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# CLEARING THE AIR OF FOG AND SMOG

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The purpose of a readability formula is to produce a number or number range which approximates the achievement level required of a reader in order to comprehend a written passage. A useful formula, especially to the classroom teacher, is one which is easily computed and which accurately predicts the needed reading ability. Two formulas which have appeared in recent years, the Fog Index and the SMOG Grade, are easily applied. But are they accurate?

Robert Gunning's Fog Index, while more complicated than the SMOG to compute, is nevertheless relatively easy. It has three basic steps. 1) Select a set of consecutive sentences ending with the complete sentence nearest 100 words and compute the average number of words per sentence to the nearest tenth. 2) Compute the percentage of "hard words," i.e., words of three or more syllables *excluding* proper nouns and proper adjectives, compounds made from short, easy words and verb forms made three syllables by adding *-ed* or *-es*. 3) Add the average number of words per sentence to the percentage of "hard words" and multiply that sum by .4.<sup>1</sup> One study of the index reported high correlation to the Flesch formula.<sup>2</sup> Correlations, however, do not seem to be the appropriate statistics for judging a formula's accuracy. Rather, simple description reveals the frequency with which one formula produces the same readability level as another formula.

The major appeal of the SMOG Grade lies in its simplicity. One can literally compute it mentally. Three ten-sentence passages are selected, each from the beginning, middle and end of a book. All words of three or more syllables, as read orally in context, are counted. The nearest square root of the polysyllabic word count is added to the constant 3 and the resulting figure is a grade level designation.<sup>3</sup> The formula is unique in that it abandons the traditional syllable count, a factor employed by most formulas to represent complexity. Instead, it substitutes a mathematical manipulation — the square root. Its originator, McLaughlin, fails to explain

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<sup>1</sup> Robert Gunning, *The Technique of Clear Writing*, revised edition (New York: McGraw-Hill, 1968), 38-39.

<sup>2</sup> Warren S. Blumenfeld and Barry M. Justice, "Six Replicated Investigations of the Relationship between Flesch and Gunning Reading Indices," *Perceptual and Motor Skills*, XL (February, 1975), 110.

<sup>3</sup> G. Harry McLaughlin, "SMOG Grading — A New Readability Formula," *Journal of Reading* (May, 1969), 639-646.

TABLE 1

GRADE LEVELS OF TWELVE INTERMEDIATE BOOKS  
BY SIX READABILITY FORMULAS OR VARIATIONS

Book	Intended Grade Level	Dale- Chall	Fog	SMOG			
				+ 3	+ 2	+ 1	+ 0
A	4-7	5-6	8.0	7	<u>6</u>	<u>5</u>	4
B	4-7	5-6	<u>6.1</u>	7	<u>6</u>	<u>5</u>	4
C	4-6	5-6	7.6	8	7	<u>6</u>	<u>5</u>
D	3-5	5-6	7.7	7	<u>6</u>	<u>5</u>	4
E	6	5-6	7.2	9	8	7	<u>6</u>
F	5	7-8	<u>8.7</u>	10	9	<u>8</u>	<u>7</u>
G	5	5-6	8.2	9	8	7	<u>6</u>
H	5	5-6	<u>6.1</u>	7	<u>6</u>	<u>5</u>	4
I	6	7-8	9.9	10	9	<u>8</u>	<u>7</u>
J	5	5-6	7.3	8	7	<u>6</u>	<u>5</u>
K	4	5-6	7.3	7	<u>6</u>	<u>5</u>	4
L	4	5-6	<u>7.5</u>	8	<u>7</u>	<u>6</u>	<u>5</u>
Times in agreement with Dale-Chall			3	0	5	10	7

Underlined scores are in exact agreement with Dale-Chall.

ratio. It produced the same grade level as Dale-Chall in five of six cases.<sup>7</sup>

<sup>7</sup>Miller and Legerski, *op. cit.*, p. 190

why a reader's ability to comprehend polysyllabic words increases geometrically.<sup>4</sup>

SMOG tends to inflate the readability of a selection when compared to the level generated by other formulas. Miller and Legerski found that it overestimated the mean score of five formulas about half of the time.<sup>5</sup> In defense of SMOG, McLaughlin argues that it reflects the level at which one

<sup>4</sup> According to the formula, a fourth grade reader can handle only 1 polysyllabic word in 30 sentences, a fifth grader—4 polysyllabic words, a sixth grader—9, a seventh grader—16, and so on until a twelfth grader can manage 81 polysyllabic words.

<sup>5</sup> Wilma H. Miller and Michael Legerski, "Do Various Readability Formulas Give Similar Results," *Minnesota Reading Quarterly*, XVI (May, 1972), 189.

can read a passage with “total comprehension.” He cites other formulas as predicting “suitability” or the level at which one can “read with understanding,” but not with total comprehension.<sup>6</sup>

Dr. McLaughlin is a professor of journalism. Perhaps reading educators ought to concern themselves with *total* comprehension. But, since formulas based on “suitability” and “understanding” are functional for classroom use, another alternative is to modify the SMOG formula so that it computes a reading level comparable to that generated by other formulas. Colleagues have suggested informally adjusting SMOG by using the constant 2 instead of the constant 3. This study compares the original SMOG formula and three variations, each using decreasing constants—2, 1, and 0.

The basic question of the study is: are Fog, SMOG, or any variations of SMOG accurate predictors of readability? Comparison was made to the Dale-Chall, a formula commonly used in readability research. Each formula was applied to selections from twelve books commonly used with children in the intermediate grades. The formulas were computed independently by the author and by a graduate assistant, Cameron Lind, for accuracy. Table 1 reports the results of the five formulas.

The Fog Index produced a level equal to the Dale-Chall in three of twelve cases. The original SMOG exceeded the Dale-Chall in all instances. SMOG + 2 was an accurate predictor five of twelve times; SMOG + 1 predicted accurately ten times in twelve; and SMOG + 0 predicted the Dale-Chall in seven of twelve cases.

The most likely predictor appears to be the SMOG variation which substitutes the constant 1 in place of the original constant 3. That variant, when applied to Miller and Legerski's data, supports the same ratio. It produced the same grade level as Dale-Chall in five of six cases.<sup>7</sup>

Precision is important in formal research but less significant in informal situations. Neither the Fog Index nor the original SMOG Grade, when compared to the Dale-Chall, appear to be sufficient for either purpose. The SMOG variation which substitutes the constant 1, however, may prove to be useful to teachers, particularly when informally assessing readability of library books for individualized reading or when analyzing the difficulty of one's own written material—tests, worksheets, learning center directions, and the like.

#### REFERENCES

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<sup>6</sup> G. Harry McLaughlin, “Clearing the SMOG,” *Journal of Reading* (December, 1969), 211.

<sup>7</sup> Miller and Legerski, *op. cit.*, p. 190.

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