

Evaluation Brief #1
Selinda Research Associates, Inc.
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How Should Large Numbers of Years Be Expressed?

3.5 billion vs 3,500 million

During the formative evaluation of the *Trail of Time*, we found that many visitors, even those who understood the timeline concept, found themselves stumbling over and getting confused by the large numbers used to measure geologic time. When looking at or thinking about one number, they wound up saying another number. For instance, one couple was confused by the step-equivalent sign at the beginning of the Mather to Yaki section because they misinterpreted 1,000,000 as “ten million years”.¹ Other evaluators who have studied visitors’ comprehension of large numbers have also noted this problem. As the Field Museum’s *Life Over Time* exhibit team used to say, “People get their -illions mixed up.”²

In conducting formative evaluation for the Field Museum’s *Life Over Time* exhibition with a sample of 45 museum visitors, Hayward (1993) found that about 45% of his sample recognized that *3.5 billion*, *3 billion 500 million*, and *3,500 million* were different ways of writing the same number. Of these three options, the most preferred and easiest to understand was overwhelmingly *3.5 billion years ago*, and the least preferred and most confusing was *3,500 million years ago*. Hayward stated that respondents chose *3.5 billion* “because it is easier to understand, faster to read, more concise, and more familiar (this format is frequently used in newspapers for large amounts of money.)” (p. 2).³

Using numbers vs. the words million or billion

While there is little in the research discussing this specifically, an online style guide said the following: “Numbers of one million and above are easier to read if written as figures with the word ‘million,’ ‘billion,’ etc.”⁴ This is supported in other style manuals as well⁵ although the National Park Service style manual does not address it.⁶ Hayward tested the forms *800,000,000* vs. *800 million* with museum visitors and found that a few preferred *800,000,000* for reasons like “all the zeros make it look impressive” (p. 2). He recommended that, if you are after an impression, you might prefer that format, but if you want clarity, spell out *million*.⁷

The definition of a billion

Another issue of interest is how to define a billion. Here is what one reference said:

How many is a billion? If you are American, it is undoubtedly 1,000,000,000. This amount is known to traditionally minded British people as “a thousand million,” and by some more adventurous ones as a “million,” though this word has not made as much headway in English as in some other European languages. A trillion is then 1,000,000,000,000, and so on. If you are British, on the other hand, a billion may be 1,000,000,000,000 (a million million), following the older convention. If you are neither British nor American, you can take your pick! (Both systems were invented by the French, but are called “British” and “American” for convenience.) Once the business world and the financial press found themselves discussing “thousand millions” so much, the “American” system simply became more convenient, despite a certain lack of logical tidiness. (A “British” trillion is the third power of a million, while the “American” one is the fourth power of a thousand, and the

¹ Gyllenhaal, E. D., & Perry, D. L. (2004). *Phase one of formative evaluation for the Trail of Time at Grand Canyon National Park*. Unpublished manuscript, University of New Mexico, Albuquerque, NM. <http://selindaresearch.com/TrailOfTimeFormativeFINAL.pdf>

² Eric Gyllenhaal, personal communication, November 3, 2004

³ Hayward, J. (1993). *Study 6.A: Time language. Life Over Time formative evaluation process*. Unpublished manuscript, Field Museum, Chicago, IL.

⁴ <http://dictionary.reference.com/help/faq/language/g61.html>

⁵ *Publication manual of the American Psychological Association*. (5th ed.). (2001). Washington, DC: American Psychological Association.

⁶ <http://www.nps.gov/hfc/products/pubs/pubs-04d.htm>

⁷ Hayward, J. (1993). *Study 6.A: Time language. Life Over Time formative evaluation process*. Unpublished manuscript, Field Museum, Chicago, IL.

“American” system continues out of sync with the arithmetic). It also makes the profits sound bigger! The “American” system is now standard use in British government publications, and is becoming the norm in many other languages.⁸

Recommendations

1. Use (for example) *3.5 billion* rather than *3,500 million*. Alternatively, conduct additional off-site testing to further determine which treatment (a) is least confusing to the public, and (b) best conveys the sense of increasing time.
2. Spell out the words *million* and *billion* rather than writing them as numbers.
3. Because it appears that the American system is becoming the norm, and because we are after all in America, use the American system for the definition of a billion (i.e. 1,000,000,000), but explain this choice in an aside in the park newspaper and on the entry portal exhibits.

⁸ <http://www.askoxford.com/asktheexperts/faq/aboutwords/billion?view=uk>