RESEARCH ARTICLE

A CONTENT-BASED READABILITY FORMULA FOR FILIPINO TEXTS

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Abstract

Several well-known formulas for measuring readability of texts have been developed for use particularly in assessing English texts. For assessing texts in other languages, these formulas were found inadequate or even inappropriate primarily because of the differences in the syntactic structure and lexical nature between and among languages. Thus, some countries have adapted or developed their own formulas to assess reading texts in their respective languages. To date, there is no known formula being widely used to establish the readability of Filipino texts.

This study attempted to develop a readability formula that can be used as the standard in determining the readability levels of Filipino academic books required in the different content area subjects, from Kinder to fourth year high school, that use Filipino as the medium of instruction.

Keywords: *readability, readability formula, Filipino texts*

INTRODUCTION

Readability describes how easy a document can be read and understood. Statistics on readability does not only provide information about the level of difficulty of particular documents

(Kouame, 2010), but also helps in guiding writers to ensure that their target audience will understand their writing.

Expressed in mathematical formulas, readability tests were designed to assess the suitability of texts and/or books for students at particular grade levels or ages. Besides assessing texts used in the classrooms, these tests were also used to assess the writing standards of documents used in government and industry.

Since the 1930s, readability formulas have been developed (Gray and Leary, 1935) to measure difficulty of written texts in quantitative terms. These formulas typically calculate sentence length and the syllable count of words in a text.

While most experts agree that the formulas are highly accurate for grading the readability of texts, the quantitative nature of readability formulas, however, does not take into consideration the role the readers play in the reading process – since comprehension is not solely dependent on the text alone, but on the result of the interaction between the reader and the text. For the readers, comprehension is dependent on 1) prior knowledge; 2) reading skill; 3) interest; and 4) motivation. By contrast, the readability of a text is affected by content, style, design, and organization.

However, reading comprehension also depends highly on readers' proficiency in the language of the written text. For instance, if a discrepancy exists between the readers' level of language proficiency and the language used in texts, they may experience difficulty, or struggle with the language barrier before even constructing its meaning. However, when their ability matches with the readability of the texts, they can use their cognitive processes to comprehend texts.

The Philippines has two official languages – English and Filipino. English is primarily being used as the language of business in the country and the medium of instruction in the majority of the subject areas in Philippine schools. Filipino, on the other hand, is often used as the medium of instruction, and the language of instructional materials in subject areas like Filipino, *Araling Panlipunan* and *Makabayan*. It is also the language of choice in tabloids and some

recreatory reading materials for the masses like novelettes, magazines and *komiks*.

For the past years, the reading ease or the reading level of curriculum materials has been one of the considerations for their selection in Philippine schools. Presently, the readability of most curriculum materials used in the country is computed using popular readability formulas, e.g. Flesch-Kincaid and Fry's Readability Formulas. However, because of the differences in some linguistic characteristics of the English language from Filipino, these readability formulas often fail in determining the reading level and reading ease of textbooks written in Filipino.

To date, no readability formula has been validated, much less widely used to determine the reading ease or readability levels of texts written in Filipino.

This study aimed to develop a readability formula for assessing Filipino texts. Specifically, it sought to develop a readability formula that focuses on content words since most curricular texts written in Filipino are those used in content area subjects with Filipino as medium.

THEORETICAL FRAMEWORK

Readability is one of the most widely researched areas in education (Fry, 2006). According to Fry (2006), the proof of success of readability is most frequently associated with their correlation with comprehension tests – i.e. a student understands less as the readability score increases. Another is their correlation with oral reading errors, i.e. as readability score increases so do oral reading errors.

Likewise, the most common purpose of readability formulas is to help students learn to read better. It has been long established that providing students a text or a book at the right level will eventually cause them 1) to really read it, 2) to comprehend it, and 3) to enjoy it.

Another purpose of establishing readability is to aid comprehensibility or the transfer of information. Since a readability formula attempts to predict the readers' understanding of the written passage, it becomes important in selecting text books. A big chunk of learning involves reading text books in many subjects at every level from elementary school through college. Thus, comprehensibility of these materials has to be established to ensure successful learning. To Gray and Leary (1935), the enriching values of reading are denied unless materials are adapted to their needs. Thus, the reading level of materials used inside the classrooms should suit the reading level of the students, or else, learning through reading these materials will not be maximized.

This idea is supported by Bruner (1966) who stated that a theory of instruction should address "*the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner, and the most effective sequences in which to present material.*"

Moreover, Bruner (1986) stressed that students learn most effectively when they are actively involved in their learning. He also laid the importance on understanding the structure of a subject being studied, and the need for active learning as the basis for true understanding.

The popular readability formulas

Most readability formulas are quite simplistic and of limited practical use. They typically grade textbooks used by schoolchildren and most of these formulas measure difficult words (defined as words containing three or more syllables) and average sentence length. The score gained, moreover, usually corresponds to a particular grade level (in the United States).

Table 1. Popular Readability Formulas.

The Flesch formulas	In 1943, Rudolf Flesch developed a readability formula for predicting the difficulty of adult reading material. The variables it used include "personal references" such as names and personal pronouns and affixes (Fry, 1989). In 1948, Flesch published his Reading Ease formula which, rather than using grade levels, used a scale from 0 to 100, with 0 equivalent to the 12th grade and 100 equivalent to the 4th grade. It dropped the use of affixes. The Flesch Reading Ease formula became one of the most widely used, and the one most tested and reliable (Fry, 1977, 1989). In 1975, in a project sponsored by the U.S. Navy, the Reading Ease formula was recalculated to give a grade-level score. The new formula is now called the Flesch–Kincaid Grade-Level formula (Fry, 2001, 2006).
The Dale–Chall formula	In 1948, Edgar Dale, together with Jeanne S. Chall developed a formula based on a "long list" of 3,000 easy words, which were understood by 80% of fourth-grade students. The Dale–Chall formula is considered one of the most reliable formulas and is widely used in scientific research (Dale & Chall, 1948). In 1995, Dale and Chall published a new version of their formula with an upgraded word list, the New Dale–Chall Readability Formula (Chall & Dale, 1995)
The Gunning Fog formula	In the 1940s, Robert Gunning helped bring readability research into the workplace. In 1952, he developed his own Fog Index, a formula that measures the readability of English writing. The index estimates the years of formal education needed to understand the text on a first reading. A Fog index of 12 requires the reading level of a U.S. high school senior (around 18 years old) (Gunning 2003).

Fry Readability Graph	In 1963, Edward Fry developed his Readability Graph, one of the most popular formulas and the easiest to apply. In this formula, the grade reading level (or reading difficulty level) is calculated by the average number of sentences and syllables per one hundred words. These averages are plotted onto a specific graph to determine the reading level of the content (Fry, 2006).
McLaughlin's SMOG formula	Harry McLaughlin determined that word length and sentence length should be multiplied rather than added as in other formulas. In 1969, he published his SMOG (Simple Measure of Gobbledygook) formula, a readability formula that estimates the years of education needed to understand a piece of writing (McLaughlin, 1969).
The FORCAST formula	In 1973, a study commissioned by the U.S. military, particularly of the reading skills required for different military jobs, produced the FORCAST formula. Unlike most other formulas, it uses only a vocabulary element, making it useful for texts without complete sentences.
The John Bormuth formulas	John Bormuth (1966) of the University of Chicago looked at reading ease using the new Cloze deletion test developed by Wilson Taylor. Bormuth confirmed that vocabulary and sentence length are the best indicators of reading ease (Bormuth, 1966).
The Lexile Framework	In 1988, Jack Stenner and his associates at MetaMetrics, Inc. published the Lexile Framework for assessing readability and matching students with appropriate texts. It uses average sentence length and average word frequency, as found in the American Heritage Intermediate Corpus to predict a score on a 0–2000 scale (Stenner, Horabin, Smith, & Smith, 1988).

ATOS Readability Formula for Books	In 2000, researchers of the School Renaissance Institute and Touchstone Applied Science Associates published their Advantage-TASA Open Standard (ATOS) Reading ease Formula for Books. They worked on a formula that was easy to use and useful with any text. The developers of the formula found that three variables give the most reliable measure of text reading ease: words per sentence, average grade level of words, and characters per word (School of Renaissance Institute, 2000).
Automated Readability Index and Coleman–Liau indices	The Automated Readability Index (ARI) and the Coleman-Liau Index are two readability tests designed to gauge the understandability of a text. Unlike the other indices, the ARI, along with the Coleman-Liau, relies on a factor of characters per word, instead of the usual syllables per word (Liau, Bassin, Martin & Coleman, 1976).
Lix Readability Formula : The Lasbarhetsindex Swedish Readability Formula	LIX is a readability measure to calculate the difficulty of reading a foreign text. The Lix Formula was developed by Swedish scholar Carl-Hugo Björnsson (1968). Björnsson used two factors — a word factor and a sentence factor — to predict readability quite accurately. The word factor in Lix is the familiar word length variable, however, it is measured differently from most other readability formulas. Rather than the usual count of syllables, polysyllabic words, or unfamiliar words as judged by a word list, Lix gauges word length by the percentage of long words.

Of several popular readability formulas, the most commonly used are the Flesch, Fry, and Dale-Chall Formulas. These formulas are briefly discussed in the succeeding section.

Since 1951, however, several studies have been conducted to develop formulas for the following languages other than English. These include Afrikaans, Chinese, Danish, Dutch, Finnish, French, German, Hebrew, Hindi, Japanese, Korean, Russian, Spanish, Swedish, and Vietnamese.

Filipino Readability Formulas

In the Philippines, where instruction is delivered using English and Filipino (and the mother tongue, in the case of primary grade schools), books and other reading materials in Filipino are often graded/levelled using "subjective judgement" since there is no known formula being widely used yet to establish the readability of Filipino texts.

Understanding the limitations of the formulas made to measure the reading ease and readability level of texts written in English and for English speakers, efforts were exerted by some Filipino researchers to develop readability formulas for books or materials written in a specific Philippine language.

The earliest readability formula for Filipino texts, the *Pilipino Readability Formula,* was developed in 1979 by Aracelli Villamin of the Philippine Normal University. It measures the readability of texts written in Pilipino using the variables: semantic loading, sentence length and syntactical complexity (Villamin, 1979).

In her formula, semantic loading refers to the percentage of unfamiliar words in the passage based on a 3000 word list that she earlier developed. In contrast, sentence length refers to the average length of sentences in the passage, while syntactical complexity pertains to simplicity or complexity of the patterns by which words have been combined to form sentences. Computing the readability of texts requires one to use a specially made worksheet.

The other readability formula developed by a Filipino is *A Feedback-Based Readability Formula for Science and Mathematics Curriculum Materials* published in 1983 by Vivien Talisayon**.** Unlike other readability formulas, this formula considered what is often left out by other formula-developers – the reader. According to her, there is a "tacit recognition of the importance of language/reading skills in the comprehension of science and mathematics curriculum materials" and thus, she used reader feedback as the major variable in her readability formula. This formula is based on the clarity of the elements of a reading material as perceived by the

reader. With English as the medium of instruction in Science and Mathematics, this formula is not meant to assess the readability of texts written in Filipino.

In 2009, Leyte Normal University developed a *Waray Readability Formula* to determine the ease in comprehending a text written in Winaray, one of the major Philippine languages spoken in Leyte and Samar. This is based on the Dale-Chall formula that anchors on the theory that longer sentences are harder to read than short sentences, and longer words are harder to comprehend than shorter ones (http://waraylanguage.org/ page.php?id=about).

In 2012, Adarna House Publications published *Wikahon*, an SRA-like system, that uses UP-AH FiTRI or the University of the Philippines – Adarna House Filipino Text Readability Index. The UP-AH FiTRI measures the readability of texts based on the number of syllables, words, sentences and paragraphs in a text. However, there is no recorded study found yet on the use of the UP-AH FiTRI outside the *Wikahon* system (http://adarna.com.ph/wikahon/).

METHODOLOGY

The formula developed in this study focused mainly on Filipino expository texts used in the abovementioned subject areas. The major premise in the development of this formula resembles the LIX that uses word and sentence factors, i.e., other than the average number of words per sentence in a given passage in Filipino, and the number of content words with three or more syllables in these materials are significant factors for text difficulty.

The development of the content-based readability formula for Filipino texts underwent three phases: 1.) the development of content text corpus and the development of a word list; 2.) the analysis of the passages and the identification of variables that could determine reading ease or difficulty; and 3.) the development of the readability formula.

Phase One

In order to develop the Filipino content text corpus, textbooks written in Filipino from Grade 1 to fourth year high school, published from 1985 to present, were gathered. Each book was divided into three parts: the beginning, middle, and end. Text samples were randomly selected from these parts. Notably, the texts did not undergo evaluation and validation since they are already existing and lifted from graded/levelled textbooks. With these samples, the following procedures were done:

- Text samples were subjected to word frequency count. The free online program determined the most frequently used words and from this source, a word list of the top 100 words for each level was developed (Appendix A).
- From the graded word list, the number of content words for every 100 words was determined to establish the frequency of content words in the texts for each grade level. Words included in the earlier list were excluded from the succeeding lists, thus, no words were repeated. Words listed were based on the frequency of their occurrence in the passages and not on their length or their roots.
- From the graded word list, word characteristics (per grade level) was also determined:
    - Number of function words vis-a-vis the number of content words
    - Number of letters and syllables of shortest words
    - Number of letters and syllables of longest word without affixation
    - Number of letters and syllables of longest word with affixation
    - Number of affixes in the longest word
- The text samples were also subjected to 'three-word phrase" count and from this, the top 20 phrases for each level was determined for analyzing phrasal structure.

Phase Two

This phase focused on the linguistic analysis of the sample passages, word list and phrasal structure. From the text samples in phase one,

twenty passages with 100 words from each level were randomly selected. These passages served as the anchor passages used in the development of the readability formula. Several factors were initially identified as predictors of variability – to wit:

- number of words per sentence
- number of content words per passage, with and without affixations
- number of syllables of both the longest and shortest words
- number of letters of both the longest and shortest words
- number of affixation

From the results of the analysis of these factors, the following variables were identified:

- number of words per sentence
- number of content words per passage,
- number of long words with 3 or more syllables
- number of long words with 4 or more syllables
- number of syllables and letters found in the longest word

Phase Three

In this phase of the study, the correlation of the identified variables with a particular grade level was computed to identify which variables are significant in determining the reading ease of the text. Afterwards, the data were subjected to multiple regression procedure to derive the formula.

RESULTS AND DISCUSSION

Table 2 shows the number of content words for every 100 words in the graded word list.

As can be gleaned from the table, the number of content words in the 20 text samples per level increases as the grade level rises. Although the number in Year 1 is lesser than that in Grade 6, a careful study of the list indicates the presence of long function words (i.e. *marahil, samantalang)* which could also further indicate

that sentences in the Year 1 text are longer and more complex.

Table 2. Number of Content Words in Graded Word Lists

Level	Number of Content Words
Grade1	30
Grade 2	64
Grade 3	87
Grade 4	88
Grade 5	90
Grade 6	95
Year 1	91
Year 2	97
Year 3	98
Year 4	99

Several aspects of the Filipino language were identified by the language expert as the major areas for consideration. Table 3 shows the aspects to be considered in identifying the variables for the readability formula. Analysis of the text samples using this table as reference could help in identifying the variables that could predict reading ease of texts written in Filipino.

Table 3. Aspects of the Filipino Language for Consideration in Identifying Variables for the Readability Formula

Aspects	Considerations
Parts of Speech (POS) - This refers to the lexical category of the words that are present in the published material.	1. There is no clear parameter regarding the parts of speech in Filipino. 2. Thus, a. Reference to a reliable monolingual dictionary in Filipino should be done b. Creation of a word list using word frequency counter to identify the most commonly used POS in each grade level. This will help in identifying easily the POS that will be covered by the formula.

Syllable Pattern - A syllable is a unit of spoken language consisting of a single uninterrupted sound. Syllable pattern refers to the system of sound combination to form a syllable. - In the Philippine-type languages, the CV({./C})CVC is the most dominant syllable pattern.	Because there are sounds that have no symbolic equivalent (i.e. glottal stop), reference to an established system of spelling in Filipino should be done to guide the analysis [i.e.2009 Ortograpiya ng Filipino: KWF]. 1. Hence, the *pormasyon ng pantig sa Filipino* (Santiago at Tiangco, 2003) can be used as reference: a. P : **o**-**o**, **a**-so, ma-**a**-**a**-ri b. KP: **ba**-**ba**-e, **ta**-o, **gi**-**ta**-**ra** c. PK: **ok**-ra, **is**-da, ma-**is** d. KPK: ak-**lat**, **bun**-**dok** e. KKP: **tse**-ke, **blu**-sa f. PKK: **eks**-tra g. KKPK: **plan**-tsa h. KPKK: **nars, kard** i. KKPKK: **trans**-por-tas-yon 2. On the number of syllables, the following questions should be considered: a. How many monosyllabic function words are present in the text? b. How many monosyllabic content words are present in the text? c. Is difficulty in decoding multisyllabic words in Filipino attributable to the number of syllables? d. On the number of characters/letters, the following questions should be considered: i. Does the number of characters/letters in words determine the difficulty or ease in decoding? ii. Does the presence of consonant cluster, diphthongs or triphthongs determine the difficulty in decoding?
Suprasegmental (Prosodic) Features - This refers to the distinctive features of oral languages that are not present or distinct in written language. These include vowel length, stress, intonation, and juncture.	1. Sound length, and stress and distinctive features of Filipino are important. Although readability formulas do not cover much of the semantic features of the language, the suprasegmental features can be used to determine the following: a. Which words that have specific sound length and stress pose difficulty or ease in decoding? b. On the sentence level, where does juncture occur? Is the juncture appropriate with the punctuation? 2. Aside from this, suprasegmental features can also be used for miscue analysis in Filipino.

Syntactic Features - This refers to the system of combining words to create phrases, clauses, and sentences.	1.	The syntactic features of a text may also affect decoding and comprehension. Thus, the number of words in a phrase, clause or sentence should be considered as factors that could affect the ease or difficulty in decoding.
Text and Text Structure	1. 2.	There is no standard spelling system in Filipino. Some texts are based on the 1987 spelling system, 2001 spelling system, and 2009 *Ortograpiya*. The writer's choice of a system may have implications on the abovementioned aspects. Text structure should also be considered since it may also have implications on syntactic features.

Findings

From the analysis of the data gathered from the abovecited procedures, the following findings are hereby summarized:

- Content words found in texts increase in number as the reading level of the material increases.
- Based on the 1000 word list, the number of content words is inversely proportional with function words – i.e., with repeated words disregarded, function words occur less frequently as the level of the material increases. In Year 3 and 4 levels, all unrepeated words in the lists are content words.
- Simple content words, or content words that have no affixations, decrease in number as the reading level of the material increases.
- The number of affixes in the content words used in the texts increases as the reading level of the material increases.

Phase Three

Using Pearson correlation and multiple regression procedures, it was found out that from the identified variables aforecited, the variables that could predict grade level variation are: a) the number of words per sentence and b) the total number of content words. The obtained regression weights for the three variables, their means and

variability are arranged in this formula.

Predicted Grade Level (PGL) = -4.161 + 0.280 (w/s) + 0.106 (cw)

where
w/s = average number of words per sentence
cw = total number of content words.

Passages used as samples have at least 100 words. If the 100th word does not mark the end of the sentence, the remaining words were counted. The total number of words was then divided by the number of periods to get the average number of words per sentence.

Content words, on the other hand, refer to nouns, verbs, adjectives and adverbs. Names of people and places were counted per word (i.e. José Rizal = 2; San Jose del Monte = 3). However, titles (spelled out or abbreviated, i.e. Heneral, Dr., Gng., G.), acronyms (i.e. ASEAN), year (i.e. 1800, 2012), and number (i.e. 12, IX) were counted as one word.

The highest and lowest means from the scores yielded by the formula was then computed, and later on the means between the high and low means were also determined to derive a conversion table that will indicate the readability level of a passage (Table 4). However, the differences in the means from Grade 6 to Year 4 are insignificant (just between 0.2 and 0.25) thus, instead of identifying the grade level, a readability index that indicates reading ease was developed to translate the scores.

Table 4. Readability Index

PGL Score	Readability Level	Grade/Year
4.9 and below	Very Easy	Grades 1-2
5-6	Easy	Grades 3-4
7-8	Average	Grades 5-6
9-10	Difficult	Year 1-4
11 and up	Very Difficult	Tertiary

Texts that are found to be **Very Easy** are appropriate and can be handled by children up to Grade 2. Texts that are found to be **Easy** are appropriate and can be handled with ease by children from

Grades 3-4; while texts found to be **Average** can be handled with ease by children from Grades 5-6. Those texts that are found to be **Difficult** and **Very Difficult** are appropriate for the high school and tertiary levels, respectively.

The formula was tested using new samples, and this generated accurate levelling of texts up to grade 6. This can be attributed to the following factors: a.) the insignificant difference of the means from Grade 6 to Year 4 as stated above; and b.) the varying writing style of some authors as required by the text type and content area (i.e. *Araling Panlipunan* texts and concepts are often more complex compared to texts on *Edukasyong Pantahan* or *Edukasyong Pagpapakatao*).

CONCLUSION

Overall, the readability formula developed is simple and easy to use, since it has only two variables to determine the reading ease of texts written in Filipino. Its use and other similar formulas will impact greatly on selecting materials for successful reading instruction and for increasing the readers' access to texts that they can read.

RECOMMENDATIONS

In light of the findings, the research offers the following recommendations:

- A digital version of the formula can be developed. Ideal for teachers and publishers of textbooks, a digitized formula will allow easier assessment of large number of texts and other reading materials written in Filipino.
- Further validation of the formula can be done using other text types, e.g. narrative texts.
- The formula developed can be tested in assessing the reading ease of texts written in other Philippine languages, and if inapplicable, a modified version, or an entirely new formula can be developed.

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