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Donna Keenan  
*University of North Florida*

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# AN EVALUATION OF THE EFFECTIVENESS OF SELECTED READABILITY FORMULAS APPLIED TO SECONDARY TEXTS

*Donna Keenan*

ELEMENTARY AND SECONDARY EDUCATION  
UNIVERSITY OF NORTH FLORIDA

"That's the reason they're called lessons," the Gryphon remarked, "because they lessen from day to day." (Alice in Wonderland)

Everyday, the reality of this statement becomes painfully obvious to many high school students across the nation. The creative ideas implemented in elementary school are not often to be found on the secondary level. Instead, we find subject area teachers who are confident of their ability to uphold the "high standards" in teaching the content of their particular disciplines. Unfortunately, these high standards frequently involve using material which is written on a high twelfth grade or college readability level. With national attention focused on students' declining scores in reading, as well as increased apprehension concerning the number of illiterate high school graduates, not to mention the escalating drop-out rate, secondary educators are beginning to reevaluate their standards of the past and to develop objectives and plans to insure that their lessons are meaningful, challenging, and readable for their students.

## Puzzling Research

The first step in this reevaluation process often seems to involve contradictory practices. Teachers try to match the reading scores of their students with the readability levels of their textbooks, the assumption being that text readability is synonymous with a student's reading grade equivalent (Fletcher, 1974; Dauge, 1970; Hagstrom, 1974; Betts, 1966). Thus, matchmaking becomes a snap. However, there is almost no research in the literature to back up the assumption. As a result, it has become increasingly popular to criticize readability formulas as a useful tool for teachers.

A recent study conducted by the author attempted to reassess the assumption that readability and reading scores are synonymous as well as to examine the value of using readability formulas on high school textbooks. A review of the literature revealed that the problem of matching secondary students to suitable instructional materials remains a perplexing one. It was thus decided to compare tenth grade students' reading grade equivalents with comprehension of their assigned textbooks measured by a test prepared by the author. The study then became a challenge to the assumption that a tenth grade student with a tenth grade reading level would be able to comprehend a textbook written for his grade.

Two basic questions were asked:

1. If a student's reading level is matched to the readability

level of a textbook, can he indeed comprehend it?

2. What is the minimal reading level a tenth grader needs to comprehend his textbooks?

To determine the reading grade equivalents of the tenth grade students in the sample, the comprehension section of the Gates-MacGinitie Reading Test, Level E, was used.

#### Comprehension Test

Comprehension of the students' textbooks was measured by an examiner-made comprehension test consisting of 300-400 word passages from nine assigned English, Social Studies, and Science textbooks. Eight multiple choice questions immediately followed each passage with the independent level of comprehension set at 75 percent.

The examiner-made test questions used to measure the students' comprehension in English, Social Studies, and Science were tested for reliability by using the split-half procedure. A class of thirty tenth grade students exhibiting a wide range of reading levels was used as the sample for the reliability test. The scores for each of these students were divided into two groups, odd-numbered items comprising one group and even-numbered items the other. Using the two scores obtained for each student, a correlation coefficient was calculated using the Pearson Product Moment Correlation formula. These correlations, then, showed the estimated reliability of one-half of the test. To obtain a reliability estimate for the entire test, the Spearman-Brown Formula was applied to the data as a correction. The correlation coefficient for the English scores was .978, for social studies, .955; and .941 for the science scores.

According to Lien's (1967) common guide that assists in interpreting coefficients of correlation, the scores obtained in this study are within the high to very high range. This means that pupils tended to do as well on odd-numbered as even-numbered items and that there is a high degree of internal consistency among the questions.

In order to measure comprehension at a higher level than mere recall, Bloom's Taxonomy of Educational Objectives (1956) and the teacher's manual to Reading for Concepts were used as guides in formulating each item. The eight questions following each passage were arranged in the same order, with each item measuring a specific skill. A brief description of the items follows:

Item 1 - Knowledge of specific facts or recall. This is the most basic level of comprehension—the correct answer is directly stated in the reading passage.

Item 2 - Meaning of word in context. This item attempts to measure vocabulary vital to the meaning of the selection.

Item 3 - Recognition of antecedents and previous references. Here, the reader must be able to locate a phrase or word described in the stem of a question in order to discern the correct response.

Item 4 - Ability to summarize reading material. Related to Bloom's "Interpretation" level of comprehension, this skill requires the student to reorder or view the material in a new way.

Item 5 - Recognition of inferences. The correct response must be chosen from a list of implied details.

Item 6 - Reading for the main idea. This skill relates to Bloom's "Meaning of the Whole" or Synthesis level and involves combining details to determine the central theme of the passage.

Item 7 - Recognition of cause and effect. This question involves a connotative skill in that the student must demonstrate his understanding of the nature of a specific process or problem.

Item 8 - Determination of relevant from irrelevant statements. To answer this question correctly, the student must be able to judge the value of the material he has read.

The readability levels of the textbooks were determined by use of the Flesch Reading Ease and FORCAST formulas. All nine English, social studies, and science textbooks were found to be written on or near a tenth grade level.

Ninety-five percent of the tenth grade students enrolled in general and advanced classes at two large Florida high schools comprised the sample for this study. These four hundred forty-five students were administered the Gates-MacGinitie Reading Test, Level E, and the examiner-made comprehension test by the course teachers.

#### Findings and Conclusions

The collected data were compiled and analyzed by comparing the tenth grade students' reading grade equivalents with their (examiner-made) comprehension test scores in the areas of English, social studies, and science. Frequency counts of the correct items in each area were compiled for the students included in each of the reading grade equivalents seven through college. Successful comprehension, as previously mentioned, consisted of six out of eight questions answered correctly. The results are shown below.

#### PERCENTAGE OF STUDENTS COMPREHENDING ASSIGNED ENGLISH, SOCIAL STUDIES, AND SCIENCE TEXTS BY GRADE EQUIVALENT

Gr. Equiv.	No. of Subjects	Percent of Students Comprehending Textbooks		
		English	Social Studies	Science
7th	76	9	21	14
8th	57	12	25	23
9th	50	24	26	20
10th	73	27	59	44
11th	54	61	76	52
12th	71	55	83	72
Above 12	64	76	95	86

The conclusions reached were:

1. When a student's reading level is matched to the readability level of a textbook, the student's comprehension

cannot be automatically assumed.

2. (a) The minimal reading level needed by at least 75% of tenth grade students to successfully comprehend their assigned English textbook is above twelfth grade level.

(b) The minimal reading level needed by at least 75% of tenth grade students to successfully comprehend their assigned social studies textbooks is eleventh grade level.

(c) The minimal reading level needed by at least 75% of tenth grade students to successfully comprehend their assigned science textbooks is above twelve grade level.

The findings imply that the traditional matching of students to materials by selecting materials of the same readability level as the students' measured reading ability is not always an adequate means of meeting individual needs of students. Previous research attempts using textbook readability as the criterion for student comprehension can definitely be challenged by the results of this study.

### Discussion

The present study suggests that the popular and simple readability formulas may not be accurate enough to predict the instructional materials best suited to the reading abilities of students at secondary level. However, a possible reason for the discrepancy between the students' reading scores and their comprehension of their texts may not be the inadequacy of the readability formulas but the failure of the Gates-MacGinitie Test to accurately measure the students' reading levels. The examiner-made comprehension test included questions on the inferential and critical levels. Kingston in the 8th Mental Measurements Yearbook (1978) states that a major shortcoming of the Gates-MacGinitie is its preponderance of literal level comprehension questions.

Nevertheless, maybe educators are expecting too much of readability formulas. As Harris and Jacobson (1979) point out, there is still no reliable formula to predict the affective components of text, and surely interest and style are two of the most crucial factors when considering the readability of a given passage.

One of the most provocative research studies regarding the affective component was inspired by Klare (1976) and performed by Fass and Schumacher (1978). The study attempted to measure the effect of motivation on the readability of text. The researchers found that changing the readability level from easy to difficult had no effect on comprehension with highly motivated subjects. Conversely, non-highly motivated subjects performed better on the easy version than on the hard version of the passage. It was concluded that motivation, not readability, was the primary factor in the students' comprehension of text. Practitioners as well as researchers in the behavioral sciences have always had difficulty in quantifying human behavior. Thus, perhaps the most important variable contributing to readability cannot be processed into a formula.

Another reason which may account for the mismatch in this study is the variety and frequency of syntactic patterns found

in all printed material. To date, there is no validated formula that easily categorizes sentences into grammatical strings, although many attempts are being examined as possibilities, notably Botel's Syntactic Complexity Formula. However, Botel et al (1973) cautioned that the formula should be used in conjunction with a vocabulary measure and "should not be considered a precise measuring instrument." (Granowsky & Botel, 1974, p. 33).

Another procedure using syntactic structures called Thought Unit Sentences is being experimented with at the University of South Florida (Lowe, 1979). This procedure is much more individualized than other readability counts and is indeed a "non-formula readability measure."

Perhaps what has been missing all along is more individualized approach to matching students with materials. Readability formulas give us a broad, ball-park range within which to work, but they are simply not enough. The next step is to find out what motivates and interests students, and to discern the kinds of patterns of syntax they use and are most familiar with. This can only be done by involving the student more frequently in the process of match-making and by much trial and error and hard work on the part of the teacher. Researchers are just beginning to explore these areas, but their initial results promise an interesting future for readability experiments and for the teachers who are meeting challenges of frustrated students by constructing lessons that d n't lesson but improve and enrich from day to day.

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