



## **Professional Paper**

**Because you need to know what is most appropriate for your students to read:**

**Using SRI to match reading texts to readers in Singapore**





## **Scholastic Reading Inventory as an instrument for effective Lexile® text measurement and analysis (Singapore)**

### **Scholastic Reading Inventory**

Scholastic Reading Inventory (SRI) is a research-based, computer adaptive reading comprehension assessment, developed in partnership with MetaMetrics Inc., creators of the Lexile Framework for Reading (A detailed explanation of the Lexile Framework for Reading is provided in Appendix A on page 11 of this document). SRI is the first assessment that can be administered individually or as a group and that directly reports student reading levels using the native Lexile item format. It is an objective assessment of students' reading comprehension levels that is designed on the principle of ability-based assessment. The results of SRI are reported on a developmental scale that is interpretable across levels, making it a useful tool for accurately establishing students' initial reading comprehension levels and monitoring their growth throughout the year. This is unlike traditional grade-level reading tests, which are merely designed to measure grade-level standards thus resulting in scores that are not equal across all levels of ability. SRI provides precise, ongoing information about students' reading development and their progress towards meeting required standards.

### **History of the Lexile Framework for Reading**

The Lexile Framework for Reading has a strong research pedigree, developed after 20 years of ongoing research. In 1984, the psychometric research team at MetaMetrics Inc. received a grant from the National Institute of Child Health and Human Development to develop scientifically based measures of student achievement that linked assessment with instruction, and to foster better educational practices to match students with materials that would meet and challenge their abilities. The result was the Lexile Framework for Reading, a psychometric system for matching readers with texts of appropriate difficulty. Lexile measures are currently the most widely adopted reading measure. Tens of thousands of books and tens of millions of newspaper and magazine articles have Lexile measures. More than 150 publishers have Lexile measures for their materials.

In the United States, Lexile measures are used at the school level in all 50 states. Each year, more than 28 million Lexile measures are reported from national and state assessments, classroom assessments and reading programs, representing about half of all U.S. students. As a result, Lexile measures tie day-to-day work in the classroom to critical high stakes tests. This provides interim assessment and feedback while using the same consistent measurement to easily track progress, all without additional testing.

### **Singapore National Reading Benchmarks**

The Lexile Framework for Reading allows teachers, students, parents and community leaders to contextualize English expectations for Singapore students. The Singapore education journey includes several benchmark exams that assess English language reading comprehension as well as other constructs. The English language reading comprehension passages from Singapore's national exams were examined to form the basic framework of a Singapore Lexile Map with reference to the research foundations of MetaMetrics Inc. (attached as Appendix A). The skills demonstrated in reading on a particular exam are dependent on the complexity and accessibility of the text. Texts typically increase in difficulty as students progress through the English Language curriculum. To help determine the reading demands of Singapore's English language courses, reading passages from the national exams from 1999 to 2010 were examined using the Lexile Framework for Reading. The descriptive statistics for each exam are presented in Tables 1 to 6. The mean passage Lexile measures are monotonically increasing which indicates increasing difficulty of the texts through the curriculum progression.

**Table 1: PSLE English Examination, Paper 1**

PSLE English: Paper 1						
Question	Situational Writing		Continuous Writing Account		Continuous Writing Stimulus	
Year	Lexile	Words	Lexile	Words	Lexile	Words
2005	530	53	460	58	470	40
2006	630	108	630	63	510	43
2007	650	68	590	59	510	43
2008	710	85	730	69	510	43
2009	920	93	810	66	730	62
2010	920	92	900	76	700	58
2011	900	104	660	68	690	58

**Table 2: PSLE English Examination, Paper 2**

PSLE English: Paper 2						
Question	Cloze		Comprehension Text 1		Comprehension Text 2	
Year	Lexile	Words	Lexile	Words	Lexile	Words
2005	900	128	810	393	620	465
2006	1050	184	900	343	860	491
2007	950	151	690	438	840	500
2008	980	187	940	415	920	535
2009	1070	162	980	428	890	515
2010	940	221	780	442	1000	478
2011	1000	223	870	514	950	545

**Table 3: GCE N Level English Examination, Paper 2**

GCE N Level English: Paper 2				
	Passage 1		Passage 2	
Year	Lexile	Words	Lexile	Words
2003	1360	566	1420	571
2004	1140	534	1300	576
2005	1270	536	1320	578
2006	1220	599	1080	599
2007	1090	534	1230	585
2008	1440	446	1160	638
2009	1190	604	1220	641
2010	1330	563	1120	613
2011	1270	663	1170	638

**Table 4: GCE O Level English Examination, Paper 2**

GCE O Level English: Paper 2				
	Passage 1		Passage 2	
Year	Lexile	Words	Lexile	Words
1999	1180	1267		
2000	1050	1251		
2001	890	1346		
2002	1180	1261		
2003	1230	1255		
2004	1080	703	830	583
2005	1100	695	750	611
2006	1400	826	1170	667
2007	1480	735	1420	675
2008	1540	810	1380	674
2009	1410	756	1210	543
2010	1350	747	1080	516
2011	1520	783	1290	445

**Table 5: GCE A Level General Paper, Paper 2**

<b>GCE A Level General Paper: Paper 2</b>		
<b>Year</b>	<b>Lexile</b>	<b>Words</b>
1997	1000	684
1998	1360	1171
1999	1330	1190
2000	1320	1144
2001	1010	1171
2002	1270	1241
2003	1270	1307
2004	1220	1292
2005	1280	1157
2006	1350	1297
2007	1400	1072
2008	1390	658
2009	1305	1160
2010	1240	1099
2011	1245	1066

## Creating a Singapore Lexile Map

Using the initial data collected and benchmarking against U.S. grade levels, a preliminary Singapore Lexile Map was constructed. National benchmark exams were measured by MetaMetrics Inc., comparisons were made with U.S. standards, and attention was given to constructing a reasonable progression to guide expectations of student growth. In addition, Lexile scores for the texts used in the Strategies for English Language Learning And Reading (STELLAR) program were used as a reference point in constructing the Singapore Lexile Map.

**Table 6: Lexile Measures for Selected Texts in STELLAR**

STELLAR Texts	
<b>Primary 1</b>	<b>Lexile Measures</b>
The Farm Concert	BR*
Mrs Wishy-Washy	AD** 50L
Dan, the Flying Man	BR
Walking through the Jungle	NP***
My River	BR
The Little Mouse, the Red Ripe Strawberry and the Big Hungry Bear	510L
There's a Nightmare in my Closet	AD 670L
Mr Gumpy's Outing	390L
<b>Primary 2</b>	<b>Lexile Measures</b>
Bubble Trouble	80L
What will the Weather be like Today?	AD 470L
Owl Babies	AD 500L
Slither and Slide	NP
<b>Primary 3</b>	<b>Lexile Measures</b>
The Wolf's Story	AD 440L
The Gruffalo	AD 200L
Camille and the Sunflowers	AD 660L
Mysterious Magnets	680 L
<b>Primary 4</b>	<b>Lexile Measures</b>
Canoe Diary	600L

(\*BR = Beginning Reader, \*\*AD = Adult Directed, \*\*\*NP = Non Prose)



The Singapore Lexile Map illustrates typical English language text demands for Singapore school levels in conjunction with information on reader performance based on the text demands of Singapore national benchmark exams. The Singapore school level features reading comprehension levels, expressed as Lexile measures, needed to be successful in Singapore English language courses. This alignment was constructed with a multi-faceted approach. The lower primary English Language syllabus is anchored in the text demand levels of the STELLAR program. Text selections in this program range from BR (Beginning Reader) to 600L. The Primary School Leaving Examination (PSLE) reading comprehension sections from 2005 to 2008 were measured by MetaMetrics Inc.

By synthesizing these measures, a range of Lexile measures was determined appropriate to students in Primary 6 courses. Primary 4 and Primary 5 ranges were extrapolated to create a continuum of performance from Primary 3 through Primary 6. Similarly, GCE O Level (1999 to 2010) and GCE A Level (1997 to 2007) reading comprehension sections were also measured. Measures across time were used to approximate a range for students in Secondary 4 courses and Junior College. Secondary 1 through Secondary 3 course ranges were extrapolated to create a continuum of performance from Primary 6 through Secondary 4.

### **Scholastic Reading Inventory as an Assessment Tool**

A Lexile reader measure is typically obtained by administering a test of reading comprehension to a reader. When a test has been linked with the Lexile Framework for Reading through a field study, a Lexile measure for the reader can be reported. SRI is a standardized assessment designed to measure how well students read literature and non-fiction texts of varying difficulties. The reader's score on the test is reported as a Lexile measure from a low of 0L to a high of 2000L. However, when a reader scores at or below 0L, a BR code is displayed on the reader's report.

The 1999 SRI standard setting process included a study of the correlation between student SRI scores at various grades and Lexile measures. The standard setting process involved curriculum specialists, test development consultants, and other educators examining text and reader based standards. According to the Scholastic Reading Inventory Technical Guide (2007), “Proficient was defined as performance that exhibited competent academic performance when students read grade-level appropriate text and could be considered as reading ‘On Grade Level.’ Students performing at this level should be able to identify details, draw conclusions, and make comparisons and generalizations when reading materials developmentally appropriate for their nominal grade level.”

Each item consists of a passage that is response-illustrated.

*Example of an SRI Reading assessment question*

**“The First Men in the Moon,”** by H. G. Wells

In addition to my belief in my powers as a business man, I had always in those days had an idea that I was equal to writing a very good play. It is not, I believe, a very uncommon persuasion. I knew there is nothing a man can do outside legitimate business transactions that has such opulent possibilities, and very probably that biased my opinion. I had, indeed, got into the habit of regarding this unwritten drama as a convenient little reserve put by for a rainy day. That rainy day had come. **I wanted to be a(n) \_\_\_\_\_.**

- A. author
- B. doctor
- C. actor
- D. singer

A student takes a test of about 50 of these items. Using a psychometric model called the Rasch model, a correspondence table of the number of items the student got correct, or raw score, is generated for each test. This score can then be converted into Lexiles. The Rasch model is a conjoint measurement model, which means two elements can be measured on the same scale, in the same units. In the case of the Lexile Framework, these elements are text difficulty and reader ability. The reported Lexile measure is an estimate of the student’s true reading ability. Variability in measures can occur over time from various factors, such as the student’s health and

well being, or the conditions in which the test is taken. The typical amount of variability, or what psychometricians call “error”, is about 70L for any given test administration. Multiple measures will reduce this error, and are encouraged for more precise measurement.

If none of the formal test methods is available, it is possible to get a very good estimate of a reader’s Lexile measure by having him or her read a passage from a book that has been assigned a Lexile measure. By paying careful attention to how well the reader negotiates the text, a determination of whether the book is too easy, too hard or appropriate for the reader can be made.

By providing a common metric that can be applied to both text difficulty and reading ability — a common metric that has more precision and less potential stigma than grade-equivalent leveling — Scholastic Reading Inventory offers educators a flexible and easy-to-use tool to help target students with texts that present the appropriate degree of reading challenge. In addition, the accuracy and flexibility of Scholastic Reading Inventory makes it an excellent way to communicate reading goals and achievements with students, families and other educators.

(This paper is written in collaboration with MetaMetrics Inc.)

## References

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Also available at

[http://teacher.scholastic.com/products/sri\\_reading\\_assessment/pdfs/SRI\\_TechGuide.pdf](http://teacher.scholastic.com/products/sri_reading_assessment/pdfs/SRI_TechGuide.pdf)

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## APPENDIX A

### What is the Lexile Framework for Reading?

The Lexile Framework for Reading is a scientific approach to reading and text measurement. It places readers and text on the same scale and allows reading comprehension proficiency to be measured consistently on the same scale across time. The Lexile Framework for Reading systematizes two common intuitions: that text can be ordered according to the difficulty each presents for a reader and that readers can be assessed according to the success each will have with any particular text.

With the Lexile Framework for Reading, both the reader and the text can be placed on the same measurement scale, using the same unit. A Lexile measure is the numeric representation of an individual's reading ability or a text's readability (or difficulty), followed by an "L" (for Lexile). The Lexile scale is a developmental scale for reading that ranges from below 0L for emerging readers and beginning texts to above 1700L for advanced readers and texts. Values at or below 0L are reported as Beginning Reader (BR).

There are two Lexile measures: the **Lexile reader measure** and the **Lexile text measure**. A Lexile reader measure represents a person's reading ability on the Lexile scale. A Lexile text measure represents a text's difficulty level on the Lexile scale. When used together, they can help a reader choose a book or other reading material that is at an appropriate difficulty level. A very useful feature of Lexile reader and text measures is that they can be used together to predict how well a reader will likely comprehend a text at a specific Lexile level. For example, if a reader has a Lexile measure of 1000L, he or she will be forecasted to comprehend approximately 75 percent of a book with the same Lexile measure (1000L). The 75-percent comprehension rate is called "targeted" reading.

The Lexile measure can also be used to monitor a reader's growth in reading ability over time. When an assessment is linked to the Lexile Framework for Reading, students' test scores immediately become actionable. Lexiles are a powerful tool for linking assessment with instruction across the curriculum, by taking the guesswork out of selecting materials that can help to improve students' reading ability.

Lexile measures are based on two factors: Word frequency and sentence length, which are more formally called semantic difficulty and syntactic complexity. Both of these factors, over decades of research, have been shown to be excellent predictors of how difficult a text is to comprehend. The relationship of these two factors within a text contributes to a single Lexile measure for that text. Early reading researchers determined that the difficulty of words is a continuum based on exposure, with frequently encountered words being the easiest and rare words the most difficult. Researchers at MetaMetrics Inc. analyzed more than 50 semantic variables to determine which were the most valid indicators of text difficulty. The mean log word frequency, which is the logarithm of the number of times a word appears in each 5 million words of a corpus of nearly 600 million words, had the highest correlation with text difficulty ( $r = -0.779$ ). This is the measurement used to determine the semantic difficulty of text in the Lexile system. It should be noted that word frequency is not the number of times a word appears in a specific passage, but the frequency of the word in the corpus of nearly 600 million words that is employed by the Lexile Analyzer. Reading researchers have found that the best predictor of the difficulty of a sentence is its length. Long sentences are likely to contain more clauses, and therefore communicate not only more information and ideas, but also an interrelationship between them. Researchers also speculate that longer sentences require the reader to retain more information in short-term memory. Sentence length is a powerful indicator of the syntactic complexity of a passage.

The Lexile Framework for Reading works by combining into an algebraic equation the measurements of word frequency and sentence length for any passage. This equation is called the Lexile equation, and reflects both the semantic and syntactic difficulty of that passage. This equation can also be used to place reading comprehension test items on the same measurement scale, so that texts and reading test scores can be reported in Lexiles as well. A Lexile text measure is obtained through analyzing the readability of a piece of text.

The Lexile Analyzer, a software program specially designed to evaluate the reading demand of text, analyzes the text's semantic and syntactic characteristics and assigns it a Lexile measure. The Lexile Analyzer measures text by breaking down the entire piece and studying its characteristics, such as sentence length and word frequency, which represent the syntactic and semantic challenges that a text presents to a reader. The outcome is the reading difficulty, expressed as a Lexile, along with information on the word count, mean sentence length and mean log frequency.

*Example of the output generated by the Lexile Analyzer*

Title	Author	Lexile Level	Word Count	MSL	MLF
Harry Potter and the Sorcerer's Stone	Rowling, J.K.	880	76896	11.94	3.25185

Longer sentence lengths and words of lower frequency lead to higher Lexile measures; shorter sentence lengths and words of higher frequency lead to lower Lexile measures.

During the calibration process, the Lexile Analyzer extracts slices from the text. A slice is a piece of text containing a minimum of 125 words. If the 125th word falls within a sentence, the Lexile Analyzer continues adding words until it finds the sentence-ending punctuation (i.e., period, question mark, exclamation mark or semicolon). A slice is used when analyzing books, periodicals, textbooks and other large bodies of text. Consider a piece of text that is 250 words long. The first 125

words consist of five long sentences of 25 words each. The second 125 words consist of 25 short sentences of five words each. If this text were analyzed as a whole, the first 125 words would have an impact of five times the second 125 words in estimating the mean sentence length for the text. Analyzed separately, the first set of 125 words is recognized for its long sentence length, and generates a high Lexile measure. The second set of 125 words is recognized for its short sentences, and receives a low Lexile measure. When these two slices are averaged, their Lexile calibration is much higher than if the full 250 words were analyzed together. Thus, breaking the text into slices allows for the most accurate Lexile measure of a complete body of text.



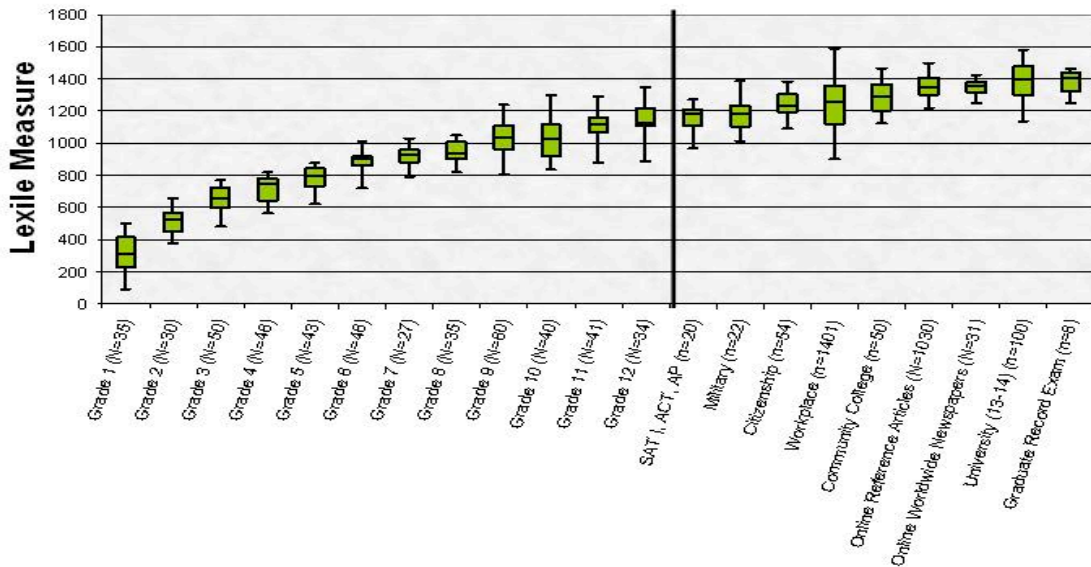
## Applications of the Lexile Framework for Reading

Lexile measures are uniquely independent, accurate and actionable. They can be applied to all types of texts, regardless of the purpose. In the first sample below, a range of international newspapers have been measured to indicate the reading challenge they pose to readers. The selection was one week of all published materials in the newspaper.

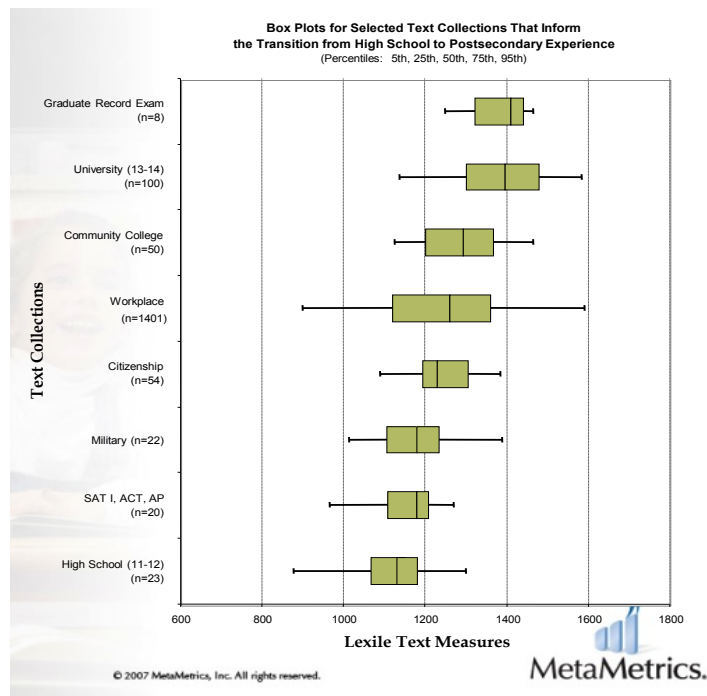
International Newspapers	Lexile Score
The Egyptian Gazette (Egypt)	1440L
Oman Daily Observer (Oman)	1430L
Financial Times (Great Britain)	1430L
The Straits Times (Singapore)	1410L
Gulf Times (Qatar)	1420L
China Daily (China)	1400L
France Daily (France)	1400L
The Moscow Times (Russia)	1400L
The Australian (Australia)	1390L
German Times (Germany)	1390L
Copenhagen Post (Denmark)	1390L
Irish Times (Ireland)	1380L
Santiago Times (Chile)	1380L
Jerusalem Post (Israel)	1370L
New Zealand Herald (New Zealand)	1290L

A study was done of all the standard texts that American school students will encounter from Grade 1 to Grade 12. The average Lexile measures were plotted below and indicate a continuum of increasing difficulty in the reading resources, with the largest increase in difficulty evidenced in the lower grade levels.

### Text Difficulty Continuum (Percentiles: 5th, 25th, 50th, 75th, 95th)



A selection of common texts that most people will be required to read in the course of their education, at the workplace and in daily life were measured to indicate the level of reading fluency required to function effectively in a community. The results indicate that at a minimum a high school level of reading fluency is required to achieve success in the workplace or complete regular citizenship tasks.







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