METAMETRICS RESEARCH BRIEF

The Text Complexity Continuum in Grades 1-12

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OBJECTIVE

The objective of this research was to depict grade-level text complexity distributions for grades 1-12. This effectively documents a systematic continuum of text complexity exposure for reading education.

Key Hypotheses:

1. Median text complexity generally increases with grade; and
2. Text complexity varies within grade.

METHODS

Participants (Units of Analysis)*:*
The units of analysis were textbooks used in the public schools in grades 1-12.

Procedure:
MetaMetrics systematically collected commonly used texts and measured their text complexity using The Lexile® Framework for Reading and the Lexile® Analyzer. The resulting Lexile® measures of text complexity were statistically summarized by grade.

The work initially began in 2004 and utilized the extant Lexile Titles Database that MetaMetrics had established and maintained since its inception. The initial work focused on high school and postsecondary texts and formed the basis for a study to characterize the gap between high school and postsecondary texts for the National Assessment Governing Board (Williamson, 2004).

Following the August 2004 report to NAGB, MetaMetrics embarked on a series of studies to update the description of the text complexity continuum for all of the public school grades. These studies were implemented in stages: the high school (grades 9-12) in Fall 2005; the middle school (grades 6-8) in Spring 2007; and, the primary grades (1-5) in Spring 2008.

In these studies, MetaMetrics identified texts by consulting textbook adoption lists from a sample of states where statewide textbook adoptions were common practice (e.g., Florida, Georgia, Indiana, North Carolina, Oregon, Texas and Virginia). We focused on student editions of textbooks, organized into six content categories: Health, Language Arts, Literature, Mathematics, Science and Social Studies. Textbooks that appeared on adoption lists in multiple states were selected for possible inclusion in the study. The assumption guiding this process was that textbooks selected for adoption in multiple states were likely to be used by a large number of students. When the textbooks occurred in a series, all books in the series were included in the study.

The updated lists of textbooks were compared with the titles in the existing MetaMetrics database to identify texts that had already been measured and those that would need to be measured for text complexity. Previously unmeasured texts were purchased and Lexile measures assigned. Texts designated for a single grade were included in the analyses so as to unequivocally characterize within-grade text complexity distributions. The resulting sample sizes are shown in Table 1. A total of 487 textbooks in Grades 1 through 12 were included in the study.

Measures:
Lexile measures (Stenner, Burdick, Sanford & Burdick, 2007) are measures of reader ability and text complexity that are based on semantic and syntactic factors and are reported on a developmental scale. Independent psychometric studies of the Lexile scale (Mesmer, 2007; White & Clement, 2001) indicate that it is a valid and reliable measure of reader ability and text complexity.

A Lexile measure is the numeric representation of an individual's reading ability or a text's complexity (or, difficulty), followed by an "L" (for Lexile). The Lexile scale ranges from 0L and below for emerging readers and beginning texts to above 1600L for advanced readers and texts. Values at or below 0L are reported as "Beginning Reader" (BR).

Extensive information about the development of the Lexile Framework for Reading can be found in the "Research" section of the Lexile website (www.Lexile.com).

ANALYSES

Each grade-level text collection was analyzed separately. Selected percentiles (5^{th}, 25^{th}, 50^{th}, 75^{th}, 95^{th}) of the text complexity distributions were calculated (e.g., with SAS PROC UNIVARIATE). These were used to construct modified box-and-whisker plots for the grade-level distributions of text complexity. The box-and-whisker plots were displayed graphically in grade-level order.

RESULTS & DISCUSSION

Sample sizes for the grade-level text collections are shown in Table 1. The median text measures are shown by grade in Table 2, along with the 25th percentile and 75th percentile (boundaries for the interquartile range). The text distributions are graphically displayed in Figure 1. Table 2 and Figure 1 confirm the two fundamental hypotheses.

First, median text complexity generally increases with grade. The only point where the increase is not monotonic is between ninth grade and tenth grade (Table 2). However, the decrease is only 10L and the sample size in tenth grade (N=40) is smaller than that in ninth grade (N=60). It is possible that we are seeing the effects of sampling variability in this decrease. Because these samples are not probability samples, a statistical test for the difference is not appropriate, strictly speaking. However, we may wish to tentatively regard the median text complexity in ninth and tenth grades as approximately equal. Furthermore, we can see from Table 2 that median text complexity increases more or less smoothly from first grade to seventh grade, and then steps up approximately 100L every two years thereafter. This may reflect how classes are organized at the middle and high school levels where there is not the specific tie with grade-level in determining the order of courses taken. Given the relatively small sample sizes, some departure from strict monotonicity might be expected. The fact that there is so little departure supports our first hypothesis: namely, that text complexity generally increases from grade 1-12. We note in addition that grade-to-grade increases tend to be larger during the earlier grades than the later ones, with the largest single grade increase occurring between grades 1 and 2.

Secondly, we infer from the box-and-whiskers in Figure 1 that the second hypothesis for text complexity is also supported. Text complexity clearly varies within grade. The IQR ranges from 60L (grade 6) to 195L (grade 10). [This is easily confirmed from Table 2.] Judging from the whiskers in Figure 2, within-grade variability appears to be greatest in the high school grades where the order of courses taken may not be as strictly tied to specific grade levels.

This study provides educators a clear picture of current text complexity demands associated with each of the grades 1-12. Even though the sample sizes appear to be modest, they in fact may represent a large proportion of the text books used in K-12 education because there are relatively few text book publishers and states have limited options for textbook adoption.

Clearly, our understanding of text demands in the public schools is an evolving one. Schools have the option of supplementing regular textbooks and both texts and auxiliary reading materials can change over time. Consequently, MetaMetrics continues its study of text complexity and updates its Titles Database to ensure adequate coverage. This in turn supports the validity of inferences about text demand from studies such as these.

We limited this study to textbooks that were designated for use in one particular grade. Of course, this decision served to reduce potential sample sizes; but it facilitated our ability to more finely ascribe text complexity exposure to a particular grade-grouping of students. Including textbooks that are designed for a sequence of grades would increase sample size, but would also tend to homogenize the grade-level text distributions and could cause us to infer less increase in text complexity across grades. In addition, it would introduce statistical dependency between the grade-level text distributions.

Studies of text complexity will no doubt continue. Textbooks evolve. Also, alternative sources of text (e.g., online sources) continue to emerge and have just begun to be studied (Stenner, Sanford-Moore & Williamson, 2012). There is still ample opportunity to enhance our understanding about text complexity and to explore how and when human beings encounter new or different text demands.

Table 1. Final Sample Sizes for Text Studies

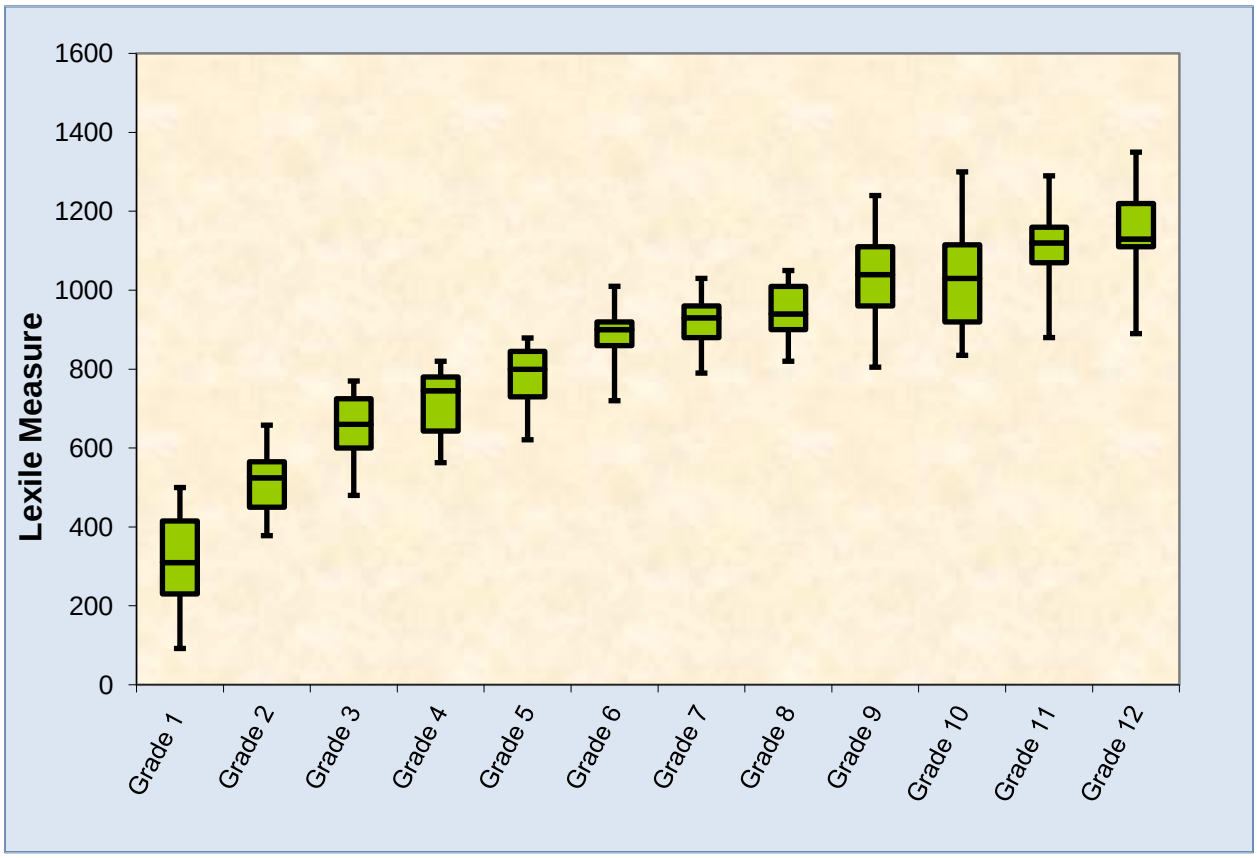
Primary School	Middle School	High School
Grade 1 (N=35)	Grade 6 (N=46)	Grade 9 (N=60)
Grade 2 (N=30)	Grade 7 (N=27)	Grade 10 (N=40)
Grade 3 (N=50)	Grade 8 (N=35)	Grade 11 (N=41)
Grade 4 (N=46)		Grade 12 (N=34)
Grade 5 (N=43)		

Table 2. Median Text Complexity Measures and Interquartile Range Boundaries by Grade

Grade	25th %ile	Median	75th %ile
1	230L	310L	415L
2	450L	525L	565L
3	600L	660L	725L
4	645L	745L	780L
5	730L	800L	845L
6	860L	900L	920L
7	880L	930L	960L
8	900L	940L	1010L
9	960L	1040L	1110L
10	920L	1030L	1115L
11	1070L	1120L	1160L
12	1110L	1130L	1220L

Note: Measures rounded to nearest 5L

Figure 1. Text Complexity Distributions by Grade (Whiskers Represent 5th and 95th Percentiles)



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