The Readability of English Language Texts in the Primary Grades

Renu Gupta, Ph.D.

Abstract

When creating or selecting texts for instruction, textbook writers frequently rely on their judgment about the difficulty of a text. For a more objective measure of text difficulty, text analysis tools are available. This paper briefly describes one such tool, Coh-Metrix, which can identify linguistic and psycholinguistic features of texts. The text analysis tool was used to analyze the texts in four textbook series that are used in Classes 1-4. The results on four parameters are displayed, allowing a comparison between textbook series and across grades.

1. Introduction

Text readability measures have been around for decades (DuBay, 2004). One common measure is the Flesch-Kincaid grade level, which is automatically provided in Microsoft Word under the Spelling and Grammar tool.

Such measures provide a basic indication of the difficulty of a text for the target audience, whether it is students reading school textbooks or adults trying to understand official documents. However, they are not used as often as they should. Instead, writers prepare texts and documents, and leave it up to the reader to understand them. This can be seen in numerous official documents that are intended for the educated layperson, but leave the reader baffled because they consist of one-sentence paragraphs, heavy noun phrases ("the involvement of the people most affected by policy decisions is necessary…"), pseudo-cleft sentences ("What this means is that …"), etc. Gherman (2013), for instance, describes how Romanian farmers cannot understand government communications on European Union benefits and, hence, are unable to apply for benefits.

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In the area of education, readability measures are used to select, modify or create texts for school children or second language learners. Since these learners are still not fluent readers, the texts have to be at an appropriate level, so that they are challenging but not frustrating. Readability measures provide basic counts of the length of the text, the average length of a sentence, and syntactic complexity. This is then converted into a readability formula for the Flesch-Kincaid grade level, which is based on what children are reading at that grade level in their first language and not what their parents or teachers think they should read.

Although readability measures provide some measures based on overt linguistic features, they cannot capture more complex text features, such as text structure, or cognitive processes, such as the use of prior knowledge or cultural knowledge. The role of these factors in reading comprehension has been known since the 1970s, but it has been difficult to design tools that capture these features. The text analysis tool, Coh-Metrix (available at http//:cohmetrix.memphis.edu), attempts to capture more complex linguistic features, such as the use of anaphora, and psycholinguistic features, such as ease of discourse processing through redundancy.

In this paper, I briefly describe the features of Coh-Metrix. In order to show how it works, I used the tool to analyze the texts in four textbook series that are used in the primary grades in English-medium schools.

2. **A Text Analysis Tool: Coh-Metrix**

Although intuitively we feel that a text with long words and sentences is difficult to understand, difficulty also depends on the characteristics of words, such as their frequency and degree of concreteness. More importantly, texts are not composed of isolated sentences; rather, the sentences are related through cohesive devices, such as anaphora, repetition of words, synonyms, etc. (Hoey, 1991). Further, the ideas (or propositions) in the text are not a net of random ideas; instead, the ideas are organized at two levels: at the highest level is the macrostructure, which provides the 'gist' or 'aboutness' of the text, and under it are the micro-propositions or details (Louwerse and Graesser, 2005).

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While the text provides the stimulus, it is the reader (or student) who has to comprehend the text. The extensive research on the cognitive aspects of reading as early as Bransford and Johnson (1972) shows that readers cannot rely solely on information in the text, but have to bring in prior knowledge (van den Broek and Espin, 2010; Verhoeven and Perfetti, 2008) and, since texts cannot specify all the information, readers need to draw inferences (Graesser, Millis and Zwaan, 1997; Graesser, Wiemer-Hastings, and Wiemer-Hastings, 2001). Comprehension is a process during which readers construct a dynamic model of the text where they integrate information from the text and their prior knowledge.

Information on Coh-Metrix is given in Graesser, McNamara, and Kulikowich (2011). When a text is input into Coh-Metrix, the output gives the scores on numerous indices that fall into three groups.

a. *Readability*. Besides the readability measure, Coh-Metrix gives information about words (concreteness and frequency) and syntactic complexity (number of words before the main verb and number of words in a noun phrase).

b. *Cohesion*. Coh-Metrix gives the number and type of connectives—additive, causal, logical, and temporal. Semantic relations are identified through the explicit repetition of words/synonyms and the use of pronouns, as well as through Latent Semantic Analysis (LSA) that examines whether sentences are thematically related.

c. *Coherence*. In Coh-Metrix, coherence is defined as a psychological construct in contrast to cohesion, which is textual (Graesser, McNamara, Louwerse, and Cai, 2004). Hence, this component attempts to capture features that enable readers to build a situation model of the text. The tool provides measures on four dimensions—causal, intentional, spatial, and temporal. These dimensions are calculated by comparing the semantic features of nouns and verbs with the number of explicit linguistic cues. For instance, in the causal dimension, verbs such as *start, create* and *begin* indicate that one event leads to another (Girju and Moldovan, 2002); the causal relation is easier to process if connectives, such as

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thus or *consequently* are used (McNamara, Louwerse, McCarthy, and Graesser, 2010). Therefore, the variable *causal cohesion* provides a ratio of the causal verbs to the causal particles in the text.

3. Using Coh-Metrix: Texts in the Primary Grades

3.1 *Background*

An English-medium school for first-generation learners asked me to identify reading problems in the primary grades. The main problem that emerged was the difficulty of the texts being used to teach reading in English. First, classroom observations showed that teachers were explaining the content of the text; a readability measure showed that the text in use for Class 4 had a readability level of Grade 7.9. Second, teachers admitted that they had problems understanding the texts they were to teach; a Class 2 teacher was struggling to understand the text she was to teach. This problem also seems to exist in the Indian languages. The study by Aser (2011) on literacy in rural schools in the Indian languages found that textbooks in the primary grades are unrealistic about the level of students' proficiency; so most students in Class 5 were unable to read Class 5 textbooks, but could handle textbooks written for Class 2.

3.2 *Method*

Four commonly prescribed textbook series were selected: NCERT (2005), Gulmohar (1975), Oxford (1992), and Images (2012). From the textbooks for Grades 1-4, the first and last texts were selected and input into Coh-Metrix. To identify differences between the four textbook series as well as trends from Grades 1-4, statistical tests were run—multivariate ANOVA, one-way ANOVA and post hoc comparisons.

3.3 *Results*

The detailed hypotheses, results and interpretations are available in Gupta (2013). Here, I touch on a few findings and give examples.

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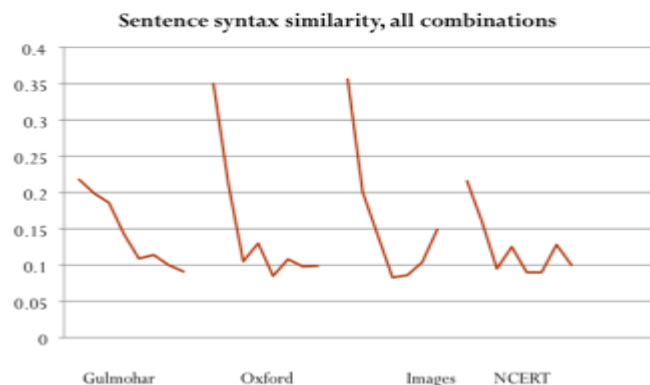
The most basic measure is the Flesch-Kincaid grade level. The scores for the four textbook series are shown in Figure 1.
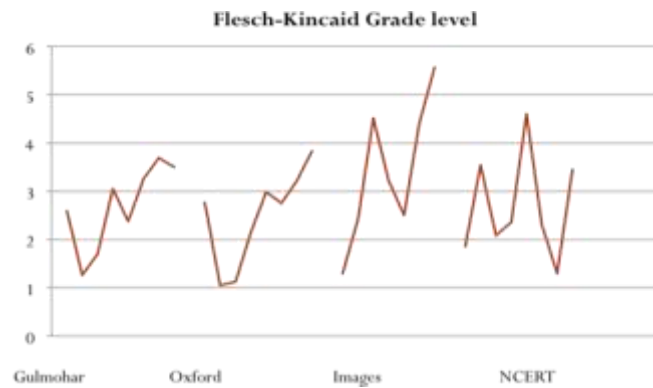
Figure 1. Flesch-Kincaid Grade level for each text.

Note that the beginning level is unrealistic in three of the series: the texts for Class 1 are written for Grade 2. *Images* begins at a more appropriate level, but then rises to Grade 5.6 in the Class 4 textbook. Another point is that the NCERT texts move within a band, whereas the commercial textbooks, in the main, show a rising trend.

The Flesch-Kincaid grade level is a broad measure, but Coh-Metrix breaks down the components. First, we expect syntactic structures to be simple in the early grades and gradually become increasingly complex. This does not happen. Instead, syntactic similarity was significant for Class 1. This means that each text in Class 1 used the same syntactic structure throughout the text, but this control was relaxed from Class 2.

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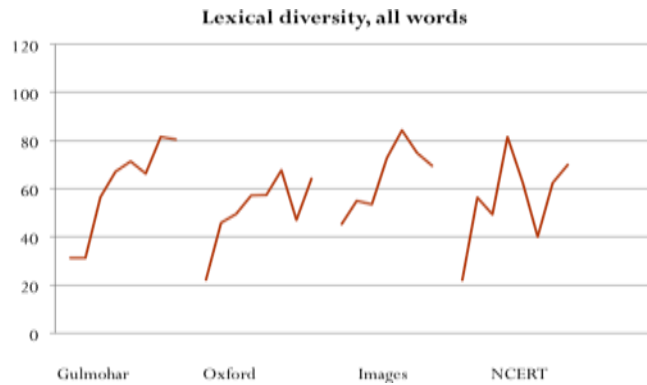
Figure 2. Similarity of syntactic structures in each text.

There were significant differences (p<0.05) among the textbook series on four other measures: length of the text, lexical diversity, cohesion, and use of the first person singular.

a. Text length. The number of words in each text is given in Figure 3. Again, the NCERT texts are in a narrow range for Classes 1-4. The commercial textbooks, however, expect students to read longer texts as they move up the grades; in two textbook series, in Class 4 students are expected to read (and understand) texts that are more than 1,000 words.
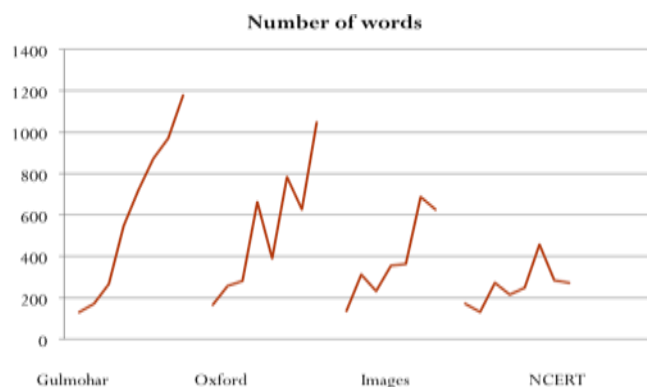

Figure 3. Number of words in each text.

b. *Lexical diversity*. This estimates the number of different words used in a text. A low score indicates that words are repeated and vocabulary is controlled. The online tool, Textalyser (http://textalyser.net/), was used to identify word frequencies for texts at the two ends of the range. In the lowest scoring text, one word, *Sharma*, occurs 16% of the time, whereas in the text with the highest lexical diversity, the most frequent words (*him*, *very*, *bear*, *lady*) occur only between 4.8% and 2.5% of the time.

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Figure 4. Diversity of words used in each text.

c. *Cohesion.* One measure of cohesion is the use of anaphora. On the use of anaphora between adjacent sentences, one story scored zero. Two sentences from this story illustrate what this means:
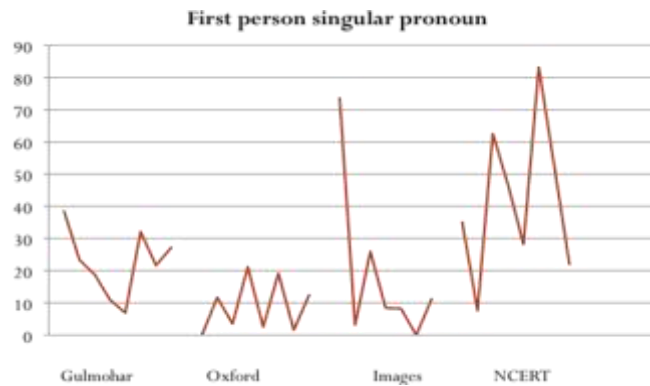
> Mrs. Sharma is getting down. Mrs. Sharma is standing at the side of the road.
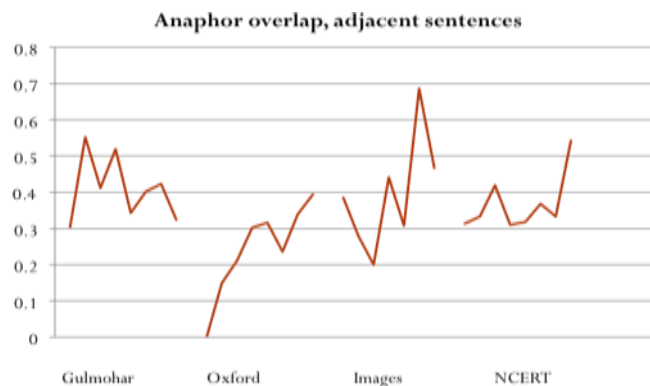
Figure 5. Anaphora in adjacent sentences.

d. *First person singular*. This index measures the use of the word 'I', and the NCERT texts score high on this measure. For example, one NCERT story uses sentences such as "I wish I had green leaves like my other friends." I used a second Coh-Metrix tool, the Text Easability Assessor, which is designed for stories. Narratives have specific features—characters, setting, and events—and use language that is close to "everyday, oral conversation". On this measure, the NCERT texts scored the highest, with a range of

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78–94, whereas the scores for the rest were Gulmohar (67–98), Oxford (29–89) and Images (61–95).

Figure 6. Use of the word 'I'.

These six indices provide a comparison across textbook series and grades. However, this paper does not address the implications of these differences.

4. Discussion and Conclusion

In this paper I used one text analysis tool (Coh-Metrix) to identify features of texts used in the primary grades in English-medium schools. Such tools provide objective measures of text readability that go beyond the writer's intuition about text difficulty. A tool such as Coh-Metrix provides measures on numerous variables; although several indices were not significant in the analysis above, they could be useful when designing texts. Some useful measures are: age of acquisition of words; the familiarity, imagability and concreteness of words; and the semantic relations between sentences in the text (provided by the LSA scores). Coh-Metrix also provides a second language readability measure, but does not indicate how this is calculated.

There are several ways to analyze textbooks series. One method is to use a single series and identify differences over grade levels to ensure that the texts increase in complexity (depending on the definition of complexity that is used). A second method, which was used here, is to compare textbook series; such an analysis shows where a series stands in comparison to other books designed for that level. A third method is to compare

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textbooks against external norms. When I compared the Indian textbooks with a Grade 3 text used in the US (provided by Coh-Metrix), there were significant differences between the two sets of texts. Indian textbooks were low on narrativity and high on syntactic control and referential cohesion, showing an attention to surface linguistic features. At the same time, Indian texts score lower on word concreteness and deep cohesion, making them difficult for readers to process.

In designing texts for reading instruction, text analysis tools can help identify texts that are appropriate for the target population. In fact, learning about text readability and calculating the readability of school texts is a standard component of the methods curriculum in teacher education programs before digital text analysis tools became available, I required trainee teachers to calculate the readability of a short text, but Kasule (2011) describes more sophisticated methods of sensitizing teachers to text readability. Attention to text readability means that we seriously consider students' linguistic abilities and provide a path that develops their reading skill. When texts are within students' linguistic capabilities, they will be able to read and understand them. However, if texts are too difficult for students, they will wait for the teacher to explain the text. This may be spoken language input, grammar instruction, vocabulary building, or listening comprehension. Reading, it is not.

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References

Aser (2011). *Inside Primary Schools: A Study of Teaching and Learning in Rural India.* Available at http://www.asercentre.org/

Bransford, J.D. & Johnson, M.K. (1972). Contextual prerequisites for understanding: some investigations of comprehension and recall. *Journal of Verbal Learning and Verbal Behavior,* 11, 717-72.

DuBay, W.H. (2004). The principles of readability. Available at http://www.nald.ca/library/research/readab/readab.pdf (last accessed March 9,

Language in India www.languageinindia.com **ISSN 1930-2940** 13:5 May 2013
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2013).

Gherman, M. G. (2013). An Examination of the Romanian State Budget regarding the
European Funds: Cofinancing Provisions. Paper presented at the World Conference
on Educational Sciences, Rome, February 6-8.

Girju, R. & Moldovan, D. (2002). Text mining for causal relations. *FLAIRS-02
Proceedings*, 360-64.

Graesser, A.C., McNamara, D.S. & Kulikowich, J.M. (2011). Coh-Metrix: providing
multilevel analyses of text characteristics, *Educational Researcher*, 40, 5, 223–234.

Graesser, A.C., McNamara, D.S., Louwerse, M., & Cai, Z. (2004). Coh-Metrix: Analysis
of text on cohesion and language. *Behavior Research Methods, Instruments, &
Computers, 36*, 193-202.

Graesser A.C., Millis, K.K. & Zwaan, R.A. (1997). Discourse comprehension, *Annual
Review of Psychology*, 48, 163-189.

Graesser, A.C., Wiemer-Hastings, P. & Wiemer-Hastings, K. (2001). Constructing
inferences and relations during text comprehension. In T. Sanders, J. Schilperoord,
and W. Spooren (Eds.), *Text Representation: Linguistic and Psycholinguistic
Aspects* (pp. 249-272). Amsterdam/Philadelphia: Benjamins.

Gupta, R. (2013). Expectations vs. reality: The readability of texts in the primary grades
in India. *Procedia-Social and Behavioral Sciences.*

Hoey, M. (1991). *Patterns of Lexis in Texts*. Oxford: Oxford University Press.

Kasule, D. (2011). Text readability and ESL learners. *Reading and Writing*, 2, 1, 63-76.

Louwerse, M.M. & Graesser, A.C. (2005). Macrostructure. In K. Brown (ed.) *The
Encyclopedia of Language and Linguistics* (2nd Ed., Volume 7), pp. 426-429.
Amsterdam: Elsevier.

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McNamara, D.S., Louwerse, M.M., Cai, Z., & Graesser, A. (2005, January 1). Coh-Metrix version 3.0 Retrieved January 24, 2013, from http//:cohmetrix.memphis.edu.

McNamara, D.S., Louwerse, M.M., McCarthy, P.M., & Graesser, A.C. (2010). Coh-Metrix: Capturing linguistic features of cohesion. *Discourse Processes, 47*, 292-330.

van den Broek, P. & Espin, C. (2010). Improving reading comprehension: connecting cognitive science and education, *Cognitive Critique*, 2, 1-25.

Verhoeven, L. & Perfetti, C.A. (2008). Advances in Text Comprehension: Model, Process and Development, *Applied Cognitive Psychology*, 22: 293–301.

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