

WINNING THE WAR AGAINST UNREADABLE TEXTS: CLASSIC VERSUS NEW READABILITY FORMULAS

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Abstract. In recent years, many texts of dissimilar genres, including academic and corporate, have been reported to be low in readability. Despite the widespread availability and frequent application of existing readability formulas, the ongoing battle against unreadable texts has not seen much improvement. This calls for a re-examination of existing formulas in order to understand the gaps and issues in readability. To do just that, the study then comparatively analysed a total of seven (7) classic and new readability formulas namely (i) Flesch-Kincaid Readability Test, (ii) Dale-Chall Formulas, (iii) Gunning Fog Index, (iv) Coleman-Liau Formulas, (v) Fry Graph, (vi) SMOG, and (vii) the New Dale-Chall formula, to unveil their similarities and differences. The study, which purposively sampled the formulas due to their practicality and wide acceptance by the public, looked into the formulas' inclusion of language factors and the texts used for their development apart from their intended use. As a result, a consistent overreliance on sentence length and word difficulty as the two commonly used factors of readability was observed. Other than that, the study also found the lack of readability formulas to specifically assess non-academic texts. These findings suggest that though readability is not a new scholarly area, there may be still much to be explored by future research. This includes incorporating other language factors as well as developing genre-specific formulas, so as to move away from the overly tested factors apart from expanding the application of readability beyond just the academic settings. Having more accurate readability assessment tools would then support the Sustainable Development Goals (SDGs) through effective public communication.

Keywords: *comparative analysis, flesch reading ease, readability formulas, Sustainable Development Goals (SDGs)*

Introduction

The earliest interest in readability can be traced back to the 19th century, an era when reading ability was regarded as a means of improving literacy. It all started when the United States went through a significant reform in its education, to improve the literacy among its general population (Scammacca et al., 2016). At the time, a graded school system was introduced, prompting educators to assess students' reading levels upon determining their placement (DuBay, 2004; Sartain, 1968). This move reflected the emphasis placed on reading proficiency as a key measure of literacy, based on the belief that learners benefit most from texts that are aligned with their reading capabilities (Scammacca et al., 2016; DuBay, 2004). Following the introduction of such an education system, McCall and Crabbs (1926) developed standardised reading assessments to evaluate students' comprehension, to facilitate the placement of students. The tests require students to read a passage before answering a set of multiple-choice questions. This was one of the earliest scholarly efforts which not only drew the link between reading ability and literacy but also laid the groundwork for the introduction of many readability formulas.

The interest in readability continued to grow into the 20th century as concerns about adult literacy were on the rise. This time around the integration of readability extended beyond just school-aged children (Scammacca et al., 2016). Despite the shift, the link between reading ability and literacy remained recognised and emphasised. As such, during the Revolutionary War, basic reading skills were taught by the U.S. military to soldiers, as literacy continued to be linked to important attributes such as intelligence, knowledge, and job performance (DuBay, 2004). For the same reason, literacy tests were subsequently made a requirement for military enlistment. Having acknowledged the profound impact of reading ability, interest in the area continued to grow rapidly to include the general population: at the time, broader literacy assessments were introduced by the U.S. government namely the Young Adult Literacy Survey of 1985 and the National Adult Literacy Survey (NALS) of 1992 to examine various aspects of literacy. One of which was prose comprehension. The tests found that approximately 40 million adults were functionally illiterate and that nearly half of the population struggled with texts written below a fifth-grade level: these troubling results urgently called for reading materials to be tailored according to readers' abilities. This marked the beginning of readability as an area of research. As a result, researchers began developing tools not only to measure text difficulty but also to facilitate the selection and identification of appropriate reading materials that match individuals' reading ability.

These efforts laid the groundwork for both classic and new readability studies which have resulted in the introduction of readability formulas. The studies include McLaughlin (1969), Coleman (1965), Fry (1963), Gunning (1952), Dale and Chall (1948) as well as Flesch (1948; 1943). Despite the inception of the area as well as the introduction of these formulas, today, ensuring that texts remain readable for many is still proven to be challenging. This is evident in the trends on how many text types have become less readable, including scientific texts across different fields (Lahmar and Piras, 2023; Hulme et al. 2022; Wang et al., 2022; Graf-Vlachy, 2022; Plavén-Sigra et al., 2017) and corporate reports (Pombinho et al., 2024; Raimo et al., 2022; Stone and Lodhia, 2019; Toit, 2017), to name a few. To address this concerning decline, it is important for existing formulas to be re-examined and compared so as to recalibrate the general interpretation and understanding of readability apart from addressing possible limitations. This is in line with the Sustainable Development Goals (SDGs) which essentially promote responsible and effective public communication. In the context of education, ensuring that academic texts are readable for students of different cultural backgrounds and language proficiency (as a result of heightened migration) would support Goal 4 through inclusive and equitable education and lifelong learning opportunities for all. Whereas in the context of corporate communications, readable reports or releases would contribute to Goal 16, which emphasises the need for effective, accountable, and inclusive institutions through clear public communication.

Therefore, to guide the comparative analysis of existing readability formulas, the following research questions were identified: (i) What are the similarities between the readability formulas? (ii) What are the differences between the readability formulas? Upon comparing them, the study looked into the language components factored in by each formula apart from its intended use, and the texts or sources from which the components were drawn from.

Classic readability formulas

Flesch-Kincaid readability tests

Probably the most popular and widely used formulas are Flesch-Kincaid Readability Tests. In 1943, Rudolf Flesch introduced his first readability formula thus becoming the earliest work in classic readability. The formula centres around sentence length, affixes, and personal references. To measure text difficulty, he used a scale from 0 (easy) to 7 (hard). The use of Flesch (1943) formula is most evident in media and education that it was reported to boost readership by up to 60 per cent upon its inception (DuBay, 2004). Despite its widespread popularity, the formula has been heavily criticised for its heavy reliance on sentence length while excluding spoken language features. The oversimplification of text readability through the factor has been argued by Aziz and Chai (2018), Vajjala and Meurers (2012), and Zamanian and Heydari (2012). Five (5) years later, Flesch (1948) revised the formula, known as the Flesch Reading Ease. This was done by incorporating syllable count and conversational markers so not to just assess readability but also human interest.

Dale-Chall original formula

The same year Flesch (1948) amended the formula, Dale and Chall (1948) devised their own formula to address the flaws in Flesch (1948) approach. They argued that Flesch (1948) inclusion of affixes does not determine difficulty. Sentence length, however, was retained by Dale and Chall (1948) while introducing the percentage of difficult words, based on a list of familiar vocabulary. This factor emerged as the strongest predictor of readability. Though they acknowledged the importance of reader interest and background, they did not extend beyond these two factors. In 1995, Dale and Chall then revised the formula. Generally, the original formula was designed with readers above the 4th grade in mind.

Gunning Fog Index

Following the introduction of the Dale-Chall Original Formula, Gunning (1952) created the Fog Index. Surprisingly, the formula took into consideration the same factors (namely sentence length and number of complex words (three or more syllables) per 100 words). According to DuBay (2004), the simplicity of Gunning Fox Index led to its popularity. The model marked the end of the earliest works in readability, paving the way for new readability studies.

New readability formulas

Coleman-Liau formulas

The first scholarly work in the new era of readability was instigated by Coleman (1965) through its model Coleman-Liau Formulas. The formula focuses on four (4) specific factors of (i) one-syllable word frequency, (ii) sentence count, (iii) pronouns, and (iv) prepositions per 100 words. For the purpose of validating the formulas, seven passages were tested using cloze procedures.

Fry graph readability formula

Unlike other formulas which were intended for general and educational purposes, Fry Graph Readability Formula was initially developed by Fry (1963) to support African educators. But because of its simplicity and board applicability ranging from

grade one to college, the model then saw much popularity (DuBay, 2004). Quite similarly, the model looked into sentence length and syllable count, with a unique approach of measuring readability through plotting on a graph. Though Fry (1963) acknowledged the influence of reader ability and subject matter, these were not included in the formula.

SMOG formula

A few years later, efforts to advance the exploration of readability continued through the founding of the SMOG formula by McLaughlin (1969) who regarded word and sentence length as key predictors of semantic and syntactic complexity. The formula took a dissimilar approach by multiplying instead of summing these factors to calculate readability. The acceptance of the SMOG formula was attributed to its simplicity.

New Dale-Chall formula

The last prominent work in the new readability studies was Chall and Dale (1948) revisited formula which increased the list of familiar words. Other than that, the new model went through further validation involving various reader groups and other formulas like Fry (1963) to improve its reliability.

Materials and Methods

The study adopted qualitative research design by reviewing and comparing relevant literature including the classic and new readability studies which had resulted in the introduction of tools for measuring text readability. These formulas were chosen based on not only their scholarly impact but also widespread use and relevance to educational and linguistic contexts. Guided by purposive sampling, the selection of both studies was to ensure a balanced representation of text readability across different times and applications.

As stated in the introduction, the comparative analysis of the formulas looked into several key aspects: (i) the inclusion of language factors, (ii) scholars' reliance on standardised texts or resources upon devising their formulas (like McCall and Crabbs (1926) passages), and (iii) the intended use. In short, this comparative analysis aimed to shed light on the conceptualisation and measurement of text readability since its instigation, with the hope to highlight the patterns and gaps in existing approaches.

Comparison of the readability formulas

The *Table 1* below presents the comparison of the readability formulas based on the focal areas:

Table 1. Comparison of the readability formulas.

Scholar(s)	Formula	Language Factor(s)	Text Used	Intended Use
Flesch (1943)	First readability formula	Average sentence length Number of affixes Number of references to people	-	Educational use, specifically schoolers
Flesch (1948)	Flesch Reading Ease	Average sentence length in words Average percentage of personal words Average word length in	McCall and Crabbs' (1926) reading passages	Educational use, particularly college students

Dale and Chall (1948, 1995)	The original Dale-Chall Formula, The New Dale-Chall Formula	syllables Average percentage of personal sentences Vocabulary load Sentence length	McCall and Crabbs' (1926) reading passages	Educational use, specifically readers above 4th grade
Gunning (1952)	Gunning Fog Index Readability Formula	Sentence length Number of difficult words	McCall and Crabbs' (1926) reading passages	General and educational use
Coleman (1965)	Coleman-Liau Formulas	Count of one-syllable words Number of sentences Number of pronouns Number of prepositions	-	
Fry (1963)	Fry Graph Readability Formula	Number of syllables Sentence length	-	Educational use, particularly teachers and textbook authors
McLaughlin (1969)	SMOG Formula	Multiplication of Word length Multiplication of Sentence length	-	

The following sections discuss the similarities and differences between the existing readability formulas.

Similarities between the readability formulas

Inclusion of language factors

Based on the comparative analysis, the first similarity shared by these formulas was their inclusion of language factors. To be specific, two (2) factors of (i) sentence length and (ii) word difficulty (e.g., syllable count or vocabulary load) were incorporated as the primary components. This includes Flesch-Kincaid Readability Tests, Dale-Chall Original Formula, Gunning Fog Index, Fry Graph Readability Formula, SMOG Formula, and New Dale-Chall Readability Formula. Though this reflects the extent to which these two factors have been tested and used, the unvarying focus means that there are more factors to be considered and tested. This was supported by Flesch (1948) himself which noted the overemphasis of sentence length as one of the readability indicators. More recently, the overreliance on the two factors has also been argued by Aziz and Chai (2018) and Vajjala and Meurers (2012).

Texts used for formula development

The second similarity observed in the analysis was the texts used upon developing the formulas. Flesch-Kincaid Readability Tests, Dale-Chall Original Formula, and Gunning Fog Index were all developed using McCall and Crabbs (1926) reading passages for children. Therefore, this raises the question of authenticity, should the formulas be used for non-children and technical texts, would the generated scores then reflect the readability of the texts. Other than that, another important revelation was how most formulas were developed based on texts sourced from the U.S (i.e., McCall and Crabbs (1926) reading passages). Therefore, this raises the question of whether the same formulas are appropriate for assessing English as Second Language (ESL) or English as Foreign Language (EFL) texts- the same question posed by Zamanian and Heydari (2012), Bruce et al. (1981), Carrell (1987), and Drury (1985).

Intended use

As for intended use, these formulas were generally designed or widely accepted to be used in educational contexts such as when matching texts to student reading levels. This includes Flesch-Kincaid Readability Tests, Dale-Chall Original Formula, Gunning Fog Index, Fry Graph Readability Formula, New Dale-Chall Readability Formula. Few formulas, however, were designed for dissimilar purposes- (i) Coleman-Liau Formulas which focuses on general readability using cloze tests and not explicitly tied to educational grading and (ii) SMOG Formula which is designed for general readability assessment, especially in public health and communication contexts. Thus, this calls for new readability formulas that cater to English for Specific Purposes (ESP) texts including corporate and financial, to name a few. This is also asserted by Zhou et al. (2017), Zamanian and Heydari (2012), and Bruce et al. (1981). This is especially important considering how other text types have been shown to gradually be less readable. This includes scientific texts across different fields (Lahmar and Piras, 2023; Hulme and McLaren-Swift, 2022; Wang et al., 2022; Graf-Vlachy, 2022; Plavén-Sigraý et al., 2017) and corporate reports (Pombinho et al., 2024; Raimo et al., 2022; Stone and Lodhia, 2019; Toit, 2017), to name a few.

Difference between the readability formulas

Additional language components

Unlike other formulas, Flesch (1948) included personal words and sentences to measure human interest whereas introduced pronouns, prepositions, and cloze tests as validation criteria. This indicates the attempts for these formulas to explore beyond just the two factors.

Conclusion

In conclusion, the comparative analysis of the seven (7) readability formulas revealed a number of key findings for consideration. Firstly, all formulas were found to consistently rely on the same language factors- namely sentence length and word difficulty, despite the assertion that the factors do not comprehensively reflect how readable a text is. Secondly, half of the formulas were developed based on children's passages. Though these formulas have been used to study not only academic but other texts, the issue of whether texts of dissimilar genres are accurately and authentically represented remains. Other than that, the inclusion of additional linguistic features (including personal references or abstract vocabulary) reflects the evolving perspectives on what makes texts readable- thus highlighting the limitations of overly simple metrics. This comparative analysis, hence, sheds light on the limitations and gaps of the existing readability formulas. These insights are deemed to be important for future research to set sail for a more accurate measuring tool or formula to solve the gradual decline in readability seen in many text types or genres. Another implication of the analysis is the putting forth the undeniable importance of readability, especially in this modern era which calls for effective communication in sectors such as education and corporate, as outlined in the SDGs goals. The move to strive for more readable texts would ultimately promote inclusivity.

Looking at the findings, it can be concluded that traditional formulas (though are deemed to be practical tools) may not accurately represent the language aspects of texts. Therefore, there are few recommendations that future research must consider. Firstly,

future readability formulas must move beyond just these factors and explore other language factors such as syntactic complexity and lexical semantics. Other than that, future studies could also develop genre-specific formulas to look into the readability of other text types, especially those that are technical. This can be particularly insightful to understand English for Specific Purposes (ESP) texts. Lastly, future research could also consider devising new formulas based on texts that authentically represent the intended users or audience. This includes ESL and EFL texts.

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Conflict of interest

The authors confirm that there is no conflict of interest involved with any parties in this research study.

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