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EDITED BY
Imke Hoppe,
German Aerospace Center (DLR) Institute of Systems Engineering for Future Mobility, Germany

REVIEWED BY
Joanna K. Huxster,
Eckerd College, United States
Julia Metag,
University of Münster, Germany

*CORRESPONDENCE
Antoinette Fage-Butler
fage-butler@cc.au.dk

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A values-based approach to knowledge in the public's representations of climate change on social media

Antoinette Fage-Butler*

Department of English, School of Communication and Culture, Aarhus University, Aarhus, Denmark

This paper supports recent calls for research programs that explore the public's online representations of their knowledge of science-related topics, and argues that a useful line of inquiry in such a program would be to investigate how values are communicated in the public's construction of their knowledge of climate change on social media. A values-based approach to public knowledge broadens the concept of knowledge from being a cognitive and quantifiable attribute that the public may be expected to have less of than experts. In so doing, it captures more holistic aspects of public epistemologies, and acknowledges that climate change is an emotive and normative issue. This paper connects such a future line of inquiry with the concept of the public's climate "imaginaries" and proposes a number of qualitative methods for analyzing the public's communication of knowledge/values on social media.

KEYWORDS

climate change, online representations, public knowledge, knowledge/values, research programs, qualitative methods

Introduction

Climate change is widely understood to constitute one of the biggest existential threats to this planet and all forms of life on it (UN, 2021). It is as though we have reached a kind of apotheosis of the "risk society" (Beck, 1992) in terms of our reflexive awareness of the risks of climate change. Climate scientists have unequivocally identified human activity as having induced global warming (IPCC, 2021), and nearly two-thirds of the 1.2 million respondents that participated in a recent international survey acknowledged that climate change is a global crisis (UNDP, 2021). We are acutely aware of the moral tensions and ambivalences inherent in knowing the predicted catastrophic consequences of untrammeled climate mutation (Latour, 2018) while our societies are still largely entangled in old habits of production and consumption. We also know that the risks of climate change are unequally distributed. Wealthier, more industrialized societies are proportionately much more responsible for carbon emissions than less industrialized societies. However, wealthier societies are less at risk of the effects of climate change than less industrialized societies where climate change exacerbates existing vulnerabilities (IPCC, 2022).

Until quite recently, climate change was hard to perceive, and the public[1] had to rely on scientific statements about climate change. However, scenes of floods, droughts, and forest fires appear with increasing regularity on our media, and act as stark visual warnings of the need to adopt new consumption behaviors and production practices, and transform existing infrastructures, economic systems, and value systems (Carney, 2021). Scientists inform us that the window of opportunity for reducing carbon emissions is shrinking fast, with tipping points regularly mentioned as being at risk of being superseded. Media coverage of climate change is shot through with values, reflecting positions on climate change that range from pro-scientific to conflictual (Bolsen and Shapiro, 2018). Framing is often associated with media representations, but it is also evident in the public's communication on social media (Jang and Hart, 2015). Frames provide "cognitive heuristics to perceive political problems" (Wendler, 2022, p. 21). The various, competing framings of climate change, from "climate change as real" to "climate change as hoax" (Jang and Hart, 2015), are ready-made ways of interpreting the problems, causes and solutions (Entman, 1993) associated with climate change. Frames can be chosen by the media in the hope of producing outcomes such as countering anthropogenic climate change denial (McCright et al., 2016). In the case of climate change, framing matters, as nothing less than the future of humankind and the natural world is at stake, and with that comes the weight of moral responsibility for future outcomes (Jonas, 1984). Due to increasing evidence of climate change and the sluggish responses of politicians, climate change has become a highly emotive issue for many members of the public, and especially young people who inherit the problem of global warming from older generations and often express their hopes and frustrations regarding climate change on social media (Han and Ahn, 2020; The Lancet, 2021; Parry et al., 2022).

Although climate change is a highly salient topic in society and has become a lived reality for some, an empirical investigation of the meanings, values and forms of public knowledge related to climate change as expressed on social media lags somewhat behind. Such a research focus would be concerned with the "public" in a broad sense, meaning those that can access social media, rather than people situated within national domains. A shortage of research in the area of "linguistic and discursive studies and [. . .] how climate change text and talk work," particularly with regard to how publics understand the "often value-laden knowledge" that relates to climate change has been identified (Fløttum, 2017, p. 2). There have been recent calls for programmes of research that explore the public's own representations of their knowledge of science-related topics on social media where they consume, participate, and generate content (Taddicken and Krämer, 2021). Jasanoff (2010), with great prescience, highlighted the vital role of the interpretive social sciences for identifying what climate change means to the public, while Pearce et al. (2019) in their review of the academic literature on social media communication on climate change identified a research gap relating to qualitative methods, emphasizing the value of qualitative methods for enabling detailed insights, such as how social media can both help and hinder public "imaginaries" of future climate scenarios, as theorized by Jasanoff and Kim (2009).

This paper concurs that the time is ripe for a concerted research focus on representations of the public's knowledge of climate change on social media that uses qualitative approaches. This would provide insights into online communities' climate-related beliefs, attitudes, and values, which underpin climate (in)action. The research program as envisaged has potential application for facilitating constructive dialogues about climate change that span diverse groups, puncturing the algorithmically derived epistemic and value bubbles that form around online communities. There is increasing awareness that the social sciences and humanities can play a key role in addressing the global challenge of climate change. This is because the humanities "make us better at asking the right questions about how we can best live our lives together from day to day in a changing world" (Tystrup, in Ringgaard, 2017). Indeed, a humanities approach appears highly relevant, given the human causes of climate change. This paper will underline the importance of investigating the interconnectedness of knowledge and values in public discourse about climate change on social media. Such a research program needs methods for empirical insights and theory-building. The question of methods is elaborated on further in this paper.

Climate change knowledge and values

Climate science relies on a scientific paradigm where models are constantly refined (IPCC, 2021), reflecting the pledge of the Intergovernmental Panel on Climate Change (IPCC) to be policy-relevant but policy-neutral (Pulkkinen et al., 2022). In this conceptualization of climate change science, there is little space for values, understood as culturally inflected signifiers of what is considered important or worthwhile (Rokeach, 1973). Indeed, one of the legacies of the strategic and disingenuous discrediting of climate science by lobby groups, described by Oreskes and Conway (2010), is that climate change scientists may have become cautious when disseminating information about climate change to avoid being seen as partisan, as highlighted by Latour (2017). "Values," on the other side, are characteristically linked to the public in existing research in connection with polarized online public debates, as linked to affect in public discourse, as defined in terms of the cultures of nation states, and as ideology-based and potentially disruptive

1 For stylistic reasons, I generally use the word "public" in its singular form throughout the paper, but this should not be understood to mean that "the public" is a homogeneous or monolithic entity.

of public trust in science (e.g., Leiserowitz, 2006; McCright et al., 2013; Lucas, 2018; Fage-Butler et al., 2022a).

Contrasting with this rather polarized understanding of scientific knowledge as objective (value-free) and the remit of climate scientists, on the one hand, and values as subjective and characteristic of public discourse, on the other hand, science and values have also been conceived in less dichotomous terms. For example, climate change science is considered an example of a post-normal science (Saloranta, 2001), which pertains when "facts are uncertain, stakes high, values in dispute and decisions urgent" (Funtowicz and Ravetz, 1993, p. 744). Douglas (2009) provides compelling analyses that demonstrate that while scientists may aspire to a value-free ideal, science is still based on ethical and epistemic values, commitments, and practices, and for that reason cannot be value-free. Moreover, Pulkkinen et al. (2022) argue that the dichotomy between knowledge and values is unfounded and unhelpful, and they assert that climate scientists "should not restrain themselves from warning about threats that have a societal impact. Scientific research cannot be value-free, and climate science is no exception" (p. 5).

Despite these insights about blurry boundaries between science and values, the distinction between climate change science and values continues. It is reproduced in empirical investigations of public understanding of climate science where knowledge of climate change is deemed to be ontologically distinguishable from values and emotions relating to climate change and thus analyzed separately (e.g., Shi et al., 2015; Leon and Arana, 2016). One notable exception to this trend is Huxster et al. (2015) who used a mental models approach when investigating students' understanding of climate science. While topics relating to knowledge, such as the extent to which publics know about climate change (Tobler et al., 2012; Taddicken et al., 2018) or trust climate science (Fage-Butler et al., 2022a) have been the object of considerable research activity, the question of how the public's knowledge may be embroiled in values has been less well-explored. The general lack of focus on values in relation to the public's knowledge is problematic, as it means that we lack understanding of values and their role in public discourse about scientific topics. Values are of great interest in the context of climate change, as they relate to tangible outcomes: values affect trust levels (e.g., whether individuals trust scientists) and underpin attitudes that in turn affect behaviors (Hansen, 2008). For various theoretical and practical reasons, then, values embedded in the public's representations of their knowledge of climate science warrant our attention.

Parallel to these developments, there has been growing interest in and recognition of the public's knowledge. Whereas once, science communication was considered the province of scientists only, science communication has been redefined as "the social communication about science" (Bucchi and Trench, 2021). In this conceptualization, communicators of science are not understood in the narrow sense of experts disseminating their scientific knowledge to the public; instead, science communication is conceived as being evident in the heterogeneous, polyvocal and often lively societal discussions about scientific topics. It should also be mentioned that knowledge in this paper is not conceived as a possession that one "has" or "does not have" to greater or lesser degrees. Instead, knowledge is understood as a discursive accomplishment between interlocutors and as value-laden.

The online setting and the knowledge-values nexus

The online setting with its possibilities for user-generated material (social media, public forums and blogs, etc.) is very relevant for exploring the "knowledge/values nexus" in public discourse about climate change. Social media data are authentic, as the discourse is produced "in the wild" rather than through data generation methods such as interviews or surveys that may inadvertently give rise to "interviewer effects" (Daymon and Holloway, 2011, p. 20). However, care needs to be exerted in relation to the ethics of handling such data (Franzke et al., 2020).

Public discussions of climate change on social media are interesting epistemically, as the public have increasingly turned to social media not only as communication platforms, but also to gain knowledge of what is happening in the world around them (Matei et al., 2021). The online setting is often seen as a place where the exchange of information, e.g., about climate change, may facilitate the production and dissemination of scientific information, misinformation (not deliberately incorrect information) and disinformation (deliberately incorrect information; Treen et al., 2020). Moreover, information is often polarized on social media as social media support homophily and produce echo chambers (Williams et al., 2015), and the information in these echo chambers is also of great interest as it will reflect a community's values.

The vast quantities of social media data lend themselves to the application of computational methods which, for example, can detect changes in cultural trends in the public's online conversations about climate change. Sentiment analysis has shown how the topic of climate change has been valorized by the public (Lineman et al., 2015), while topic modeling has been used on Twitter data to explore the public's perception of appropriate actions to address climate change (Gaytan Camarillo et al., 2021). Pearce et al. (2019) who reviewed the academic literature on social media communication about climate change found that most studies used Twitter data, and that most Twitter users presented climate science as settled, reflecting a pro-science discourse often used by climate activists. To gain traction on the under-explored and rather opaque issue of values as they relate to climate science, there have been calls for theoretical perspectives and greater use of qualitative analytical tools from the humanities (Pulkkinen et al., 2022). As mentioned earlier, Pearce et al. (2019) observed that there

was little focus on qualitative methods; they also found very little analysis of other forms of data than textual data relating to the public's online communication about climate change. These gaps, they suggest, should be "urgently addressed if the huge potential of social media as a source of climate change communication knowledge is to be fulfilled" (p. 10).

Qualitative methods

Given the shortage of qualitative research of online representations of the public's knowledge of climate change, I present four qualitative approaches that can be used to explore the normative and epistemic qualities of knowledge/values: three approaches for text (Foucauldian discourse analysis (FDA), framing analysis and narrative analysis), and one for other modes (multimodal analysis)—useful for the more visual content typical of Instagram and TicToc, for example. These are intended to indicate a range of approaches and are not meant to be exhaustive. They have been applied in similar ways before with social media data. For example, Bisiada (2021) used Foucauldian discourse analysis to analyze the production of knowledge about Covid-19 on Twitter, Jang and Hart (2015) used qualitative framing analysis to analyze Twitter data about climate change, Riley et al. (2016) applied a narrative analysis to the analysis of global warming narratives on Chinese Weibo posts, while multimodal analysis has been used to analyze climate change communication on social media, including non-expert knowledge of climate change and expressions of care for the environment on Tic-Toc (e.g., Hautea et al., 2021).

Discourse analysis can identify values in text because:

> texts contain representations and intentionality. There can be underlying (and to some extent hidden) prevailing perceptions, opinions and understandings that are baked into the text. The analysis then consists primarily of interpreting these understandings to find shared and possibly hidden values or values in practice.
>
> (Kivle and Espedal, 2022, p. 171)

Regarding textual approaches to discourse analysis, an excellent reference point is Foucault who conceptualized discourse as "power/knowledge" (Foucault, 1980), and implicitly in that designation emphasized the normativity of discourse. FDA which builds on the theoretical approach to discourse presented in *The Archaeology of Knowledge* (Foucault, 1972), sees discourse as reflective of disciplinary knowledge and as having normative qualities that need to be exposed through analysis of a discourse's "enunciations" (p. 205) expressed in texts. In previous work, I have used FDA to explore the normative and epistemic qualities inherent in topics such as the public's online risk discourses about the HPV vaccine (Fage-Butler, 2021) and homebirth (Fage-Butler, 2017). Approaches to discourse analysis other than FDA that have been inspired by Foucault exist, and these can also be used to analyze values in discourse (Kivle and Espedal, 2022).

A second analytical approach that can be considered fruitful for exploring knowledge/values is framing analysis, as frames incorporate valorizations of a topic. For example, when analyzing frames using Entman (1993), it is relevant to consider the following four categories: problem definition, causal interpretation, moral evaluation and treatment recommendation. Entman's (1993) theoretical approach to framing has been applied in both qualitative (e.g., Molder et al., 2002) and quantitative research (e.g., Rochyadi-Reetz et al., 2019). For an example of qualitative framing analysis where Entman's four categories provide a schema for the qualitative coding of data, see Fage-Butler et al. (2022b).

A third approach that can be applied to analyze knowledge/values is narrative analysis. Fisher (1987) conceptualized narration as a paradigm of human communication, and asserted that narratives about knowledge incorporate values. Fisher's (1987) theoretical insights into narratives as "not presum[ing] intellectual contact only" (p. 75) have been used to conceptualize scientific discourses about Covid-19 as narratives that are assessed on the basis of people's lived experiences and values (Engebretsen and Baker, 2022).

Climate change communication is often visual (Doyle et al., 2011), and Pearce et al. (2019), as noted above, have highlighted a lack of research focus on material that is not textual in form relating to the public's online discursification of climate change. For an analysis of knowledge/values in visual (and other non-textual) forms, a useful approach is multimodal analysis (Kress and Van Leeuwen, 1996; Machin, 2007). Multimodal analysis can be valuably combined with a social semiotic approach (Van Leeuwen, 2005), as social semiotics explores the significance of multimodal communication in relation to sociocultural meanings and practices. Guenther et al. (2022) show how multimodal analysis has also been combined with qualitative framing analysis to analyze climate change news stories, an approach that can readily be applied to social media data.

Qualitative analysis of the public's knowledge/values regarding climate change in online settings opens up new research vistas. As mentioned earlier, qualitative approaches make it possible to analyze imaginaries relating to climate change, where "imaginaries [...] at once describe attainable futures and prescribe futures that states believe ought to be attained" (Jasanoff and Kim, 2009, p. 120). The future orientation of "imaginaries" as described and conceived in the tradition of Science and Technology Studies (STS) is relevant, as climate change is often presented in terms of risks (future dangers we may be able to avert) by scientists; as practical (e.g., infrastructural), economic and ideological challenges facing society that need to be resolved by politicians; and as requiring transformative approaches by climate activists. In this way, I suggest that a focus on knowledge/values may help to create

empirical findings that unpack the public's future-oriented climate "imaginaries."

Discussion

This paper supports the call for new research programs that investigate the public's representations of their scientific knowledge of climate change in online settings and particularly on social media (Taddicken and Krämer, 2021). It sees great potential in exploring values in relation to knowledge in such a research program, as by moving beyond understandings of knowledge as defined in the natural sciences, we can better understand the meanings associated with climate change in the online public arena.

This paper argues for the usefulness of applying qualitative methods to analyze knowledge/values in the public's climate change discourse, and it presented four methods that could support that endeavor. These methods could be supplemented with other approaches that are tailored to specific analyses. Future research programs exploring knowledge/values may want to go beyond a qualitative approach and use mixed methods, for example. The methods included in this paper are meant to indicate the potential and range of qualitative approaches, and they could also be used to analyze the public's online communication about topics other than climate change at the confluence of knowledge and values, such as the Covid-19 pandemic. Although the results of empirical investigations of knowledge/values are likely to be different for different topics due to an abundance of contextual and topic-related factors, analyzing and comparing a variety of topics in relation to knowledge/values would further theorization of knowledge/values in public online discourse about scientific topics.

This paper sketches only some of the ingredients of a future line of inquiry. These would need to be supplemented by theoretical and methodological input related to the specific online medium/genres used to communicate about climate change. For example, Facebook, Twitter, discussion blogs, and online forums etc. have different affordances (Boyd, 2010) that facilitate certain communication possibilities while restricting others. Focusing on these media-related features is essential, as they shape the knowledge/values meanings that are possible in the online context.

In underlining the importance of exploring knowledge/values in the public's communication about climate change on social media, this paper broadens the understanding of public knowledge. It maintains that more holistic approaches to knowledge are needed, as knowledge is not value-free. Humanities researchers have analytical tools as well as ethical and critical perspectives that can be applied to unpack knowledge/values in social media communication about climate change. Such a humanities "kit" can lead to greater awareness of public perspectives on climate change, and, we can hope, provide leverage for the dialogue and action needed at this critical juncture in our history and the history of our planet.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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