

**Research Reproducibility 2020**  
**Educating for Reproducibility: Pathways to Research Integrity**  
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**FROM COMPLIANCE TO CREATIVITY: STRUGGLING TO MAINTAIN THE  
INTEGRITY OF RESEARCH INTEGRITY**

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**ABSTRACT**

**INTRODUCTION:** Faced with a series of public-trust-eroding cases of scientific misconduct more than a generation ago, federal research funders contemplated government rules to regulate scientific behavior. The academy rightly resisted, arguing that academics are best able to put their houses in order. Since then, U.S. universities, in compliance with vague NIH and NSF regulations, have instituted indigenous curricula for self-governance in the responsible conduct of research. An informal survey of a dozen research universities suggests, however, that most institutions of higher learning do not teach RCR in the manner of other courses but, rather, deliver curricula narrowly intended to meet those vague regulations. Indeed, many research universities have conflated the teaching of research ethics with corporate-compliance-like “training.” Worse, most appear not to be preparing faculty to address RCR issues with their own students, or ensuring research ethics exposure across academic careers. This stance impedes and erodes pedagogic creativity and innovation. Tracking compliance appears to be supplanting credible pedagogy and we are paying dearly for the corporatization of research ethics.

**METHODS AND RESULTS:** An example of efforts to sustain traditional teaching is the introduction of scientific prose and computer code into RCR education. We have previously argued that these activities are under- or even un-recognized parts of the scientific process and yet can hinder – or foster – reproducibility in the empirical sciences. That is, poorly written prose contributes to failures to reproduce; and well-crafted prose contributes to reproducibility successes. We have hypothesized that certain qualities of ineffective scientific communication, such as hedging, boasting, use of the passive voice and other crutches and vices, have undermined empirical inquiry. Likewise, writing and revising computer code: version control, documentation and fitness for purpose are aspects of software engineering that affect reproducibility. We have introduced these ideas into our institution’s RCR curriculum.

**CONCLUSION:** Creativity and innovation need to be a part of the RCR curriculum because that is where interesting work can flourish. RCR education should be thought of not as presenting a list of topics to endure and be checked off, but as bona fide pedagogic duties and, indeed, an academic inquiry in itself.