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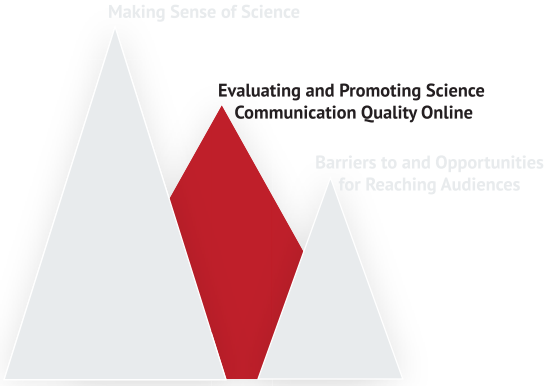
Research Insights

Science Communication Quality



Question in focus

How can science communication quality be assessed in the complex digital media environment?

Empirical approach

- Delphi study with 32 international and interdisciplinary science communication researchers, two waves of consecutive surveys
- Workshops with science communication practitioners in seven European countries

Core findings

- Quality criteria for science communication online can be distinguished into five main categories: content, presentation, procedural, technical and context criteria.
- Quality assessment is regarded as highly context dependent; criteria relating to 'new' settings and actors in science communication especially challenge traditional quality assessments.
- Experts agree that promoting science communication quality is important. Education, reflection and raising awareness within the science communication community are considered the most important approaches, and combining different interventions seems most appropriate.

Future directions

- Develop and foster approaches to promote and enhance science communication quality

Objectives and Approach

Science communication via the Internet and social media has been associated with a number of opportunities; for instance, online communication has been said to lower the hurdles for scientists' public engagement (Jünger & Fähnrich, 2020). Moreover, with the developments around open access and open science, scientific knowledge has become more accessible to those outside science. In contrast, recent debates around 'fake news', misinformation, science denial or the so-called 'infodemic' in the context of COVID-19 indicate the threats and challenges that the digital media environment poses for public communication in general and science communication in particular. It goes without saying that these developments are not without consequences for the quality of public science communication (Peters, 2012). Previous research on science journalism has focused on standards to assess quality and has developed quality frameworks (e.g., Bachmann et al., 2021; Rögener & Wormer, 2017). Moroever, professional science communication has dealt with ethics and related criteria in science communication (Medvecky & Leach, 2017), and Dudo and Besley (2016) indicated that scientists must follow scientific quality control criteria when undertaking public engagement. However, with the tremendous changes to science communication in the digital media environment, the applicablity of these frameworks needs to be scrutinised. Against this backdrop, the maintenance of science communication quality has become of central concern, and reflecting upon this quality is of vital importance. Our research investigated how 'good' science communication could be conceptualised in the digital science communication ecosystem. We investigated which standards should be applied to assess the quality of science communication and whether there are different standards for different online science communication. Finally, we investigated how quality standards of science communication can be promoted in an increasingly complex digital media environment.

Science Communication Quality

To address these questions, we conducted a Delphi study with 31 science communication scholars. The Delphi method is an approach that allows a group of experts to deal effectively with a complex problem in the context of an iterative and anonymous process (Linstone & Turoff, 1975; Niederberger & Renn, 2019). Participating experts represented 17 different national perspectives: Austria, Australia, Brazil, Denmark, Estonia, Germany, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, the UK, the USA, South Africa and Switzerland. Scholars were full or associate professors (63% for Wave 2), meaning that junior scholars were less well-represented. Experts had a background in communication science, STS (Science and Technology Studies), media studies, political science, psychology and other fields. To deal with the questions of focus, the Delphi study was conducted in two survey waves. In addition, we presented our data to science communcation professionals in seven European countries to reflect upon the findings and discuss implications for practice.

Quality complexity

Our first approach was to ask experts for criteria that they would associate with science communication quality in a digital media environment. Overall, experts' responses resulted in a comprehensive list of criteria that can be grouped into five categories.

(1) Content criteria refer to characteristics of the information *per se*. These encompass aspects such as accuracy, objectivity, relevance, the presentation of multiple perspectives, completeness, truthfulness and credibility – criteria known from (science) journalism and science itself. In addition, aspects such as the legitimacy and reputation of sources fall into this category and might be associated with strategic communication.

(2) Presentation criteria refer to how information is exchanged and which modes of interaction are applied. In this regard, quality criteria include transparency (of authors, sources, backgrounds) and language characteristics, such as readability and comprehensibility. In addition, criteria include reading appeal and whether online science communication is engaging.

(3) These criteria show several overlaps with a group of criteria that we denominate as procedural criteria, which refer to aspects relating to goals and audience orientation and thus align with effectiveness. These criteria seem to apply more strongly in online contexts and can thus be considered increasingly important in the context of the digital media environment.

(4) In addition, technical quality criteria are considered to have a large impact on quality. In this category, the adoption of specific platform criteria (e.g., regarding different standards, such as the lengths and tone of posts on social media platforms) and interactivity are associated with quality. Moreover, overall characteristics of online communication, such as the level of hybridity and media convergence (e.g., through links), are indicated.

(5) Finally, context criteria form a meta category that deals with the institutional and moral framework of science communication online.

As the list of criteria derived from the Delphi survey was comprehensive, complex and difficult to apply in practice, we asked the experts to indicate which criteria they considered the most important to evaluate quality in science communication online at a general level. Responses included the following 14 criteria.

Meta-Criteria	Description	Most important criteria
Content	What is communicated?	• Relevance • Accuracy
Presentation	How is it communicated?	• Accessible language & style • Comprehensibility • Engaging communication
Technical	How does the infrastructure interact with the communication?	• Opportunities for dialogue and feedback • Technical accessibility
Context	What is the context of communication?	• Transparency • Clear purpose/ motivation • Reliability of evidence • Expertise of sources
Process	What precedes/follows the communication?	• Definition of goals • Standards • Evaluation

Table 1: Overview of meta-criteria of science communication quality online derived from the Delphi study.

Science Communication Quality

Quality in context

Some experts argued that context is so important that overall science communication quality criteria cannot be defined. This is in line with previous literature that has pointed to a huge variety of definitions, the relativity and dynamics of the concept and related difficulties assessing and evaluating communication quality (Lacy & Rosenstiel, 2015). There is agreement that quality cannot be assessed objectively but is dependent on the expectations of certain actors (journalists, scientists, bloggers, users). Previous research has examined public communication quality from different sides. From a demand perspective, the focus is on the interaction between the needs and requirements of media users and the media content (Dohle, 2017; Prochazka et al., 2014; Urban & Schweiger, 2014). From a production perspective, those who produce media content specify and apply characteristics that are associated with high or low quality (Gertler, 2013). From both perspectives, however, quality is a 'matter of degree. It is not as simple as having or not having quality' (Lacy & Rosenstiel, 2015, p. 11). In a digital context, content is 'created by users from different backgrounds, for different domains and consumed by users with different requirements' (Chai et al., 2009, p. 791). Against this backdrop, we aimed to explore quality requirements for different situational settings in which science communication occurs and asked experts to compare these with regard to quality criteria. We proposed the following settings:

A. A news section on a university website presenting the latest research from their organisation,
B. A scholar's Twitter thread commenting on policy issues by referring to the latest evidence,
C. A governmental campaign on different social media sites referring to public health issues,
D. A blog by environmental activists citing scientific studies to strengthen their argument,
E. An influencer's post on Instagram presenting spectacular scientific experiments and
F. A podcast provided by the science section of a leading daily newspaper.

	Direct intervention	Incentivisation	Self-regulation
Informal	'Some kind of community assessment, where non-governmental and non-institutional agencies apply critical scrutiny' (p. 6).	'Quality standards should be conveyed and promoted as reflective tools and not as deterministic tools' (p. 21).	'Quality criteria for digital science communication cannot be set top down' (p. 24).
	'Evidence-based countering of [false] claims to try to limit the spread of misinformation' (p. 11).	'Foster a culture in which we can discuss openly and constructively criticize outputs with one another" (p. 7)	'Assessments of quality rest with individual audience members' (p. 23).
	'One might think of a mechanism similar to fact checking/seal of approval' (p. 22).	'With more science communication done on a professional basis, opportunities to promote quality standards increase" (p. 6)	'Quality should be defined and promoted within the specific communities of practice' (p. 19).
	'Partnerships with the major social media platforms to quickly identify problematic content' (p. 11).	'Awards that name role models and provide incentives' (p. 26).	'Starting with the audience to improve media literacy should be prioritized' (p. 25).
	'This can only be effective if policy and funding organisations champion the cause of quality' (p. 10).	'Educational institutions and professional member bodies have a responisbility to promote best practice/professional standards for quality' (p. 17).	'To invest in better education and a critical view of society' (p. 24).
Formal	'Direct blocking of content, and criminalization' (w. 2, p. 7).		

Figure 1: Approaches to conveying, promoting and/or securing quality criteria for science communication online (statements from participants of the delphi study)

Science Communication Quality

Although many participants compared the settings and hinted at differences in the quality assessments of different situations, it was obviously difficult for experts to eliminate criteria. Regarding the (ir)relevance of the given criteria in different situational settings, it was argued that it was rather a 'matter of relative importance of different criteria in different settings, than a case of some not applying. They all apply, to a greater or lesser extent' (w2, P2)[1].

Table 1 displays a summary of the responses and lists those criteria that were considered especially relevant for the given situation. This does not mean that other criteria might not apply, but we attempted to mark differences between different science communication settings. Highlighting these differences might be relevant for different stakeholder groups, including science communication trainers, policymakers or lay communicators. It is striking that experts chose those situational settings that they were probably most familiar with: a university website, a scholar's thread on twitter and a newspaper podcast. The government campaign setting was chosen less but still considered. The situational settings of Instagram posts and environmentalists' blogs were not discussed. This is unfortunate, as these examples differ most from the 'old' and analogue science communication world and thus would have been especially interesting to compare.

Quo vadis? Promoting science communication quality in the future

Discussing online science communication quality criteria is closely connected to questions of how these criteria could be transformed into quality standards. Against this backdrop, we asked how experts would convey, promote or even secure the quality criteria that they considered most important. Different arguments could be located on a continuum with direct intervention to secure the quality of science communciation (e.g., fact checking, collaboration with/regulation of platforms) on one end and self-regulation (e.g., quality standards should be conveyed and promoted as reflective tools and not as deterministic tools) on the other, with incentivisation (the best we can hope for is to foster a culture in which we can discuss openly and constructively criticize outputs with one another) in between the extremes. Another distinction can be made between formal and informal approaches. Figure 1 shows the range of possible approaches.

The study results thus offer starting points for the promotion of science communication quality standards in the digital science commnunication environment. For the experts participating in our Delphi study, combining different interventions seemed most appropriate. Overall, experts agreed on the need for education but also for reflection and raising awareness within the science communication community. In this regard, strengthening the collaboration between scientists and practitioners to evaluate the quality discourse was also considered an important approach. Moreover, we are convinced that reflecting upon science communication training is an important step and thus we encourage you to engage your students to contribute to this challenge.

Recommended reading

Science communication in digital contexts:

Davies, S. R., & Horst, M. (2016). The Changing Nature of Science Communication: Diversification, Education and Professionalisation. In S. R. Davies (Ed.), *Science communication* (pp. 79–101). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-50366-4_4

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Communication quality

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[1]-w refers to waves of the delphi studies, P to participant

Science Communication Quality

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Peters, H. P. (2012). Scientific sources and the mass media: Forms and consequences of medialization. In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The Sciences' Media Connection – Public Communication and its Repercussions* (pp. 217-239). Springer.

Prochazka, F., Weber, P., & Schweiger, W. (2018). Effects of Civility and Reasoning in User Comments on Perceived Journalistic Quality. *Journalism Studies, 19*(1), 62-78, https://doi.org/10.1080/1461670X.2016.1161497

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