Open Science Practices – a theoretical reflection

Isabel Steinhardt [0000-0002-2590-6189]

Department of Social Sciences, University of Kassel, Kassel, Germany,
steinhardt@incher.uni-kassel.de

ABSTRACT

Keywords

Open Science, Practices, Crisis of Science, Disciplinary Cultures

Purpose of this paper

More and more articles discussing a "crisis of science" (Saltelli & Funtowicz, 2017). The crisis is identified by seven symptoms: First, the replication crisis, which means that published studies cannot be replicated by other researchers or lead to different results (Open Science Collaboration, 2015). Second, the deficit in statistical training and good statistical designs/models (Young, 2018) which for example leads to not useful research in medicine (Ioannidis, 2016). Third, the manipulation of p-values (or 'p-hacking') is identified as a problem. For example, Simmons et al. (2011) state: "In many cases, a researcher is more likely to falsely find evidence that an effect exists than to correctly find evidence that it does not." Since only positive and significant results are published results in the creation of a bias in scientific literature (Bruner & Holman, 2019). Fourth, "journal-based metrics, such as journal impact factors, should not be taken as a surrogate measure for the quality of research, and, above all, should not be used in hiring, promotion, or funding decisions." (Ioannidis, 2014) At the same time, especially early career scientists must comply to the metric system if they want to survive in academia (Fanelli, 2009). Fifth, complying with the metric system implies publishing in peer reviewed journals, which according to Frey (2003) is tantamount to prostitution: "Authors only get their papers accepted if they intellectually prostitute themselves by slavishly following the demands made by anonymous referees who have no property rights to the journals they advise." Sixth, the metric system motivates scientists to producing as many articles as possible, which leads to the "publish or perish" effect of splitting research into as small parts as possible (Saltelli & Funtowicz, 2017). Seventh, Fanelli (2009) refers to a poll in which 2/3 of the interviewed scientists "admitted having recurred to 'questionable' research practices" because of the publish

or perish culture. In sum, these symptoms contribute to science being under increasing pressure as the ”public trust in the evidence produced by science and its institutions“ decreases (Saltelli & Funtowicz, 2017).

Taking a step back, the described problems do not account for a crisis of science as such but are (systemic) bad practices of scientists. The bad practices reflect very much the counter-norms of science (Mitroff, 1974). Open science can be seen as a counter-movement to the bad practices and also aims for a system change. Open Science is a movement (Allen & Mehler, 2019) ”that advocates for more public and accessible science, and has progressively encompassed new researchers’ practices and identities that go beyond the idea of digital science towards open and social activities“ (Raffaghelli & Manca, 2019). The first goal of Open Science is to change the practices of scientists so that they design their research process as open as possible from the initial idea to the archiving of data (Steinhardt, 2019), by using open methodology, open access, open data and open peer review. The second goal is to create the necessary political and infrastructural conditions to support open practices.

So far, little has changed in the practices of scientists, even though politics exerts pressure, for example by linking funding to the re-use of data (Horizon 2020) or by open access strategies (Plan S). However, and this is the thesis of this paper, scientific practices will only change connected to disciplinary cultures (Becher, 1981) and their values, norms and patterns of acting, thinking and perceiving (Bourdieu, 1977). Schatzki defines practices as: ”temporally unfolding and spatially dispersed nexus of doings and sayings“. The awareness of practices are part of the process of socialisation into a disciplinary culture, when individuals incorporate the typical social structures and practices of the disciplines (Schneijderberg, 2018). This means, if the practices of the discipline are not characterized by openness and the principles of Open Science are not part of socialization, then they will have difficulties to finding their way into the practices of scientists.

Research limitations/implications

The proposed contribution is a theoretical reflection and therefore no empirical material is used.

What is original/value of paper

Up to date, Open Science has been viewed primarily from a normative perspective, without paying attention to distinction, power imbalances, micro-political negotiations or the stability of existing practices. This paper will explore the research gap of scientific practices in the discussion on Open Science and give some ideas to fill the gap by using the theory of practice.

References

Allen, C., & Mehler, D. M. A. (2019). Open science challenges, benefits and tips in early career and beyond. *PLOS Biology*, *17*(5), e3000246. https://doi.org/10.1371/journal.pbio.3000246

Becher, T. (1981). Towards a definition of disciplinary cultures. *Studies in Higher Education*, *6*(2), 109–122. https://doi.org/10.1080/03075078112331379362

Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge: Cambridge University Press.

Bruner, J. P., & Holman, B. (2019). Self-correction in science: Meta-analysis, bias and social structure. *Studies in History and Philosophy of Science Part A*, S003936811830164X. https://doi.org/10.1016/j.shpsa.2019.02.001

Fanelli, D. (2009). How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. *PLOS ONE*, *4*(5), e5738. https://doi.org/10.1371/journal.pone.0005738

Frey, B. S. (2003). Publishing as Prostitution? – Choosing Between One's Own Ideas and Academic Success. *Public Choice*, *116*(1), 205–223. https://doi.org/10.1023/A:1024208701874

Ioannidis, J. P. A. (2014). How to Make More Published Research True. *PLOS Medicine*, *11*(10), e1001747. https://doi.org/10.1371/journal.pmed.1001747

Ioannidis, J. P. A. (2016). Why Most Clinical Research Is Not Useful. *PLOS Medicine*, *13*(6), e1002049. https://doi.org/10.1371/journal.pmed.1002049

Mitroff, I. I. (1974). Norms and Counter-Norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists. *American Sociological Review*, *39*(4), 579–595. https://doi.org/10.2307/2094423

Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science*, *349*(6251), aac4716. https://doi.org/10.1126/science.aac4716

Raffaghelli, J. E., & Manca, S. (2019). Is There a Social Life in Open Data? The Case of Open Data Practices in Educational Technology Research. *Publications*, *7*(1), 9. https://doi.org/10.3390/publications7010009

Saltelli, A., & Funtowicz, S. (2017). What is science's crisis really about? *Futures*, *91*, 5–11.

Schatzki, T. R. (1996). *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge University Press.

Schneijderberg, C. (2018). *Promovieren in den Sozialwissenschaften*. https://doi.org/10.1007/978-3-658-19739-1

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant. *Psychological Science*, *22*(11), 1359–1366. https://doi.org/10.1177/0956797611417632

Steinhardt, I. (2019). *Teaching Open Science and qualitative methods* [Preprint]. https://doi.org/10.31235/osf.io/b3zf7

Young, C. (2018). Model Uncertainty and the Crisis in Science. *Socius*, *4*, 2378023117737206. https://doi.org/10.1177/2378023117737206

Suggested Citation

Steinhardt, I. (2019). Open Science Practices – a theoretical reflection. Research Symposium – Open Practices in Education (OPINE). 14-15 Nov 2019, Frankfurt a. M., Germany. [doi see Zenodo]