

## Near-Authentic Learning Experiences in Scientific Writing and Scientific Peer Review

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Science involves “data-based, rational analysis” and “scientific peer review” provides for the evaluation and assessment of the quality of reports of original science.

The majority of scientific papers contain original data and an authentic exercise in scientific writing must be concerned with the rational analysis of original data. Students should learn how to communicate aspects related to the acquisition of data, how to document original data, and how to structure the data analysis to arrive at clear conclusions. Yet, there are obvious limits to original data generation in a writing class and one of the central questions therefore is “How to write a scientific paper without original data?”

Scientific peer review is at the core of science communication and the understanding of the SPR process is essential for successful scientists. The peer review process affects the writing of a paper from the start, it might lead to requests for revision, and in some cases peer review might result in rejection. Hence, an authentic exercise in scientific writing must include a realistic peer review experience. Yet, students usually lack sufficient expertise in the discipline to engage in competent peer review and another central question therefore is “How to enable students to engage in meaningful peer review?”

We have created near-authentic learning experiences which are based on a large, known two-dimensional dataset (i.e., structure-property data pairs). Such datasets may be found in science databases and/or review articles and they result from compilation of many entries that have accumulated over many years of research by various groups as part of more or less disjoint efforts. Specifically, we requested pairs of students to write a paper on “Substituent Effects on Benzoic Acid Acidity”. Given a compilation of acidity data of hundreds of substituted benzoic acids, students were asked to pick a “cast of several related benzoic acids” for which the acidities had been measured and these selections reflect individual preferences of the students. The students are then asked to pretend that they have synthesized the molecules in their cast for the first time and that they have measured the  $pK_a$  values (acidities) of these new molecules for the first time. With this premise, the students are asked to write a scientific paper to report their “new” results with proper documentation of their new data and with a careful discussion of these results in the broader context. Everybody will write a paper on “Substituent Effects on Benzoic Acid Acidity” and this commonality makes the assignment manageable and guarantees well-educated peer review. At the same time, the resulting papers vary greatly because of the students’ selections of “their casts”.

We will present on implementations in an upper-division WI course at the University of Missouri (Spring '10) and in a first-year graduate course at the Graduate University of the Chinese Academy of Sciences (Summer '10).