International Society of the Learning Sciences

Finding Out about Science through the News: How Specialist and Non-Specialist Science Journalists' Epistemic Aims and Practices Vary

Christiana Varda, UCLan Cyprus, CVarda1@uclan.ac.uk
Kalypso Iordanou, UCLan Cyprus, KIordanou@uclan.ac.uk

Abstract: People resort to the news to find out about science, but the evolving media landscape has transformed how science is reported. Due to media's infrastructural challenges, specialist journalists and non-specialist science journalists report on science. Given that journalists hold an epistemic function by disseminating knowledge claims, this exploratory study sought to understand how epistemic and non-epistemic aims and epistemic practices compare between specialist and non-specialist journalists reporting on science. We adopted a case study analysis and analyzed two focus group with distinct samples (specialist/non-specialist journalists). Both groups mentioned epistemic aims, but these differed: non-specialist journalists aimed for objectivity and fairness, while specialist journalists aimed at explaining science. Non-specialist journalists also verbalized financial incentives and speed as non-epistemic aims. The epistemic practices between the groups also varied extensively; only making science personally relevant applied to both groups. The study holds implications for journalism instruction and curricula for science reporting.

Introduction

Adults get informed about scientific processes and findings through the news, as well as other online sources (e.g., social media) which have broadened the ways in which people might be incidentally exposed to science-related issues (Dunwoody, 2014). Social media platforms, which allow for anyone to post any — accurate or inaccurate — information, have heightened concerns over the presence of misinformation on health-related topics, as illustrated in the recent COVID-19 pandemic (Yang et al., 2021), as well as topics pertaining to climate change, often sowing the seeds for societal polarization (Falkenberg et al., 2022). Formerly, journalists held a gatekeeping role, as they determined what scientific information entered the public sphere (Trench, 2008). Currently, the new information environments online hold epistemic consequences by challenging existing journalistic infrastructures and circulation practices, while also creating epistemic contests between journalists and other actors, who engage in an ongoing competition and negotiation between what news knowledge should look like (Carlson, 2020).

Journalists hold an epistemic function since they engage in knowledge-producing practices and the communication of knowledge claims (Ekström, 2002). On account of this epistemic function, science journalists' practices have been used to inform science instruction and the design of learning environments that empower individuals to rely on science to reach decisions (Polman et al., 2014). How journalists report on science also shapes how society responds and engages with science, beyond formal schooling (Bucchi & Trench, 2014). However, while there is interest for science coverage, newsrooms are getting smaller (Fahy & Nisbet, 2011), which can mean that science might not necessarily be reported by a science journalist (i.e., specialist), and could be assigned to a non-specialist journalist instead. Given journalists' role as an epistemic authority, this exploratory work examines and compares the epistemic aims and practices of specialist and non-specialist science journalists. We approach this work with the understanding that journalistic communities of practice are likely to shape the meanings, identities and practices (Wenger, 1998) of specialist and non-specialist journalists reporting on science. How science is reported in the media plays a role in how people learn about and engage with scientific issues. Focusing on the epistemic role that journalists occupy in this context can help us identify potential gaps that could inform journalists' professional instruction and curricula for science reporting.

Who reports on science and how?

The COVID-19 pandemic shifted the focus of scientific reporting from the periphery to the main story, and has heightened interest in science reporting (Claveau et al., 2020). The epistemic practices that journalists reporting on science rely on are bound by infrastructural constraints (Carslon, 2020). For instance, science stories must first pass through the news production cycle before getting publicized (Dunwoody, 2014), and this is a process of negotiation that happens between journalists and editors (Palmerini, 2008). Additionally, due to legacy media's infrastructural challenges (e.g., shrinking newsrooms, limited funding), science reporting might be conducted by specialist science journalists, who hold a scientific background, or non-specialist journalists, who have

professional journalistic training but may report on science by adopting a lay stance (Figdor, 2017); in both instances science stories enter the public sphere.

The literature supports that non-specialist journalists may lack the expertise to validate the science, and in response they resort to two staple journalistic norms: *objectivity* and *balance* (Dunwoody & Konieczna, 2013). Journalists are bound by such professional norms, which can also be considered as epistemic aims, since through their achievement the intention is to produce good epistemic products (Mohseni et al., 2022). This is also indicated in the code of ethics that guides journalistic work, which points to journalists' responsibility of ensuring the accuracy of their work (International Federation of Journalists, n.d.). Non-epistemic aims such as having a financial motivation to increase readership or online clicks to attract greater advertising revenue, might also apply (Mohseni et al., 2022). However, journalistic norms might create unintended harm by misrepresenting science (Figdor, 2017). To ensure objectivity, a journalist will focus on accurately representing the claim in the news story; this can mean that the main issue is not whether the evidence fits the claim, but whether what the journalist presents fits with what the source says (Dunwoody, 2014). Balance is related to objectivity, but it focuses on adequately representing an array of competing claims, with the aim of being fair (Mohseni et al., 2022). This might mean giving equal weight to claims that are not equally valid, thus creating a 'false balance'; this has occurred on issues such as MMR vaccinations, as well as climate change (Murcott & Williams, 2013). An objective story can still turn out to be false, and a balanced story can lead to a false conclusion when equal space is given to claims across the spectrum (Dunwoody & Konieczna, 2013).

To achieve their aims, journalists can employ a set of epistemic practices to ensure the production of epistemically sound products. In their work examining the epistemic practices of science journalists, Polman and colleagues (2014) identify five such practices that guide how science is reported in the media. First, concerns *personal relevance*, which endeavors to connect science to one's life and interests by situating it in everyday life. Second, concerns *searching* for additional information in order to become better informed about the topic one is writing about, while being cognizant of the trustworthiness of the retrieved information. Third, relates to the use of *multiple sources*, which refers to reliance on a range of credible sources that are quoted in a news story, and clearly attributed. Fourth, concerns *contextualization*, which takes into consideration the societal impact of the science reported, and the scientific consensus on the issue, if such exists. Fifth, concerns *sense-making,* which refers to journalists' ability to synthesize science content in order to clarify the science for a lay audience.

In this work our intention is to explore if, and how, epistemic aims and practices compare between specialist and non-specialist journalists, to understand the motivations and means through which science is reported to the public.

Methods

We draw from data collected in the context of a three-year European research project, which focuses on understanding how to bolster trust in science. We adopt a case study approach to analyze data from two focus groups with two distinct samples: one focus group comprised non-specialist journalists (n=5) who reported on science amongst other topics, and a focus group with specialist science journalists (n=4) who exclusively reported on science, mostly for dedicated science-related media outlets. Non-specialist journalists were recruited through a personalized invitation shared with a range of local news media organizations; specialist journalists were recruited through an open invitation extended to an official European body for science journalists.

Data were collected through a semi-structured interview and were audio recorded for the non-specialist journalists focus group, which took place in a physical space; the specialist journalists' focus group was recorded using digital conference software since it was conducted online. The interview focused on understanding (a) the challenges journalists faced when reporting science, (b) best practices for reporting science, and (c) actors and actions that could bolster trust. The average duration of the focus groups was 1 hour and 25 minutes; all data were transcribed verbatim, resulting in a rich qualitative dataset (non-specialist journalists: 31 single-spaced pages, 13,323 words; specialist journalists: 27 single-spaced pages, 12,458 words).

The data were initially analyzed using thematic analysis, to identify themes related the research questions guiding the broader research project. During the thematic analysis, we identified verbalizations that mentioned the epistemic aims and practices that participants adopted while they reported on science topics; this was reported across all journalists' focus groups conducted for the project, but was beyond the scope of the funded research project. We noted these episodes, and then returned to conduct an exploratory analysis on two of the focus groups that comprised two distinct samples (other focus groups comprised a mix of specialist and non-specialist groups) to better understand how epistemic aims and practices guide science reporting. For epistemic aims, we coded for the two aims discussed in the literature: objectivity and fairness (Dunwoody, 2014; Mohseni et al., 2022); we also coded for the non-epistemic aim of financial incentives (Mohseni et al., 2022). For epistemic practices, we coded for the five epistemic practices identified by Polman et al. (2014): personal relevance, searching for additional

information, multiple sources, contextualization, sense-making. We also coded for 'other', to capture any other aims or practices verbalized in the data that did not fit the aforementioned categories. Data were coded by the first author, and then discussed with the second author, until consensus was reached where there were disagreements. Excerpts coded for epistemic aims and practices were then tabulated to draw comparisons between the two groups.

Findings

This exploratory case study analysis sought to understand the epistemic and non-epistemic aims that specialist and non-specialist journalists have when reporting on science stories, and the epistemic practices they rely on to achieve those aims. While both groups mentioned epistemic aims, these differed between the specialist and non-specialist journalists. Additionally, the non-epistemic aim related to financial incentives was only mentioned by the non-specialist journalists focus group, alongside an additional non-epistemic aim — speed.

As concerns epistemic practices, in our data we find evidence to support the epistemic practices cited by Polman et al. (2014), mainly for the specialist journalists group. Both groups mentioned personal relevance as an epistemic practice relied on, as well as the use of multiple sources, though the way that this latter practice was adopted by each group differed. Contextualization and sense-making were only mentioned by the specialist journalists group. Two additional epistemic practices were reported: participants in the specialist journalist group mentioned transparency as an important epistemic practice, while participants in the non-specialist group referred to personal testimony as an epistemic practice they relied on to report on science. We elaborate on these insights below, accompanied by some qualitative excerpts.

Epistemic aims

Participants in both groups expressed epistemic aims which guide their work in science reporting, but there was a clear difference between the two groups in the types of aims they set. For instance, only participants in the non-specialist journalists group mentioned the aim of remaining objective, achieved by merely repeating what scientists are stating. When discussing the aim, participants mentioned that by aiming for objectivity, their role was merely to inform the audience, rather than to persuade, as indicated in the following excerpt:

> "I believe that it's neither the media's nor the journalist's role to persuade people to trust science. What the media needs to do, and what the journalist generally has to do – each of us individually — is to give [the scientist] the opportunity, to look for a topic, present it objectively, answer people's questions. From that point onwards, we go back to what we were saying earlier: each person can think critically. On their own. We present the facts, we, in turn, get informed, we inform people, and the people will be the judge. The journalist doesn't set out to report with the intention of persuading." (Non-specialist journalists FG)

On the contrary, participants in the specialist journalist group did not mention the aim of objectivity at all. Instead, the discussion mainly focused on a different aim that we had not initially coded: explaining science. Participants in the specialist group considered that it was within their purview to enhance their readers' understanding of science, and thus the primary aim for reporting on science was not just explaining the main topic of a particular story being covered, but also explaining how science works. This is illustrated in the following excerpt:

> "We identified quite early on that explaining the scientific process was something that we had to do a lot and we have to reference it a lot in our articles because you know our audience is mainly a lay audience. [..] This idea that people want absolutes and, you know, science is not an absolute, and so, you know, throughout the pandemic or, you know, take any scientific subject and the more we know, it doesn't mean that everything else was wrong. It just means the scientific process is working." (Specialist journalists FG)

Both groups discussed fairness as an epistemic aim, but the way it manifested in practice differed between the two groups. Participants in the non-specialist journalists focus group, aimed at being fair by maintaining a balance among a range of expert – or pseudo-expert – voices. When participants discussed this aim they gave examples from the COVID-19 pandemic, and noting the absence of opposing views from panel discussions as an important gap in reporting. Alternately, when participants in the specialist journalists group referred to fairness, it was underpinned by equity concerns, and the representation of a range of diverse, expert voices (e.g., by considering gender balance when sourcing expertise).

Non-epistemic aims

Participants in the non-specialist journalists group referred to financial incentives as a non-epistemic aim, pointing to the constraints put forth by the new online information landscape that requires clicks, and engagement to generate revenue. They also mentioned speed as an additional non-epistemic aim, pointing to the pressure to meet the demands of a fast news cycle, which often results in mere reproduction of news stories, as indicated in the rather striking excerpt below:

> "I insist that [science journalism] pseudo-exists. I don't even know if it pseudo-exists, what you call 'science journalism'. I think it doesn't exist. We just reproduce the news, because this is what we learned, this is what we know, and this is what is asked of us at the end of the day." (Non-specialist journalists FG)

Epistemic practices

Apart from personal relevance, the epistemic practices differed between the two groups; due to limited space, we focus on three of these practices. Both groups mentioned the use of multiple sources as a practice they adopted when reporting on science, but the way that this was applied differed between the groups. For instance, participants in the non-specialist journalists group adopted an acritical approach to the use of multiple sources, perhaps linked to the aim of achieving fairness through maintaining balance. In the context of health, a participant in the non-specialist journalists group mentioned she would use a range of sources, including medical doctors, as well as alternative medicine practitioners, positioning both as experts in health; the view of alternative medicine practitioners was considered important to include on account of their publicity on social media. On the contrary, participants in the specialist journalists group referred to this practice with a more critical stance, indicating the inclusion of multiple expert sources as a means of providing context or an explanation. As one participant in the specialist journalists group mentioned "it is journalists' responsibility to be critical of the science that they are covering as well, and going to experts who are not involved in research is a really good way of doing that."

Participants in the specialist journalists focus group mentioned an additional epistemic practice which concerned transparency. Participants described openly reporting on how science stories are selected, as well as clearly indicating who is writing the story. We also noted an additional epistemic practice mentioned only by the non-specialist journalists group. Participants mentioned relying on personal testimony as a means of achieving a well-rounded story, that included multiple perspectives. We differentiated this from the multiple sources code because the focus was not focused on including credible sources, as indicated in Polman et al. (2014); instead the focus was on highlighting anecdotal evidence from lay sources as corroboration for claims made by credible scientific sources. This is illustrated in the following excerpt:

> "Examples. I mean beyond the scientist, space should be given to the regular citizen, who might have been helped by science. Maybe they can give their own example. How? Why?" (Non-specialist journalists FG)

Implications of this work

Despite the changes to the news media landscape brought about by new online technologies, people still resort to the news to find out about topics related to the environment, science and technology (Newman et al., 2024). However, the infrastructural constraints facing legacy news media (Carlson, 2020) can also affect how science reported: both non-specialist journalists and specialist journalists may report on science. In this exploratory analysis we sought to examine whether these two groups differed in how they typically report on science by examining the epistemic and non-epistemic aims, and the epistemic practices they verbalized during a focus group. To our knowledge, this is the first attempt to understand the epistemic and non-epistemic aims guiding journalists' reporting on science; it extends prior work that has considered other epistemic aspects, such as issue selection (Badenschier & Wormer, 2011), and the use of evidence (Guenther et al., 2019). In our data, we found that the aims between the two groups differed; their practices also differed and this is to be expected, considering how epistemic practices facilitate the achievement of epistemic aims (Chinn & Rinehart, 2016). The non-specialist journalists in our sample mainly focused on producing science stories for the sake of coverage, whereas the specialist journalists in our group viewed science reporting as a way of achieving information delivery that enhances science literacy and contextualizes science, while also encouraging public engagement by seeking to empower readers with scientific knowledge. This suggests a marked difference in how science gets reported in the media, which can hold implications for how people find out about science, to make decisions in their everyday life. The study also holds implications for journalism education: what kind of learning instruction, or curricula could support better science reporting? Figdor (2017) points to the need of enhancing data literacy, but perhaps more is needed; this exploratory study is a first step to opening this conversation.

References

Badenschier, F., & Wormer, H. (2011). Issue selection in science journalism: Towards a special theory of news values for science news?. In Rödder, S., Franzen, M., Weingart, P. (Eds). *The Sciences' Media Connection–Public Communication and its Repercussions* (pp. 59-85). Dordrecht: Springer Netherlands.

Bucchi, M. & Trench, B. (2014). Science communication research: Themes and challenges. In Bucchi, M., & Trench, B. (Eds.). (2014). *Routledge Handbook of Public Communication of Science and Technology* (pp. 27-39). New York: Routledge.

Carlson, M. (2020). Journalistic epistemology and digital news circulation: Infrastructure, circulation practices, and epistemic contests. *New Media & Society*, *22*(2), 230-246.

Chinn, C. A., & Rinehart, R. W. (2016). Epistemic cognition and philosophy: Developing a new framework for epistemic cognition. In Greene, J. A., Sandoval, W. A. & Bråten, I. (Eds). *Handbook of Epistemic Cognition* (pp. 460-478). Routledge.

Claveau, F., Roy, J. H., & Santerre, O. (2020). Viral Science? How COVID-19 Brought Science into the Limelight. Available at SSRN: https://ssrn.com/abstract=3747158

Guenther, L., Bischoff, J., Löwe, A., Marzinkowski, H., & Voigt, M. (2019). Scientific evidence and science journalism: Analysing the representation of (un) certainty in German print and online media. *Journalism Studies*, *20*(1), 40-59.

Newman, N., Fletcher, R., Robertson, C. T., Arguedas, A. R. & Nielsen, R. K. (2024). Digital News Report 2024. Reuters Institute for the Study of Journalism. https://reutersinstitute.politics.ox.ac.uk/sites/default/files/202406/RISJ_DNR_2024_Digital_v10%20lr.pdf

Dunwoody, S. (2014). Science journalism: prospects in the digital age. In Bucchi, M., & Trench, B. (Eds.). (2014). *Routledge Handbook of Public Communication of Science and Technology* (pp. 27-39). New York: Routledge.

Dunwoody, S., & Konieczna, M. (2013). The role of global media in telling the climate change story. In Ward, S. J. (Ed.). (2013). *Global media ethics: Problems and perspectives.* (pp. 171-190). John Wiley & Sons.

Ekström, M. (2002). Epistemologies of TV journalism: A theoretical framework. *Journalism*, *3*(3), 259-282.

Fahy, D., & Nisbet, M. C. (2011). The science journalist online: Shifting roles and emerging practices. *Journalism*, *12*(7), 778-793.

Falkenberg, M., Galeazzi, A., Torricelli, M., Di Marco, N., Larosa, F., Sas, M., Mekacher, A., Pearce, W., Zollo, F. Quattrociocchi, W. & Baronchelli, A. (2022). Growing polarization around climate change on social media. *Nature Climate Change*, *12*(12), 1114-1121.

Figdor, C. (2017). (When) is science reporting ethical? The case for recognizing shared epistemic responsibility in science journalism. *Frontiers in Communication*, *2* (3).

International Federation of Journalists. (n.d.) *Global Charter of Ethics for Journalists*. https://www.ifj.org/who/rules-and-policy/global-charter-of-ethics-for-journalists

Mohseni, A., O'Connor, C., & Weatherall, J. O. (2022). The Best Paper You'll Read Today: Media Bias and the Public Understanding of Science. *Philosophical Topics*, *50* (2).

Murcott, T. H., & Williams, A. (2013). The challenges for science journalism in the UK. *Progress in Physical Geography*, *37*(2), 152-160.

Palmerini, C. (2008). Science reporting as a negotiation. In Bauer, M. W., & Bucchi, M. (Eds.). *Journalism, science and society: Science communication between news and public relations*. (pp. 95-99). Routledge.

Polman, J. L., Newman, A., Saul, E. W., & Farrar, C. (2014). Adapting practices of science journalism to foster science literacy. *Science Education*, *98*(5), 766-791.

Trench, B. (2008). How the Internet changed science journalism. In Bauer, M. W., & Bucchi, M. (Eds.). *Journalism, science and society: Science communication between news and public relations*. (pp. 133-141). Routledge.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning and Identity*. Cambridge University Press.

Yang, K. C., Pierri, F., Hui, P. M., Axelrod, D., Torres-Lugo, C., Bryden, J., & Menczer, F. (2021). The COVID-19 infodemic: Twitter versus Facebook. *Big Data & Society*, *8*(1), 20539517211013861.

Acknowledgments

This work has been partially funded by the VERITY project (101058623), under the "HORIZON-WIDERA-2021-ERA-01-44" call of the European Commission. This document reflects the views only of the authors.