

What Adds Up to Citizenship?

A review of the book *If... A Mind-Bending New Way of Looking at Big Ideas and Numbers* by David J. Smith
(New York: Kids Can Press, 2014)

Leah A. Libresco

At first glance, David J. Smith's book, *If... A Mind-Bending New Way of Looking at Big Ideas and Numbers*, looks like it would find its most natural home in a math classroom, not a social studies one. Smith's book is focused on numeracy—giving students a way to get an intuitive handle on the size of the universe, or the proportion of water that is salt versus fresh. Getting a better handle on numbers is a way to introduce students to the beauty and wonder of the natural world, but it is also a way to give them a clear sense of the consequences of human choices and help them choose how to take action—all essential skills for good citizenship and necessary components of a social studies curriculum.

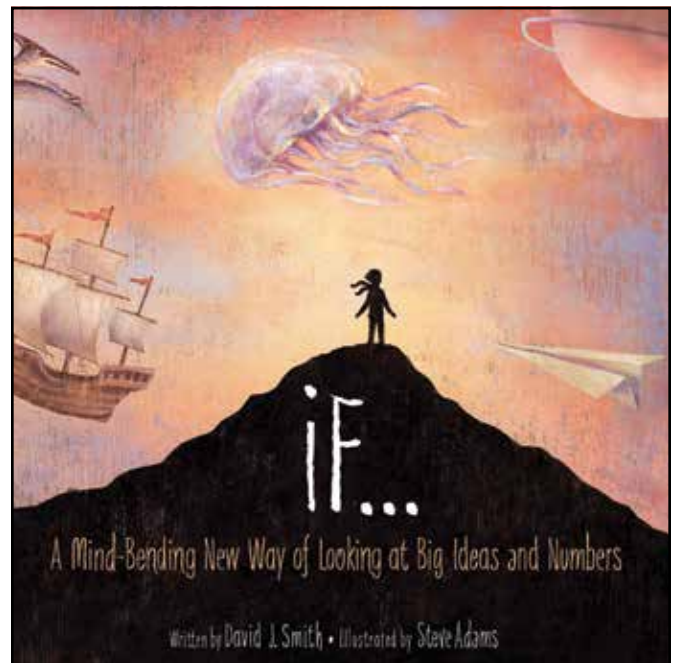
Smith makes numbers and statistics graspable, even by small children, by scaling them so that they can be illustrated by and compared to ordinary objects. In short, as readers of other his books know, Smith shows how to make all numbers human-sized.¹ In his hands (and as illustrated by Steve Adams), the entire Milky Way galaxy is the size of a dinner plate (making the visible universe, in this framework, the size of Belgium), and all the water on Earth becomes 100 glasses, only three of which contain fresh water.

One excellently chosen scale is Smith's illustration of global water inequality. He writes:

Who uses the water and for what? We use about 10 percent of the Earth's water in and around our homes—for drinking, cooking, washing, and other household needs. People in America use about 2 ½ bathtubs of water per person a day for household purposes. In Europe, it's about 2 bathtubs full. In Africa, that number falls as low as 1/10 of a bathtub, even though the United Nations says that 1/4 bathtub of water is needed per person for health and well-being (p. 23).

The choice of scale is apt—bathtubs are intrinsically linked to water use (the connection of galaxies to plates is more tenuous), and a bathtub is precisely human-scaled. All children reading this page will be able to picture a bathtub of water and will even remember the last bath that they took, which was equivalent to the amount that four people need to get them through their day.

Making numbers vivid is a critical skill for civic engagement and political literacy, especially as most of us are much less sensitive to numbers in text than we are to other qualities. (In fact, humans are so sensitive to color words like “red,” “green,” and “blue” that, if confronted with the word “red” printed in blue ink, people stumble when asked to identify the color of the ink. This fumbling is called the Stroop Effect, and is used



by psychologists as a widely used measure of reaction time.)

Most English speakers can understand the sentence, “Joseph Stiglitz and Linda Bilmes estimate that the cost of the Iraq War will be over \$3 trillion,” in the sense that they can spot the subjects of the sentence and the claim that they’re making.² But, for many, however literate, that sentence doesn’t feel meaningfully different from “Joseph Stiglitz and Linda Bilmes estimate that the cost of the Iraq War will be over \$16 trillion” or “... will be over \$3 billion.” This insensitivity limits our ability to be active, engaged citizens. In order to communicate facts about policy and government, we require a free press. In order to read, comprehend, and act on this information, we require an educated polity, but, if citizens are merely literate, they still may not be ready to engage and organize. Thus, every social

studies teacher must also be a numeracy teacher, to prepare students to evaluate policies and act politically. Developing a facility with the kinds of scaling demonstrated this book can help give students (and adults) a handle on numbers so large that they seem like abstractions.

Activists have used written and graphic techniques that “play with scale” to good effect. In the early years of the Iraq War, one blog was set up specifically to scale the costs of the ongoing war into sums that were a little easier to understand. The blog took its title from its first post, which explained that, for the same price as waging a war in Iraq, the U.S. government could buy a Toyota Prius for every single household in America.³ Some of their other posts focused on policy tradeoffs (“For the price of the Iraq War, we could’ve given everyone with HIV a lifetime supply of AIDS drugs”),⁴ while others more closely resemble examples from this book trying to give the reader a handle on the magnitude of the number being discussed (“For the price of the Iraq War, we could’ve bought enough pecans for a pecan pie the size of West Virginia”).⁵

“War or Car” is a fantastic resource, but it only translates one cost. “Dictionary of Numbers,” a Chrome extension written by Glen Chiacchieri, allows a user to get an intuitive handle on a wide variety of numbers. Dictionary of Numbers will scan the webpages you visit looking for numbers. When it finds a number it can understand, it inserts after the number what the number is like in human terms. For example, it might turn “315 million people” into “315 million people [≈ the population of the United States].” If there are more descriptions, you can hover over the visible description to reveal them in a popup window.⁶

One engaging lesson that could build on the examples in *If...* would be to have students assemble their own “Dictionary of Numbers” in class. Just as students might write down a word that they didn’t recognize, to look up later, students could look at readings in class, from articles about current events or historical documents, and try to identify numbers that were difficult to visualize or comprehend.

Once students had found social studies-relevant examples of large, abstract numbers (or been assigned passages chosen by the teacher), they could work in groups to design scalings that would be as arresting and informative as Smith’s own water inequality example or the “War-or-Car” project. They might explore their options by assembling a list of possible yardsticks, and checking how well they fit the prompt before them.

Some possible scalings include:

- If all American wealth were spread out evenly over a football field, would the wealth held by the bottom 50 percent reach the 50-yard line? Would it even make it out past the 20-yard line?
- What is the gender ratio in my class today? (e.g. 60 percent girls and 40 percent boys.) If there were a Congressperson sitting in each seat of my classroom, and the gender ratio was that of congress, how many seats would be occupied by women?

- If the life of an average American were scaled over the course of 24 hours, how much of the day would be spent in activity X (e.g. riding in cars; sleeping; or looking at TV and computers)?

As the students practiced devising their own scaling examples, they would be able to show their Dictionary of Numbers definitions to their classmates and learn which kinds of scales worked well and which did not. Were they careful to link their proposed metric to the problem being illustrated (as Smith did, by using bathtubs to illustrate water usage)? Was the scale big enough to permit subdivision, but small enough to be able to be visualized?

If... exposes students to the power of scaling, and building their own Dictionary of Numbers would empower them to build scales of their own when they reach a number that confuses them. More than that, it teaches them to get curious when they see a big number or an abstract proportion, rather than pass over the reference.

Numerate, imaginative students will be prepared to make use of the data they encounter when reading about current events and public policy. And once they’ve informed themselves, facility with scaling will empower them to communicate with others, so that they can engage in data-driven activism without sacrificing specificity or emotional salience. 🌍

Notes

1. David J. Smith, *If the World Were a Village: A Book about the World's People* (Tonawanda, NY: Kids Can Press, 2011); D. J. Smith, *If America Were a Village: A Book about the People of the United States* (Tonawanda, NY: Kids Can Press, 2009)
2. Joseph E. Stiglitz and Linda J. Bilmes, *The Three Trillion Dollar War: The True Cost of the Iraq Conflict* (New York: W.W. Norton, 2008).
3. Neil Sinhababu, “A Toyota Prius for Every American Household,” warorcar.blogspot.com/2008/08/toyota-prius-for-every-american.html.
4. Neil Sinhababu, “Give Every HIV-positive Person a Lifetime Supply of Drugs,” warorcar.blogspot.com/2008/11/give-every-hiv-positive-person-lifetime.html.
5. Neil Sinhababu, “Buy Enough Pecans for a Pie the Size of West Virginia,” warorcar.blogspot.com/2008/11/buy-enough-pecans-for-pie-size-of-west.html.
6. Glen Chiacchieri, “Dictionary of Numbers,” source/dictionaryofnumbers.

LEAH ANTHONY LIBRESCO is a statistician at a charter school in Washington, D.C.