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Open, Organized, and Onerous: Understanding and Recognizing the Labors of Open Science

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ABSTRACT

In the face of high-profile cases of scientific fraud, there has been a renewed call among scholars to reconsider current best practices in academic publishing. Prominent in these discussions is a set of open-science practices that ask scholars to "publish more" of their research—not in terms of manuscripts, but in terms of supplemental materials to the scientific enterprise. Through creating, curating, and publishing artifacts such as study materials (experimental stimuli, survey texts, etc.), datasets and analysis code, and other content, the scientific process is made more transparent for readers. However, such practices involve a substantial labor cost to researchers that is *de facto* invisible, as few institutions formally recognize the value in these practices, which can serve to implicitly disincentivize their adoption. This essay presents a brief review of open science practices (including their challenges and opportunities) and suggests ways in which administrators can incentivize these practices, as well as the local and global impacts of those incentives. Ultimately, administrators have the capacity to reward scholars for producing quality and impactful scholarship.

KEYWORDS: open science, #opencomm, data sharing, tenure and promotion, transparency

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Introduction

Among the many reasons that scientific research is valued is a presumption of rigor—that the scientific method is more than a heuristic of knowledge veracity but rather, a *bona fide* process in which one reduces biases and auxiliary explanations and instead, bases knowledge claims on observed phenomena in a systematic and increasingly objective fashion. Contemporary approaches to the scientific method go further, adopting a paradigm of falsification (Popper, 1959) as an additional protection against faulty or inaccurate claims. Here, theoretical explanations must be specific enough to be directly tested (also see Shoemaker et al., 2004) and thus, empirical data is collected that could logically contradict those explanations. Such practices are presumed to set a high bar for what is accepted as sound scientific evidence and theory.

However, science is also a human and social enterprise and thus, the reward structures that enable, foster, and support scientific research are only as strong as the integrity of the individuals who engage them. For university faculty and affiliated researchers, research productivity is more than a marker of personal and professional success but rather, careers are often contingent of publication—be it securing extramural grant funding to secure one's position or earning promotion and tenure and, thus, securing employment (Bouter, 2015). For Bouter, such incentives are considered perverse insofar as they reward publications, rather than the science in those publications.[1] For our focal conversation, such perverse incentives are at least partially responsible for highly publicized scandals in the social sciences from cases of scientific fraud (Levelt Committee et al., 2012; O'Grady, 2023) to broader concerns over the robustness and validity of seemingly established theories (Open Science Collaboration, 2015; Shrout & Rodgers, 2018).

Among myriad suggestions to alleviate these concerns, one is to increase the transparency of the scientific process by way of open science practices in which researchers consider making available additional artifacts of their research such as study materials and empirical data (Bowman & Keene, 2018; Dienlin et al., 2021). However, such practices are not so easily implemented and face resistance on several dimensions—not the least of which is a general lack of incentives for engaging in the additional labor associated with creating and curating these materials. This essay provides an overview of open science practices and the principles behind them, then discusses the labor associated with open science practices, before concluding with a preview of administrative practices that could reward such labor.

A (Brief) Overview of Open Science Practices

As defined by Munafò et al. (2017), open science is a broad term referring to "the process of making the content and process of producing evidence and claims transparent and accessible to others" (p. 5). Bowman and Keene (2018) framed this as moving from a position of implicit trust to one of explicit verification, achieved by publishing supplemental content in addition to manuscripts. They

1. This is a classic example of Goodhart's law, in which the measure (research productivity *vis-à-vis* published reports) becomes the target (i.e., increasing the number of publications, rather than their quality; see Goodhart, 1981).

further proposed a layered model that organizes such practices as degrees of transparency, moving from the least transparent ("by Author(s) request") to the sharing of study materials (such as copies of survey materials, experimental stimuli, and codebooks), data analysis files (such as syntax for statistical packages or data output files), to sharing data analysis files (such as datasets and other empirical data).[2,3]

Already suggested in the introduction, the impetus for open science practices stems from concerns around the validity of published scientific claims. For example, Dienlin et al. (2021) argued that publishing study materials, data, analysis code, and other shared elements addresses three concerns by (a) facilitating the reproduction of reported analysis and the replications of published research by third parties, (b) providing additional resources for knowledge creation and thus aids in incremental science production, and (c) reducing questionable research practices through analytical transparency. In follow-up research (Bowman et al., 2022), 330 members of the International Communication Association completed a mixed methodological survey of their knowledge of, experience with, and dispositions toward open science practices. Data from that project suggested that although there was widespread familiarity with and support for such practices among respondents, engagement in the practices was far less common. Further exploration of written responses from their study suggested numerous concerns: ambiguity around shared standards for open science, incompatibility with some scholarly approaches such as humanities approaches and qualitative data analyses, fears over misuse of materials by others, and concerns over toxic cultures regarding open science. Concerns over toxic cultures are especially concerning, as they have been highlighted by others. For example, Whitaker and Guest (2020) coined the term #bropenscience to highlight often gendered disparities in terms of aggressive and abusive voices leveraging social media to attack and bully scholars for even the slightest perception of malfeasance. As they noted, #bropenscience was less about scientific integrity but rather—to quote from Bowman et al.'s 2022 data—"A small, loud, and privileged set of people get to narrowly define what is 'good' research."[4]

A combination of unclear standards, inconsistencies among associations and journals about where and how open science practices are engaged, and concerns about various "bad actors" and #bropenscience behaviors serve as hindrances to the broader adoption of open science practices. For some, they are left with a feeling that they are "Damned if they Do, and Damned if they Don't." Although this essay cannot address all these concerns, one that consistently emerges across conversations is a perceived lack of recognizing and incentivizing the labor inherent to open science practices.

2. For Bowman and Keene (2018), their model centers registered reports as most transparent, which incorporates all other sharing practices as well as a multi-stage peer review of research proposals and reports. For this essay, we set aside registered reports as they represent more fundamental alterations to the journal publication process that are beyond the scope of the current argument.

3. Data sharing brings with it a unique set of concerns and critiques in the protection of participants (see Fox, 2022; Fox et al., 2021), although we submit that many such concerns are robustly engaged in existing processes of ethical review and open science practice (see Dienlin et al., 2021).

4. Data available online at: https://osf.io/7dyte/,

The (Unrecognized) Labor of Open Science

As previously noted, scholars have outlined the processes and benefits of open science practices (Bowman & Spence, 2020; Cook et al., 2018; Dienlin et al., 2021). Moreover, specific journals have highlighted a commitment to recognizing these practices (see Bowman & Keene, 2018; Spence, 2019; Weber, 2019) and accordingly, there is broad support for open science practices in theory.[5] However, considerations of costs and benefits (re: labor) are often ignored in these discussions. Put simply, the labor that accompanies open science practices is generally not considered as "meritorious" by most institutions in their evaluation of faculty performance. Scholars must make numerous decisions based on the rewards that come as the result of their efforts. This is especially true of early career scholars without secured or tenured positions, and/or who are still amassing social capital and reputation within their areas of study (Bazeley, 2003). These can be decisions from a detailed systematic analysis or heuristic decision-making, which often includes a variably detailed cost–benefit analysis on the amount of work undertaken relative to the plaudits from that work. These analyses and their resulting decisions are made throughout the entire career of an academic and can be found in myriad areas of that career. For example, in designing a research project, the addition of a single additional condition within an experiment has the potential to provide stronger explanations of the findings and create a strong argument for the author, but the decision also comes with costs—added time to recruit eligible participants, possibly costs associated with incentives and staffing, and decisions regarding increasingly robust-yet-complex statistical analyses.

Included in this constellation of decisions to be made are the open science practices discussed above. Decisions to create and curate study materials and study data for broad public consumption are not inconsequential and involve cost–benefit analyses as well. As outlined by Allen and Mehler (2019) "[s]ystems that reward open science practices are currently rare, and researchers are primarily assessed according to traditional standards" (p. 4) and in the absence of rewards and incentives, adoption of the practices will be slow; Dienlin et al. (2021) offered similar observations, noting that while there is some movement by funding agencies to encourage or even require open science practices, such practices are generally not directly incentivized. Especially in the face of primary pressures to draft and submit grants and manuscripts, scholars could see open science practices as additional labor with little to no "added benefit" to their core mission. Consider a scenario in which a manuscript is submitted for peer review. In many communication journals, such manuscripts are somewhere around 8,000 words in length, or between 25 and 30 pages for an initial submission. Supplemental materials including a clearly described code book that explains how responses to self-reported measures were transformed into a data file and outlining decisions made in data transformations, case exclusion and inclusion criteria, preparing precise variable explanations and data labels, and other tasks can end up being longer than the initial manuscript submitted. In a real sense, producing supplemental open science materials for any given study can result in twice the work for a scholar, when others doing the same research absent open science practices can do so

5. From the Open Science Framework database, more than 100 scientific journals currently participate in their Open Science Badges program, including several in the "communication" discipline, and are categorized online at https://web.archive.org/web/20230718194908/https://topfactor.org/journals?factor=Open+Science+Badges&disciplines=Communication&perPage=100. Some communication associations, such as the International Communication Association, also use Open Science Badges in their official programs.

in what seems like half the effort. This is especially concerning when the "open scholar's" research is further scrutinized by unscrupulous actors online (see discussions of academic incivility; Singal, 2016), and in some cases, peer reviewers do not engage any of the curated content.[6]

The time costs could pull scholars away from other research, teaching, or service responsibilities key to their position, and to career advancement broadly. Even in the face of some evidence regarding indirect incentives—McKiernan et al. (2016) argued that open science practices can increase citation rates, media attention to research, and encourage collaborations—if there are no direct encouragement or support systems for this additional labor in one's department, program, school, college, or institution, the costs are likely to appear larger than the benefits. This is one reason why most researchers default to making study materials and data available upon reasonable request from the author.[7] Notably, our arguments focus on tenure-track faculty with a research focus but would be equally applicable to the decisions of non-tenure track faculty, who presumably are also dissuaded from additional labor that is not directly incentivized (for example, if such practices cannot be accounted for in teaching and service obligations). Mirroring claims from Scheliga and Friesike (2014), we can revisit Bowman et al. (2022) and note that in written responses regarding problems with open science practices, the most frequently occurring concern was "labor and value" defined as "concerns regarding the (often devalued) labor required to properly engage [in practices]" (p. 220), including sample quotes such as participants feeling "little to no professional benefit or recognition" and others feeling that the practices could be considered "exploitative" insofar as the labor is not only unrecognized, but seems to benefit other parties (such as other scholars using the shared data and materials for their own research).

In the end, agreement on what activity(ies) deserves merit between and within academic units is difficult to obtain, especially when units might presume a zero-sum game—if some behaviors are rewarded, then other behaviors are not. Moreover, there are many other practices that academics engage in that similarly go unrewarded to which some would argue are worthy of merit that are beyond the scope of our review.[8] Over time, it may be that open science practices will become a requirement of the research process, as has been seen by international funding agencies and some journals (such as the *Open Science Journal,* https://web.archive.org/web/20230719195332/https://osjournal.org/submissions.html and manuscripts with the *PLoS* suite of journals, https://web.archive.org/web/20230719195355/https://journals.plos.org/plosone/s/data-availability). However, mandates are not supported by communication scholars (see Bowman et al., 2022) and introduce

6. The lead author can attest to this being an ongoing source of frustration as an author, editor, and peer reviewer having received critiques about studies that are directly answered in the shared supplemental materials—to which colleagues have responded with an unwillingness to "do the labor of reading extra information."

7. The notion of a "reasonable request" is difficult given that the term itself is ambiguous, and not defined in practice. For example, the American Psychological Association's guidelines on sharing (Section 8.14), "(a) After research results are published, psychologists do not withhold the data on which their conclusions are based from other competent professionals who seek to verify the substantive claims through reanalysis and who intend to use such data only for that purpose, provided that the confidentiality of the participants can be protected and unless legal rights concerning proprietary data preclude their release. This does not preclude psychologists from requiring that such individuals or groups be responsible for costs associated with the provision of such information" (APA, 2017). That said, there are complications with this approach—one of the most unintentional is that author contact information is not always up-to-date and is generally not updated once a manuscript is published.

8. For broader discussions of invisible labor, see Gordon et al. (2022), Reid (2021), Social Sciences Feminist Network Research Interest Group (2017), and many others.

other problems and concerns outside the scope of this essay. That said, the merit of if and how administrators could create systems that explicitly incentivize a practice that benefits the quality of science as well as the position of scientists should be part of the larger discussion.

Benefits of Recognizing Open Science Labor

To this point, we have argued that for many scholars, there is reason to empathize with the position that the costs for engaging open science practices seem to outweigh benefits. However, beyond an intrinsic benefit of contributing to transparent and reproducible science, we highlight at least three potentially overlooked extrinsic benefits that might encourage administrators to consider incentivizing open science practices and, thus, encourage scholars to adopt the same.

First, we can expect that papers in which authors engage open sciences practices are more likely to be cited by their peers (McKiernan et al., 2016). Among many reasons for this could be that when this work is later engaged by others, especially with replication efforts, the original research would feature prominently in later studies (see examples in Boren & McPherson, 2018; Faw et al., 2018; Lane, 2018; Markowitz, 2022; Yoshimura et al., 2022). Whether original studies are directly named in the title or not, further engagement of any original authors' supplemental materials should increase reader attention to the original paper. Such effects, presuming that the attention brought to research was overall positive, would help researchers grow their academic profiles. This can happen directly via citations and impact metrics and indirectly via increased engagement with the authors, which likely facilitate promotion and tenure progress for the researcher, as well as the prestige and reputation of the program for which the researcher is affiliated with. The examples cited above are related to replication efforts but can also be seen when scholars engage other aspects of the shared content from a researcher.[9] For example, sharing newly created survey metrics or experimental stimuli likely results in increased citations to those original studies.

Second, open science practices can help researchers organize their own research pipeline, which could be an overall productivity gain—or at least, not a productivity loss. Borrowing from a colleague's claim that "your worst co-author is yourself, six months ago" (Jacob Fisher, private communication, November 14, 2019), open science practices help organize and keep record of our scientific efforts. For example, preregistration can be a useful tool for reminding researchers of their *a priori* hypotheses and analysis plan, no matter how much time passes. Especially for scholars already asked to juggle many projects at once, it is not uncommon for the time from initial data cleaning and analysis to the drafting and submitting of an academic manuscript to take *at least* 6 months—and often, longer. Consider a scenario in which a scholar is responding to reviewers in a journal revision and is trying to recall intricate details of specific data cleaning and analysis decisions they made some time ago. For scholars who have already prepared details as part of their broader open science materials, such details are readily accessible. Indeed, they are often included

9. On the flip side, we should note that replication efforts might not always produce confirmatory findings, which could expose individuals to further critique. Yet even here we note that a failure of studies to replicate is not a *de facto* indication of dubious or erroneous science but rather can well be part of the iterative nature of knowledge generation. For example, several studies in the special issue of *Communication Studies* dedicated to replication were useful in identifying boundary conditions of prior research and theory (see McEwan et al., 2018).

with the manuscript submission and, thus, could allow reviewers to avoid raising such issues in the first place. In a real sense, open science practices provide the original researcher as well as those reading and reviewing the work a trail of "breadcrumbs" with which they can retrace decisions.[10] Such practices are likely to reduce labor in the long run.

Finally, although not yet commonplace, some universities are already revising their tenure and promotion guidelines so that the labor of open science practices can be recognized in myriad ways. For instance, demonstrating an up-to-date GitHub or OpenScienceFramework.com repository (see Klein et al., 2018) could be counted as research activity in tenure and promotion decisions, ultimately rewarding a candidate for their time and effort spent creating and curating open science materials. Others might consider this service activity (i.e., in service to science broadly, or specific subdisciplines) or even teaching activity (i.e., if shared materials are used as part of course materials). Perhaps at an extreme side of the argument, some (such as Dienlin et al., 2021) have suggested that scholars with a demonstrated track record of open science practices could be prioritized in job searches and grant awards, noting evidence that the latter is increasingly common (also reviewed in Dienlin et al., 2021). One could argue that as open science practices become increasingly normative—in some cases, mandated for funding and publication—administrative structures that recognize and encourage this work now would help insulate programs from later turbulence.

Conclusion

Conversations about merit and labor are difficult, and administrators might see the topic of open science practices to be "yet another faculty argument." That said, we would argue that debates around recognizing the labor of open science practices is a beneficial and relevant one that stands to improve the local and global research environment. Indeed, among the myriad populations for which scholars serve such as our students, colleagues, and local communities, we have an obligation to meet the needs of the scientific community—in all cases, administrators are a part of that process. Administrators are essential in helping faculty meet and excel in these roles. To do this, administrators must also recognize and understand the labor that goes into open science practices, as well as the necessity and benefit of those practices, and therefore must create conditions that facilitate the advancement of open science practices in the academy. Recognizing the work that goes into open science along with incentives and merit for completing that work will help to strengthen science and the role faculty play. While we wholly recognize that open science practices are neither broadly applicable to nor appropriate for all forms of scholarship, we acknowledge that transparency is a useful-yet-laborious benefit to many social science approaches, and we encourage administrators to consider ways to reward such practices when appropriate, relevant, and equitable.

10. In Bowman et al. (2022), one participant noted that "my data sets are so ugly" and that it would be "embarrassing to share them" (p. 220). The authors of this essay surely empathize with this position, while also suggesting that such "ugliness" could also be an unintended source of errors in the academic record.

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