
Readability Formulas May Be Dangerous to Your Textbooks

BONNIE B. ARMBRUSTER, JEAN H. OSBORN, AND ALICE L. DAVISON

Textbooks composed to meet readability formulas are sometimes harder to understand; there are more sensible ways to match textbooks and students.

Readability formulas exert a powerful influence on American textbooks. Yet evidence is fast accumulating that these formulas may not be very useful in selecting textbooks and that, in fact, they may adversely affect the quality of textbook writing.

Poor Predictors of Text Comprehension

The prevailing belief among many educators is that students will be able to read and understand only if they are given textbooks written to their grade level. Readability formulas are the handy tool publishers use to respond to this belief. These formulas are objective, quantitative, and relatively easy to use as measures of text difficulty. Unfortunately, some research has found that readability formulas fail to predict how easily readers comprehend particular texts (Klare, 1976).

There are two major problems with readability formulas as measures of how well a text will be understood. First, readability formulas fail to take into account many characteristics of text that are known to affect comprehension—for example, content difficulty and familiarity, organization of ideas, author style, page layout. The

Bonnie B. Armbruster is Assistant Professor, Jean H. Osborn is Associate Director, and Alice L. Davison is Assistant Professor, all with the Center for the Study of Reading, University of Illinois at Urbana-Champaign.

most popular formulas use only two aspects of a text in computing readability levels: word difficulty and sentence length. Even one of the latest techniques for measuring readability—the Degrees of Reading Power—is based only on letters, words, and sentences. Second, readability formulas neglect characteristics of *readers* that affect comprehension—such as their motivation, interest, purpose, perseverance.

A Misleading Term

Another concern is the meaning of the term "readability level." The readability level of a text is the grade level for which the text is appropriate, according to a readability formula. The reported readability level of a textbook is typically the *average* of readability levels of several passages sampled from the textbook. Readability levels vary widely for different passages within a single book. We used the Fry graph to determine the readability level of four 100-word passages randomly sampled from a 5th grade social studies textbook. The levels of the four passages were 4th, 7th, 8th, and 11th grade. Unfortunately, information on the sampling procedures used to determine the readability level of textbooks is usually not provided to consumers.

In addition, different formulas predict different grade levels. We used four popular readability formulas to compute the grade level of a randomly

chosen passage from a recently published 6th grade science textbook. The predicted grade levels were 3.1 according to the Spache; 4.2 according to the Dale-Chall; grade 4 according to the Gunning; and grade 7 according to the Fry graph. This range clearly demonstrates that the reported readability level of a textbook depends on the formula the publisher uses.

Writing to Formula

Publishers are under pressure to produce texts with given readability levels. Some states will consider using a textbook series only if it comes with specified reading levels. Given that most formulas are based on word difficulty and sentence length, it is relatively easy, especially with modern word processing capabilities, to create

a textbook at any desired readability level. Ironically, when readability formulas are used as the basis for writing texts, the result may be texts that are more, rather than less, difficult to understand.

For instance, consider an author who has written a draft of a chapter in a biology textbook that turns out to have too high a readability level. One



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way to reduce the readability level is to simplify the vocabulary and shorten the sentences. The author soon finds that simplifying the vocabulary often involves substituting vague words for precise words, that the costs of using “easy” words include some loss of meaning and more than a little ambiguity. The author realizes that a respectable biologist would surely cringe when reading this description of a cell:

A cell is made of living stuff. A cell can grow. It takes in food. It changes the food into more living stuff . . .

Shortening sentences can also have disastrous effects. Dividing sentences by separating clauses and deleting connectives such as “and,” “but,” “then,” and “because” often makes them harder, rather than easier, to understand—because the reader must infer the missing connectives. The problem is particularly severe in sentences that use *causal* connectives (“because,” “therefore,” “since”) to give explanation. For example, consider the following explanation that our author wrote for a 6th grade science textbook on why stomates close at night:

The light fades in the evening. Photosynthesis becomes slower. The carbon dioxide in the air spaces builds up. This buildup of carbon dioxide makes the guard cells relax. The openings close.

She realizes that this paragraph, almost devoid of causal connectives, reads more like a list of facts than an explanation, and she wonders how many 6th graders will understand from reading it why stomates close at night.

Just for fun, she writes what she considers a more informative paragraph and highlights the causal connectives.

Because the light fades, photosynthesis slows down in the evening. Respiration, however, does not depend on light and *thus* continues to produce carbon dioxide. The carbon dioxide in the air spaces builds up, which makes the guard cells relax. The relaxing of the guard cells causes the leaf openings to close. *Consequently*, the leaf openings close in the evening as photosynthesis slows down.

She believes that 6th graders who read this version would know more about stomates, even though the paragraph is “harder” according to the readability formula she must follow. She also realizes she must toss this “harder” paragraph into the wastebasket.

More Harm Than Good

Frankly, we think the problem of matching textbooks and readers is vastly overrated. Children *can* read and understand texts within a wide range of difficulty, and it is probably to their advantage to do so. We cannot see any harm in children breezing

through some sections of a textbook and then slowing down and working harder to understand more difficult sections.

On the other hand, 2nd graders should not have to struggle with Proust or Tolstoy. Decisions about the matching of textbooks to children are probably best made by trained and experienced judges—the teachers and librarians who have worked with children and who have witnessed the interactions of a lot of children with a lot of books.

Relying on readability formulas as the sole index of text difficulty probably does far more harm than good. Readability formulas not only fail to provide help in matching textbooks and students; they also contribute to the production of poorly written text. We strongly urge textbook adoption committees and teachers to stop demanding textbooks with specific readability levels, and we urge authors and publishers to refrain from writing to formula. □

Reference

Klare, G. R. “A Second Look at the Validity of Readability Formulas.” *Journal of Reading Behavior* 8 (1976): 129–152.

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