Fundamental errors of data collection & validation undermine claims of 'Ideological Intensification' in STEM

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> "@arizonalumni: Good luck to former #UofA student and @NASCAR champ @KurtBusch as he attempts to race in both the Indy 500 and Coke 600. #BearDown!"

Efforts to advance Diversity, Equity, and Inclusion (hereafter, DEI) at universities in the United States have emerged as another contentious issue in an increasingly polarized political climate (Diep 2023, Kelderman 2023, Kumar 2023). While individuals and organizations critical of DEI often claim that these programs have become increasingly pervasive and ideological (Goad and Chartwell 2022), this assertion is rarely supported with empirical evidence.

The National Association of Scholars (i.e., NAS) recently published a report by Mason Goad and Bruce R. Chartwell (Goad and Chartwell 2022) which the authors claim is "the largest quantitative study of the growth of DEI-related language in the sciences" published to date. Goad and Chartwell searched university web pages and Twitter accounts, funding agency databases, and repositories for scientific literature for instances of "DEI-related terminology" (e.g.,"diversity", "equity", "justice","race"). They claim to to have found a dramatic increase in the use of these terms in university communications and the scientific literature since 2010, which they conclude is unambiguous empirical evidence of "ideological intensification" in the academic and scientific arenas (Goad and Chartwell 2022). They also conclude that if these trends continue, "the future of STEM, along with the rest of the academy, is almost certainly imperiled" (see Goad and Chartwell (2022), p. 47), and encourage others to use their data-mining tools and database to conduct similar research. Since the report's release in December 2022, it has been widely hailed and distributed by prominent DEI critics such as Jordan Peterson and Christopher Rufo.

Readers of the NAS report, especially those familiar with scientometric research, will quickly identify some glaring analytical shortcomings. These include the absence of any formal statistical tests, the use of a single (and questionable) "control" term in literature

searches, and using the absolute number of DEI-related tweets or scholarly publications emerging from universities as the foundation of their analyses and graphs (Fig. 1). This last issue is particularly egregious — the trends they purport to have documented, and which they attribute to institutions increasingly emphasizing "DEI ideology" over science, are simply artefacts of both Twitter use and publication numbers increasing dramatically since 2010. Put another way *one would expect to see increases like those they report even if the proportional effort made by institutions remained unchanged*, which is why it is essential to conduct analyses such as these with 'relativized' rather than absolute values.

That said, none of this actually matters in light of what I discovered when accepting a challenge made by the report's authors in their *Technical Appendix* (p. 48–50).

Goad and Chartwell made the laudable decision to make their code publicly available (National Association of Scholars 2022a), along with the 'clean' data on which they base their conclusions (National Association of Scholars 2022b), "so that other analysts can scrutinize the methods and replicate them" (Goad and Chartwell (2022), p. 48). When I did so, I found that they failed to conduct even the most rudimentary data validation procedures prior to text-mining. Using standard tools and simple methods, I found that their "clean" data sets contain thousands of irrelevant records and duplications [*Supplementary Materials and Methods*]. Notable examples include the tweet that opened this *Letter* — one of over 12000 about topics ranging from sporting events ("race") to members of the Supreme Court ("justice") to hedge funds ("equity") — along with almost 2000 NSF grants for ecological and evolutionary research on species "diversity", and hundreds of "DEI articles in STEM journals" that were actually published in outlets such as *Critical Sociology*, *The Medical Law Review*, and *The Annual Review of Law and Social Science* (see *Supplementary Materials*).

Research from think tanks and advocacy organizations heavily influences policy, legislation, and contemporary debates related to scientific research and higher education (Gándara and Ness 2019, Baig et al. 2020). Computational approaches can greatly expand

the scope and impact of this research, but only if the conclusions are based on robust methods and reliable data. Furthermore, methodological transparency by organizations publishing outside of the traditional scholarly literature are commendable, but only when accompanied by self-accountability. Because the conclusions in Goad and Chartwell's report were based solely on datasets that are clearly of questionable quality, the NAS should adhere to its principles and retract the report. Failure to do so would be an ironic example of what they claim has become pervasive in university settings: the prioritizing of ideology over intellectual rigor.

References

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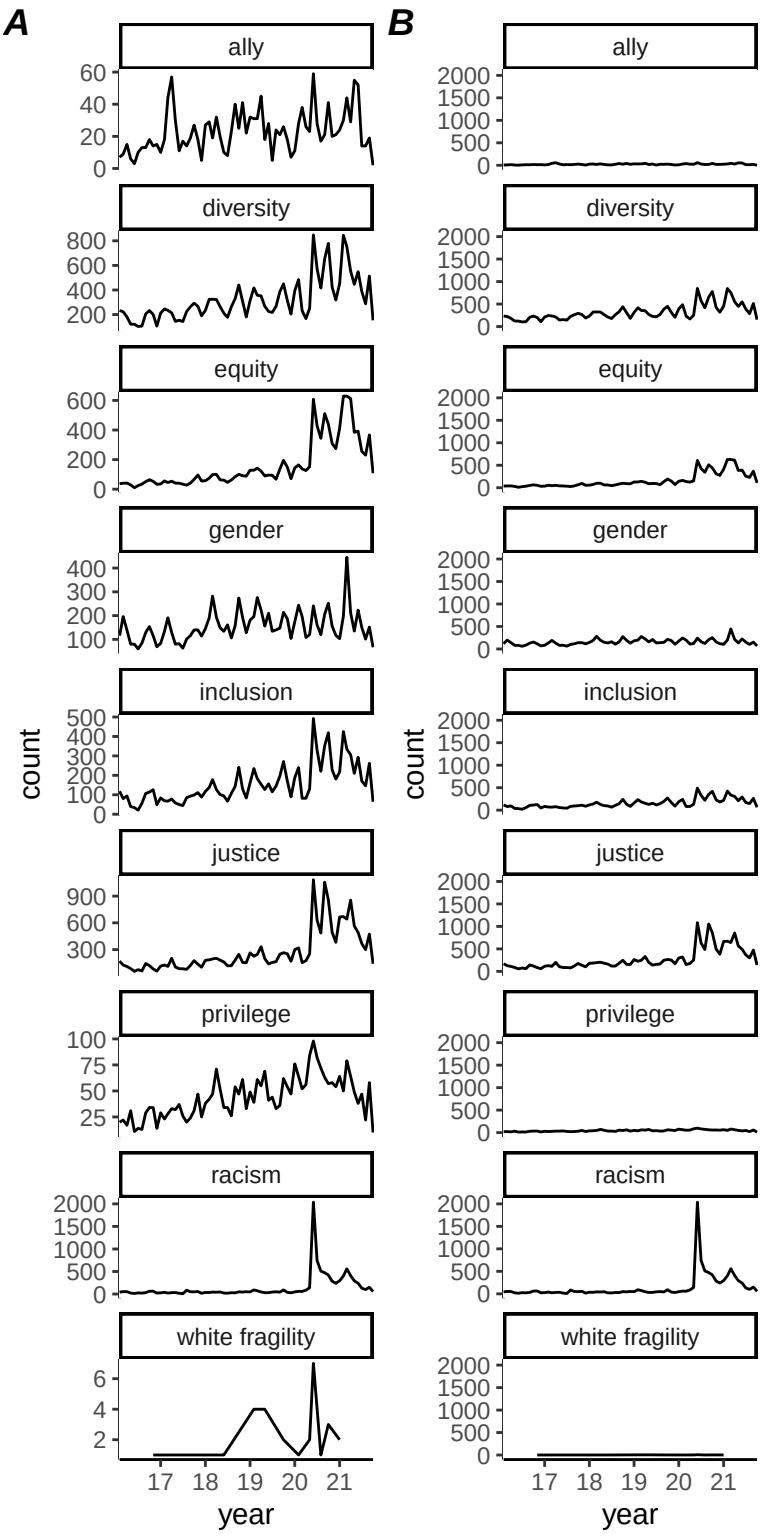

Figure 1: (A) Subset of Figure 8 from the NAS report (*'Fig 8: DEI-related Tweets from all school-related accounts by DEI term'*); the floating y-axes accentuate negligible increases in very rare terms. (B) The same panels as in A, but with identical y-axes for all panels scaled by the frequency of the most common term. Note that both of these figures were made with the original, uncorrected NAS data, so the actual number of tweets for each term is actually much lower.