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## Statistical indexes as the quality indicators for the readability and performability of academic texts

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### ABSTRACT

The primary aim of this article was to demonstrate the position of the readability criterion in the evaluation and selection of academic texts. Various textual examples were used to prove the importance of the analytical approach to the choice of suitable texts in the educational process. In the form of nominal scores, assessed by scales of statistical indexes, we can analyse readability as a quality criterion. Performability goes hand in hand with fulfilling the readability criterion.

**KEYWORDS:** readability, performability, academic texts, statistical indexes, English, software tools

**JEL CLASSIFICATION:** C46, C88, C43

### INTRODUCTION

#### The outline

The educational process at the university level is quite specific compared to the lower levels of education. An integral part of the teachers' competences is the authorship of their textbooks, manuscripts, and other forms of academic writing. This makes the academic environment special. There is a general agreement on these duties. Nevertheless, teachers struggle to overcome the problems associated with the appropriateness of the choice of their textual outputs or the texts of other authors. It is because they are not in a position to assess the *readability* and *performability* of these particular materials. When searching for the solutions to these problems, it is suitable to ask two key questions:

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- What is the target group (students/applicants)?
- What is the purpose of using the text?

Generally, we can say that identifying the target group and the purpose of using the text is involved in the specification of the true learning needs of students. That is, according to [16], objectively determined by independent assessment of the students' performances against an optimum. And therefore, for the optimum, certain educational standards must be adopted and respected.

Identifying the target group is crucial for the choice of materials. It sets the criteria for the factors, such as topic, level of proficiency, methods, etc. Skilled and experienced teachers who for a longer time and in more detail deal with their students mostly recognise it precisely. If it absents, e.g. it is a new group of students or teachers are inexperienced (unable) to identify it on their own, initially, it will cost them some time to find it out. The same goes to the purpose of using the text. Is it the teacher's pure academic output or the material for the seminars? The ability to find balance is one of the symptoms of professionalism. If texts are to be usable, students must be taken into consideration.

In practice, teachers do not have sufficient time to detect all preconditions of the correct choice of textual materials. So, practically, it is expected to focus on certain details – the specific markers that would lead to the fast and correct choice of texts. That is why it is unlikely to solve this problem smoothly. In teachers' efforts to find an adequate way, they should focus on *readability* and then *performability* of their academic/educational texts.

### **Readability and performability**

This subchapter brings several definitions and ways of perception of the terms *readability* and *performability*. It is evident that although being used by teachers and other academic practitioners, they are still problematic to be terminologically classified. Even in some acclaimed dictionaries, when searching for them, it is limited. The alternative way was to derive the meaning from the yet-existing terms.

- **Readability** (syn. Readableness)
  - a) According to the Oxford Advanced Learner's Dictionary [10], it is defined as “*the fact of being clear and easy to read*” or “*the fact of being easy, interesting and enjoyable to read*”.
  - b) Similarly, the Cambridge Dictionary [11] shows that it is “*the quality of being easy and enjoyable to read*”.
  - c) The Macmillan Dictionary [12] follows with the statement that “*writing that is readable, is clear and able to be read*”.
  - d) Dictionary.com [13] displays that it is “*the state or quality of being readable*”.
- **Performability** (syn. Operability, Usability)
  - a) According to the Collins Dictionary [8], it is defined as “*the quality of being performable*”.
  - b) In Merriam-Webster Dictionary [7], there is no direct definition of this term, but it is possible to derive it from the infinitive verbal form of the verb TO PERFORM.
    - Coming out of the meaning TO CARRY OUT, the meaning of PERFORMABILITY can be *the ability to bring something to a successful issue, to put something into execution, or to carry out an action or pattern of behaviour*.

- Coming out of the meaning TO DO, it can be *the ability to do something in a formal manner or according to a prescribed ritual*.
- c) The Cambridge Dictionary [9] also does not show this term, but it is possible to derive it from the adjective PERFORMABLE, which means "*being able to be done or acted*".

When searching for the meaning of "performability of the text", we can think about functionality (as a feature or state of something that works, that is aimed at some purpose), or applicability/usability. In this sense, well-prepared texts are those that are fully readable/applicable/usable at seminars, and therefore we can also take into account the synonyms of operability and feasibility. Such materials are performable. In trying to find the core of readability, it is possible to view it from various perspectives, see [5]. It can be, e.g. the clarity of the written text (comprehension), legibility (layouts, colours and contrast, technical aspects), interest/topic affiliation vs antipathy, translatability (a problem for other than native English speakers), or learnability/usability.

### **The role of statistics**

Certain specific linguistic tasks are perceived very measuredly and confusingly. The reason may be that the students face subjective difficulties, e.g. various animosities, which come from their previous experience with text or are not sufficiently proficient in the language. The heterogeneous groups of students do not enable teachers to satisfy everyone and set a consensual level of difficulty for the tasks. Coming out of this, there should be a more objective way of choosing texts.

Various linguistic statistical models are used "*to get detailed, data-driven insights into complex interactions*", see [15]. So, it can be empirically investigated. According to [4], "*...In quantitative research, linguistic features are classified and counted, and even more complex statistical models are constructed in order to explain these observed facts. In qualitative research, however, we use the data only for identifying and describing features of language usage and for providing real occurrences/examples of particular phenomena.*"

Therefore, we see applying statistical indexes within the process of analysing readability and performability as the way to go.

## **MATERIAL AND METHODS**

### **What are readability indexes (scores)?**

The principle is simple. This analytical approach is based on certain mathematical algorithms, which judge various parameters. [6] shows them – the length of sentences, often counting the number of words, and the length of the words themselves, considering the length in letters or syllables. These text analysis criteria are used with mathematical formulas to obtain *a readability index*.

A readability index says, how difficult the text is for a certain target group of recipients, resp. if the text is suitable for that chosen target group of recipients.

### How to use indexes and scales?

A readability index is displayed as a particular numerical value. As a lonesome number, it is vague. We know that each process must have an evaluation module or mechanism, against which that number is confronted. For this reason, each index has a numerical scale that represents/defines the difficulty levels. That particular numerical value is judged against the scale.

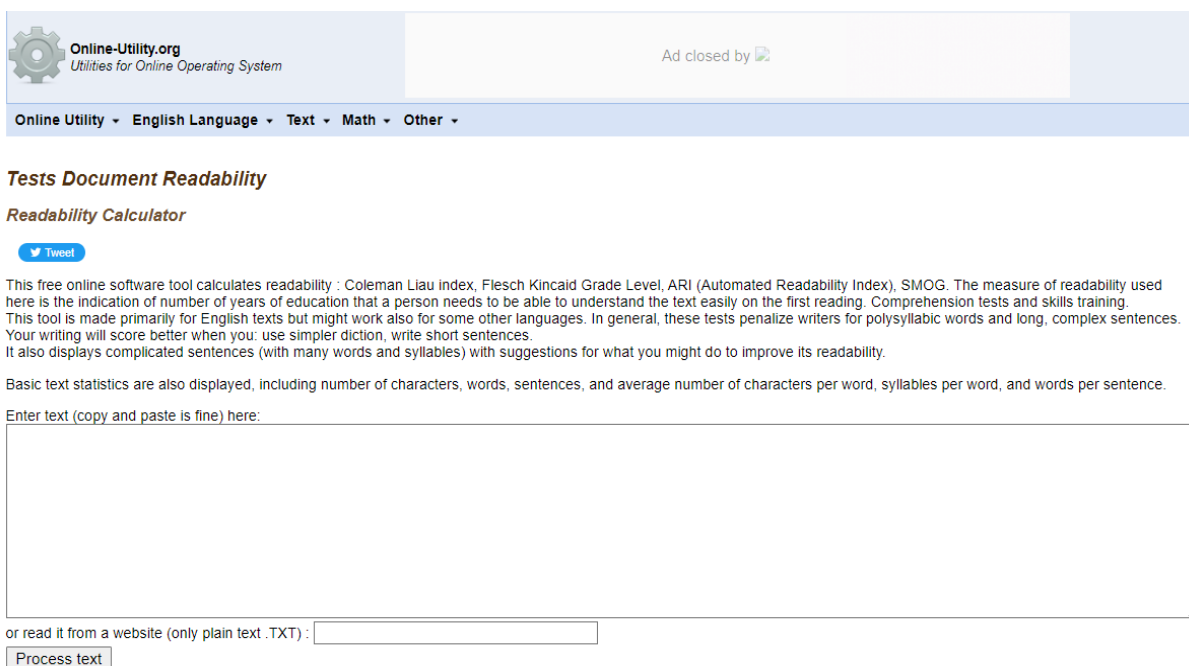
The indicated numerical value of the index equals a certain status of difficulty.

The process is mathematically complicated when counted manually, but nowadays, computer linguistics and statistics use specialised software tools. In the end, there is a statistical output – in numerical value – and that is a readability index. Developed software applications provide statistics in multiple indexes, so it is up to the teachers which index they will choose.

Even though there are multiple software tools (free or commercial) used in practice, the work procedure when using software applications is almost identical, so here is the simplified methodological process (using the example of software analysis):

1. Take the chosen text file.
2. Copy the sample text from the original text file and insert it into the software.
3. Press ENTER, PROCESS, or CALCULATE buttons (each software has it different).
4. The software needs some time to process the textual material.
5. The software displays a readability index (score) in the form of numerical value.

For understanding more closely, Figures 1, 2, and 3 show an example of Online Utility software [14], which is free of charge, easy to use, and on disposal online. Moreover, it is only one of several software applications usable online.



**Figure 1** Readability Calculator (Online-Utility.org)

The sample text used is the paragraph from the original article on TEFL [1].

Online-Utility.org Utilities for Online Operating System Ad closed by Online Utility English Language Text Math Other Tests Document Readability Readability Calculator This free online software tool calculates readability : Coleman Liau index, Flesch Kincaid Grade Level, ARI (Automated Readability Index), SMOG. The measure of readability used here is the indication of number of years of education that a person needs to be able to understand the text easily on the first reading. Comprehension tests and skills training. This tool is made primarily for English texts but might work also for some other languages. In general, these tests penalize writers for polysyllabic words and long, complex sentences. Your writing will score better when you: use simpler diction, write short sentences. It also displays complicated sentences (with many words and syllables) with suggestions for what you might do to improve its readability. Basic text statistics are also displayed, including number of characters, words, sentences, and average number of characters per word, syllables per word, and words per sentence. Enter text (copy and paste is fine) here: There are numerous books of research methodology in our library. Many research articles can also be found through the search of scientific journals. The writer can easily find articles about language studies covering studies of pragmatics, sociolinguistics, language acquisition, or psycholinguistics. It is also easy to find articles on language education through the search of journals of language teaching research. This library study examines the research methods commonly used by today's researchers in the field of language education. The result of the analysis is addressed to reveal the current practice in research tradition in this field. From this, the readers will learn different types of research methods implemented by researchers around the world. or read it from a website (only plain text .TXT): Process text

Figure 2 Inserting the text (Online-Utility.org)

Tests Document Readability Readability Calculator This free online software tool calculates readability : Coleman Liau index, Flesch Kincaid Grade Level, ARI (Automated Readability Index), SMOG. The measure of readability used here is the indication of number of years of education that a person needs to be able to understand the text easily on the first reading. Comprehension tests and skills training. This tool is made primarily for English texts but might work also for some other languages. In general, these tests penalize writers for polysyllabic words and long, complex sentences. Your writing will score better when you: use simpler diction, write short sentences. It also displays complicated sentences (with many words and syllables) with suggestions for what you might do to improve its readability. Number of characters (without spaces): 639.00 Number of words: 114.00 Number of sentences: 7.00 Lexical Density: 56.14 Average number of characters per word: 5.61 Average number of syllables per word: 1.85 Average number of words per sentence: 16.29 Indication of the number of years of formal education that a person requires in order to easily understand the text on the first reading Gunning Fog index: 13.88 Approximate representation of the U.S. grade level needed to comprehend the text: Coleman Liau index: 15.37 Flesch Kincaid Grade level: 12.60 ARI (Automated Readability Index): 13.11 SMOG: 13.56 Flesch Reading Ease: 33.72 List of sentences that we suggest you consider rewriting to improve readability: The writer can easily find articles about language studies covering studies of pragmatics, sociolinguistics, language acquisition, or psycholinguistics. This library study examines the research methods commonly used by today's researchers in the field of language education. It is also easy to find articles on language education through the search of journals of language teaching research.

Figure 3 Readability score (Online-Utility.org)

**Which index to use?**

There are many indexes, e.g. The Flesch Reading Ease Index, the Flesch-Kincaid Grade Level Score, The Gunning Fog Index, etc. They differ according to the case. Many external factors have to be taken in.

We decided to demonstrate the principle of **The Gunning Fog Index**, see [3]. It was introduced by Robert Gunning in 1952. It is a rough measure of how many years of schooling it would take s.o. to understand the text. The lower the number, the more understandable the content will be to the students (see Figure 4, Table 1).

The algorithm is [2]:

1. Select a passage (such as one or more full paragraphs) of around 100 words. Do not omit any sentences.
2. Determine the average sentence length. (Divide the number of words by the number of sentences.).
3. Count the "complex" words consisting of three or more syllables. Do not include proper nouns, familiar jargon, or compound words. Do not include common suffixes (such as -es, -ed, or -ing) as a syllable.
4. Add the average sentence length and the percentage of complex words; and
5. Multiply the result by 0.4.

$$0.4 \left[ \left( \frac{\text{words}}{\text{sentences}} \right) + 100 \left( \frac{\text{complex words}}{\text{words}} \right) \right]$$

**Figure 4** The Gunning Fog Index

**Table 1** The scale for The Gunning Fog Index

INDEX	LEVEL
20+	Ignoring the reader
17-20	Scientific texts
17	College graduate
16	College senior
15	College junior
14	College sophomore
13	College freshman
12	High school senior
11	High school junior
10	High school sophomore
9	High school freshman
8	Eighth grade
7	Seventh grade
6	Sixth grade



**RESULTS AND DISCUSSION**

In the previous part (MATERIAL AND METHODS), we dealt with readability indexes (scores), using these indexes and scales. Additionally, we described the process of using a readability calculator (an online software tool for analysing the readability of texts). And finally, we introduced one of the most used indexes – The Gunning Fog Index.

To the results of using Online-Utility.org (check again Figures 1-3). For analysing the results, watch Figure 3, (data below is extracted from Figure 3 – see as separated Figures 5, 6, 7, 8). The sample of the text used is in Figure 5.

1. Here we have the basic statistics, which can be used in essential textual analysis. This can be helpful in continual research which is quantitative or translation analysis.

Number of characters (without spaces):	639.00
Number of words:	114.00
Number of sentences:	7.00
Lexical Density:	56.14
Average number of characters per word:	5.61
Average number of syllables per word:	1.85
Average number of words per sentence:	16.29

**Figure 5** The basic textual statistics (Online-Utility.org)

2. Here we have the display of the Gunning Fog Index. The numeral value is 13.88. According to the scale (see Table 1), we can identify the difficulty level of the text. It is approximately 14. It means almost 14 years of education – A college sophomore – and that can be transferred to Slovak conditions as a second-grade of Bachelor’s degree studies. So, teachers preparing educational materials for their seminars at the Bachelor level can be sure that it is suitable for that level.

<i>Indication of the number of years of formal education that a person requires in order to easily understand the text on the first reading</i>	
Gunning Fog index:	13.88

**Figure 6** The Gunning Fog Index - the numeral value (Online-Utility.org)

3. Here we have other indexes used in the analysis. It is good to have a variety of choices. This software application proves its practical benefits – one text used is evaluated via several indexes.

<i>Approximate representation of the U.S. grade level needed to comprehend the text:</i>	
Coleman Liau index:	15.37
Flesch Kincaid Grade level:	12.60
ARI (Automated Readability Index):	13.11
SMOG:	13.56
Flesch Reading Ease:	33.72

**Figure 7** Other indexes - the numeral value (Online-Utility.org)

4. The last positive feature of this application is that it shows proposals for rewriting if anything is problematic.

List of sentences that we suggest you consider rewriting to improve readability:

- The writer can easily find articles about language studies covering studies of pragmatics, sociolinguistics, language acquisition, or psycholinguistics.
- This library study examines the research methods commonly used by today's researchers in the field of language education.
- It is also easy to find articles on language education through the search of journals of language teaching research.

**Figure 8** Proposals for rewriting (Online-Utility.org)

## CONCLUSIONS

Preparing textual materials for the seminars, and analysing textual sources, together with own academic writing, are essentially important for university teachers. There is no doubt that many of us teachers are able to work autonomously. But we also recognise that time is not limitless. If there is any chance to save our precious time, we do it for the sake of our precious time. For we prefer to dedicate every last-standing minute to our students.

Including the readability factor in the analytical process of selection, we can prepare more precisely, effectively, and mainly faster. We are able to improve our academic outputs and be more addressable. And above all, we have the power to influence our students.

Despite possible initial concerns of technological factors included (using PCs, and the Internet), plus statistics involved, we are persuaded that modern academicism must reflect new approaches and methods. Using software analysing academic texts is highly adaptable to whatever academic field or discipline, not only linguistics.

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