Teaching with Writing (TWW) Tip
Writing with Numbers

Although it is often suggested that numbers speak for themselves, written explanations can make data meaningful and valuable. As Growe and Ruiz have noted about the interplay between text and numeric data, "Academic arguments involve the construction of meaning based in evidence: quantitative reasoning supplies an important category of evidence for successful argument" (6). In order to help students write effectively with numbers, instructors may find it helpful to incorporate some of the following strategies into their assignment design and coaching practices:

Create assignments that specify an audience: Decisions about how much data is needed and how complex it should be are based on the perceived needs of the writer's target audience. Writers want to provide *enough* information to support a claim, but not so much as to cloud the message. Also, establishing a real-world context for mathematical applications sometimes produces assignments with greater meaning and significance for students. Here's an example of a quantitative assignment that specifies audience:

> You have already completed an analysis of the relationship between agricultural contamination and the growth of the hypoxic zone at the mouth of the Mississippi in the Gulf of Mexico. For this portion of the assignment, please prepare two briefs on your findings, one for a panel of federal water quality regulators (an audience of experts) and one for publication in a newspaper (an audience of educated laypersons, but without expertise).

Equip students with appropriate tools for displaying information: Students may benefit from being made aware that different mathematical representations serve different purposes. For simple numerical expressions or just a few examples, numbers can be expressed *in sentences*. For larger quantities of information, *tables* are the best choice when each of the individual values matters. Finally, if the aggregate data of a large quantity of information is the most important, writers should choose *charts or figures*. Students can use all of these tools in combination, and it can be helpful to show how the same data set might answer different questions depending on the mode of display.

Where appropriate, require students to address the "who, what, when and where" of data: Providing contextual details about data helps readers to understand information and helps ensure that students are considering their data in an appropriate context. For example:

Weak: In 2014, the annually-averaged temperature was 0.69°C (1.24°F) above th previous year.

Stronger: NOAA recently announced that 2014 was the hottest year on record, with global temperatures climbing 0.69°C.

Strongest: NOAA announced that 2014 was the hottest on record, with global average temperatures climbing to 13.9°C (an increase of 0.69°C over the previous year).

Not only does textual information help to establish source credibility, but it also directs readers' attention to the relationship between the reported data and the purpose for writing.

Design assignments that require both reporting and interpretation of data: In asking students to provide numerical data, encourage them to explain the value and significance of their findings in prose. Your instruction can emphasize that in real-world contexts, identifying the correct numerical answer is simply the first step in communicating findings to an audience. Jane E. Miller recommends using the GEE method when communicating a conclusion regarding a large quantity of data:

Generalization: Create a sentence that describes the overall message represented in the data.

Example: Follow it with a specific concrete example that meets the generalization.

Exception: Conclude with possible exceptions that show the limits and exceptions to the general claim.

> Infant mortality rates in the United States are dropping. Between 1965 and 2015, the number of infant deaths per 1000 live births declined from 25 to 6.8. In metropolitan areas, the rate remains slightly higher, at 7.2 deaths for every 1000 births.

Not only does the GEE rule assist in communicating with data, but the requirement to identify limits and exceptions can deepen students' understanding of the generalizability and applicability of numerical and statistical data.

Learn more:
- University of Minnesota Center for Writing Resources: On Writing in Mathematics
- Jane E. Miller, The Chicago Guide to Writing With Numbers
- Nathan D. Growe and Carol A Ruiz, "Integration with Writing Programs: A Strategy for Quantitative Reasoning Program Development"

Further support: Visit us online at http://writing.umn.edu/tww. To schedule a phone, email, or face-to-face teaching consultation, click here.

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