scientific ideas of objectivity, that led experienced reporters to give equal attention to industry-funded skeptics and those who represented the overwhelming scientific consensus (Boykoff & Boykoff, 2004). Hiles and Hinnant (2014), writing more recently, describe how experienced environmental journalists attempt to balance their professional skepticism towards authority (including scientific authority) with new strategies that attempt to communicate the weight of scientific evidence. Sadly, this progress may be limited to climate change: the tendency of journalists to balance opposing perspectives can still be found in coverage of topics such as the putative connection between autism and vaccines (Dixon & Clarke, 2013).

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Traditional news media outlets have become less important for public engagement with science as people have gained access to a wider array of informational material, particularly through the internet (National Science Board, 2008). Some of this material is free from the pressures of advertising, marketing, and mass appeal that constrain the news media, but all of it is subject to pressures of some sort. This is true even for scientific publications: Bazerman (1988) gave a compelling account of the constraints that shape the production of scientific articles, while Kleinman (2003) showed how commercial pressures and practices infiltrate scientific work even before it reaches publication. Reading Lippmann in the internet age, we must recognize that he placed particular importance on the news because it seemed, at the time, the only way for the public to become informed about pressing matters. If they could not learn about such things from the news, their chances of engaging in productive policy dialog—of forming a public sphere—seemed depressingly slim. Today, Lippmann’s cautions about the self-interested press should be read as a more general lesson about genre, authorship, and audience in the interpretation of all media. As Norris (1997) pointed out, citizens will rarely be in a position to replicate scientific work or analyze original data; their intellectual independence rests on their ability to make sense of the inevitably imperfect texts available to them, to weigh the value of claims astutely based on their context and origins. If science education means to prepare students for science in the public sphere, helping do this is surely part of the puzzle.

Dewey’s Response: The Role of Community and the Emerging Tools of Dialog

In his response to Lippmann, Dewey did not attack the idea of stereotypes, nor did he paint a more positive picture of the media. Instead, he took issue with Lippmann’s portrayal of individuals and groups. Although Public Opinion is an argument about the viability of the public, as a collective, and Lippmann was clearly aware (and suspicious) of the power of cultural groups, his skepticism about the public sphere was anchored in the limitations of individual citizens. Groups, in Lippmann’s account, exist only to supply individuals with stereotypes that simplify their interpretation of new information, leading them to prefer one narrative over another. Lippmann did not consider the possibility that groups could accomplish what individuals could not. It was in this possibility that Dewey found hope for the public sphere.

Much of Dewey’s The Public and Its Problems is devoted to connections among people. Dewey repeatedly pointed out that citizens are connected in complex webs of membership, with every individual belonging to multiple groups and organizations. We cannot obtain an accurate picture of civic life by considering the frailties of individual people, he argued, because

the human being whom we fasten upon as individual par excellence is moved and regulated by his associations with others; what he does and what the consequences of his behavior are, what his experience consists of, cannot even be described, much less accounted for, in isolation. (p. 188)

Dewey believed that groups of citizens reflecting and acting together could transcend the stark limitations of the individual. Under the right circumstances, people could become more than the sum of their individual parts, achieving the “expansion and reinforcement of personal understanding and judgment by the cumulative and transmitted intellectual wealth of the community” (p. 218). All of us, he suggested, are embedded in communities that have the potential
to provide us with knowledge and expertise; in a diverse and well-functioning community, an individual does not need to know about a particular topic as long as she is meaningfully connected to someone who does. Our capacity to take insightful and constructive action therefore depends on our ability to find or make functioning communities, and what stands in the way of the public sphere is not the starkly limited capacity of individuals but the failure of communities to recognize and use their collective strength. In Dewey’s words, “the outstanding problem of the public is discovery and identification of itself” (p. 185).

Although he believed in the potential of communities to transcend individual limitations, Dewey shared many of Lippmann’s concerns about the conditions that prevent healthy public discourse. He recognized that the scale of modern societies makes it difficult for people to see the consequences of their political action, and that citizens’ ability to perceive threats and opportunities is hampered by “secrecy, prejudice, bias, misrepresentation, and propaganda” in government and mass communication (Dewey 1927, p. 209). Most of all, he regretted the “dislocation and unsettlement of local communities” (p. 212), in which face-to-face interaction provides what he believed to be the best medium for political conversation. To overcome these obstacles, a society truly committed to democracy must focus on “the improvement of the methods and conditions of debate, discussion and persuasion” through which meaningful social connections are made (Dewey, 1927, p. 208).

In some ways, science education is well positioned to fulfill this aspect of Dewey’s vision for the public sphere. The increasing popularity of sociocultural theories has led to a wide array of projects that focus on diverse groups working together to achieve shared goals (Barton & Tan, 2009; Bell, Bricker, Reeve, Zimmerman, & Tzou, 2013; Brown & Campione, 1994). For example, Birmingham and Barton (2014) recently described how a group of middle school students combined scientific understandings with place-specific concerns to achieve their goal of sharing environmental knowledge with their neighbors. Newer projects like this one complement an increasingly well-established set of research-based pedagogies that focus on collective engagement with socially meaningful science. Perhaps the most familiar of these fall under the umbrella of Science-Technology-Society (STS), a pedagogical tradition now in its fifth decade (Pedretti & Nazir, 2011). Although not all incarnations of STS embody Deweyan ideals, some of the most familiar examples feature students coordinating their different strengths in a reasonable semblance of the public sphere (e.g., Pedretti, 1997). Socio-Scientific Issue Discussion (SSID), which engages students in structured dialog around politically and scientifically complex topics, offers another promising avenue for pursuing democratic goals in science education. According to Zeidler, Sadler, Applebaum, and Callahan (2009), SSID exposes students to moral problems that involve a number of discrepant scientific, social or moral viewpoints, many of which may conflict with the student’s own closely held beliefs. The scientific knowledge that forms as a result of social knowledge construction and discourse becomes personally relevant and socially shared. (p. 74)

If education has anything to learn from science communication here, that lesson lies in the remarkable array of public engagement platforms that communication researchers have developed or studied in recent years (Nisbet & Scheufele, 2009). Some of these, such as the science café, have started to find their way into educational research and practice (Fenichel & Schweingruber, 2010). Others, such as consensus conferences (Powell & Colin, 2008) and science blogs (Kouper, 2010), have yet to be examined from an educational perspective. Science education researchers might also learn from the manner in which their science communication colleagues conceptualize the outcomes of public engagement with science. Although we have made some
progress in conceptualizing complex and socially situated outcomes, we are still overly inclined to measure our success in terms of specific scientific skills and knowledge. If we wish to support citizens in engaging with science around political issues (e.g., Levinson, 2010), we must support the development of a public sphere. This requires a different set of skills and knowledge. As Bubela et al. (2009) observe,

> the focus of these deliberative exercises should be an honest effort at relationship- and trust-building rather than persuasion, with mechanisms for actively incorporating the input of lay participants into decision-making. (Bubela et al., 2009, p. 517)

Ultimately, the most important outcome of engaging with science in groups might be an improved ability—and willingness—to engage with science in groups.

**Optimism, Pragmatism, and the Role of Experts in a Democratic Society**

In reviewing these few points from the Lippmann–Dewey debate, I have attempted to extract three challenges for science education. These challenges derive primarily from the debate itself, but also owe their formulation to research in science communication. First, I argued that science education research, as a field, should balance its attention to prior knowledge with a similar attention to the non-scientific frames and narratives that people use to interpret news about science. As we race to valorize scientific dispositions and practices, we should also consider how they can fruitfully co-exist with the other requirements, dispositions, and practices of citizens. Second, I argued that students need to learn more about what I called the second shaping of scientific facts—how they are packaged into stories by the formal news media as well as other, less institutional sources. As others before me have pointed out, no source of science information is truly neutral, and citizens must learn to work with available (imperfect) sources. Third and finally, I argued for more attention to the new and creative platforms for public engagement that science communication researchers have started to explore. Although we have a strong theoretical foundation for thinking about collective engagement with science, we must learn to measure our success in different ways, such as the ability to forge productive communities for engaging with science around matters of public concern. It was in such communities, not in scientifically literate individuals, that Dewey saw hope for the public sphere.

Richard Bernstein suggested that the essential difference between Dewey and Lippmann was Dewey’s commitment to the possible, what Dewey (1922) himself called “the need that every human being rise to his full stature” (p. 286). Though both men were anchored in the American pragmatist tradition, Lippmann saw himself as responding to an ugly reality, while Dewey hoped that new educational methods could make reality less ugly. Dewey anticipated later theorists such as Habermas and Arendt in arguing that “the revitalization of a public sphere in which there is genuine debate and mutual participation is still not only a real concrete and urgent possibility but a task before us” (Bernstein, 2012, p. 777; my emphasis). As Dewey wrote in his review of *Public Opinion*, it was “faith in the dignity of human nature” that convinced him that the public was not in permanent eclipse (Dewey 1922, p. 286).

But there was something other than Dewey’s optimism and Lippmann’s pessimism that separated the two men and lent urgency to their argument: they disagreed profoundly about the role of experts in society. Lippmann, who saw no hope for an informed public, sought to amplify the voice of expert advice. “To traverse the world,” he wrote, “men must have maps of the world. Their persistent difficulty is to secure maps on which their own need, or someone else’s need, has not sketched in the coast of [landlocked] Bohemia” (Lippmann, 1922, p. 16). Accurate maps come from experts, and Lippmann saw experts as the best counterweight to a public that was both
mercurial and easily misled. In Lippmann’s view, the role of the public stops at the ballot box (Lippmann, 1925). Once the voters have chosen their elected representatives, those representatives should rely on unbiased experts and eschew the vagaries of public opinion⁴.

Dewey was deeply suspicious of elite groups, and did not mince words in rejecting Lippmann’s vision of elected leaders guided by councils of unbiased experts. He argued that experts, culturally cut off from the general public by their own elite status, could not possibly serve the public will. “In the degree in which they become a specialized class,” he wrote, “they are shut off from knowledge of the needs which they are supposed to serve” (Dewey, 1927, p. 206). Ironically, experts could only know the needs and sufferings of the public if the public itself had “an articulate voice” (ibid.), something that Lippmann devoted books to denying. Without a direct line to the public will, Dewey worried that experts would become “a class with private interests and private knowledge” (p. 207), or, even worse, “an oligarchy managed in the interests of the few” (p. 208).

A simplified visual representation helps clarify this contrast between Lippmann and Dewey. Lippmann saw the relationship between public, experts, and decision-makers as an inverted V: the public elects decision-makers and then steps back while the experts provide guidance on important matters of policy (figure 1a). There is no advice, no creative contribution or public will, flowing from public to decision-makers, and there is no connection between public and experts at all. Dewey was convinced that the public could play a role in policy matters, but for this to happen, for the public to form a real public sphere, it needed a connection to expertise (figure 1b). On the other hand, for experts to give solid advice, pursuant to the public good rather than their own narrower interests, they needed to understand the public will. Not only did Dewey complete the triangle by connecting experts and the public, he saw that the connection, in which “free social inquiry is indissolubly wedded to the art of full and moving communication” (p. 184) would need to flow both ways to serve his vision of democracy.

This foray into abstraction requires one last return to the question: Why does this matter for science education? Put simply, there is very little room for the democratic goals of science education in Lippmann’s vision of democracy. Citizens might perhaps apply science to their own health and consumer choices, but could not be expected to play an enlightened role in policy. If they are to be troubled with civic science at all, they should be taught to affirm the advice of experts, so as to avoid the possibility that they would reject experts altogether (a possibility that Dewey also foresaw). The job of science education becomes immeasurably simpler, but it forever abandons its democratic ideals.

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If, on the other hand, we accept Dewey’s vision, we are back in the thick of things, spurred on by his conviction that citizens can and should play a role in important public decisions, even when arcane scientific knowledge is involved. We retain our cherished belief in civic science literacy, but it is slightly transformed. On one hand, it is not a matter for individuals; as Dewey tells us, there is no hope for civic science literacy without community. On the other hand, we see a new purpose in our democratic efforts: in addition to learning from experts, citizens must also learn to communicate their collective will to those same experts, who must, in turn, learn to listen. As the body entrusted with training scientists, science education might accept some responsibility for preparing future scientists to listen to citizens, as well.

To his credit, Dewey did not think that all of this would be easy. Even before he started work on *The Public and Its Problems,* he grasped the central point of the struggle ahead. In his review of *Public Opinion,* he gave it hopeful voice:

Democracy demands a more thoroughgoing education than the education of officials, administrators, and directors of industry. Because this fundamental general education is at once so necessary and so difficult to achieve, the enterprise of democracy is so challenging. To sidetrack it to the task of enlightenment of administrators and executives is to miss something of its range and challenge. (Dewey, 1922, p. 288)

The Lippmann–Dewey debate offers science education a choice. We can ignore the hazards that both Lippmann and Dewey identified and continue to prepare isolated individuals as if that, alone, would suffice. We can follow Lippmann’s advice and teach students to leave expert matters to the experts. Or, if we believe that non-expert citizens can and must help guide the ship of state, we can embrace Dewey’s democratic vision and teach our students to form communities capable of rich, science-inflected civic debate—thereby reinvigorating what Habermas called the public sphere. Science communication holds some of the tools for accomplishing this goal, and if we accept the challenge “at once so necessary and so difficult to achieve,” we will need every tool we can get.

Endnotes

1 Habermas noted elsewhere that he was influenced by the pragmatist school of philosophy that Dewey helped to establish (Grisprud et al. 2010, p.43).

2 Evidence for both of these claims can be found in a close reading of recent standards documents, such as the United States’ Next Generation Science Standards (NGSS Lead States, 2013).

3 This essay, written for a science education audience, focuses on the lessons that science education researchers might draw from the famous exchange of ideas between Lippmann and Dewey, and from their contemporary counterparts in science communication. There is also much that science communication might learn from science education, yet as a relative outsider I am hesitant to point out another field’s weaknesses; as reviewers of this manuscript made clear, it is difficult enough to make defensible generalizations about one’s own field, even after years of socialization and comparatively deep knowledge of the literature. From the perspective of an interested outsider, though, it does seem that science communication researchers sometimes fail to recognize how and when scientific ideas have meaning for people beyond the contexts in which they initially arise, and that people develop those meanings over a long arc of learning and development (Bransford, Brown, & Cocking, 1999; Bell et al., 2009; though see also Laslo, Baram-Tsabari, & Lewenstein, 2011, for a notable exception). At times, science communication researchers also underestimate what people are capable of, both as individuals and in purpose-
driven communities. In particular, their use of statistically constructed “audience segments” (e.g., Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011) may lead them to miss the interpretive power of less obvious social groups. Finally, their focus on science as it appears embedded in social issues can cause them to ignore how scientific ideas are usefully connected under the shell of overt social relevance. These and other, similar observations would be best addressed in a separate article written by education and communication researchers in collaboration.

Much of this argument is articulated most clearly in Lippmann’s second book on this topic, *The Phantom Public*, where he narrowly circumscribes the possible role for the public in political decisions of any sort.

References


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