

Examining the Readability of Research Abstracts to Determine Whether the General Public Can Understand Key Findings in Science

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ABSTRACT

The public must understand science to make informed decisions. However, the complex nature of primary literature may be challenging for lay readers to comprehend. The National Institutes of Health requires lay abstracts for grant submissions, but lay abstracts are not the norm for research publications. This exploratory study will examine the readability of undergraduate research that received the 2014 UCLA Dean's Prize as a group and by discipline.

This study will also compare the prize-winning primary student literature to version later published by the student's faculty mentor. Each category of research papers was assessed through computer programs and formulas (the Flesch Readability Index and the Gunning Fog Index) for their readability score to generate an average for each group of papers. We will use abstracts for our comparisons.

The goal is to determine whether the primary literature findings are presented in a manner that the general public can easily understand. Essentially, the research papers must have a low score on each readability index to properly distribute the main messages and key findings to the general public.

BACKGROUND

- According to a previous study by Weeks and Wallace, medical articles published in the 21st century have been found to be extremely difficult to read. Listed below are the scales used in this project to determine the readability of various research abstracts.

Gunning-Fog Index	Reading level by grade
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

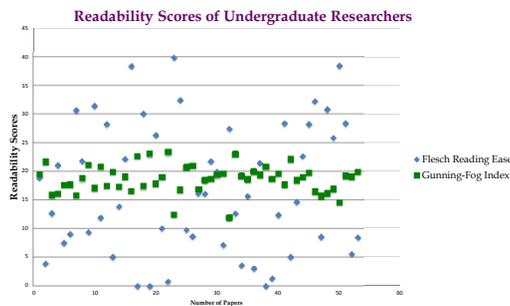
Flesch-Kincaid Readability Score	School Level	Notes
90.0-100.0	5 th Grade	Very easy to read.
80.0-90.0	6 th Grade	Easy to read.
70.0-80.0	7 th Grade	Fairly easy to read.
60.0-70.0	8 th and 9 th Grade	Plain English.
50.0-60.0	10 th to 12 th grade	Fairly difficult to read.
30.0-50.0	College	Difficult to read.
0.0-30.0	College Graduate	Very difficult to read.

HYPOTHESIS

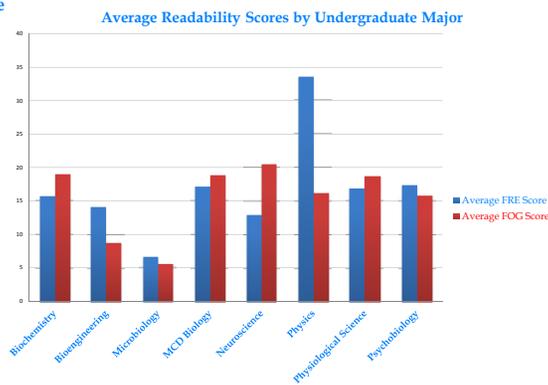
This current investigation seeks to understand if there is a difference between the average readability scores between the students' abstracts that won the 2014 Dean's Prize compared to the work of their faculty mentors published at a later date. We will also be looking at the general readability of the students' abstracts that won the 2014 Dean's Prize as a group and by major to see if there is a difference in readability by discipline.

We hypothesized that the faculty mentors' abstracts would be more difficult to read than those of the students because they have a higher level of education, therefore we believed the faculty mentors would communicate at a higher level.

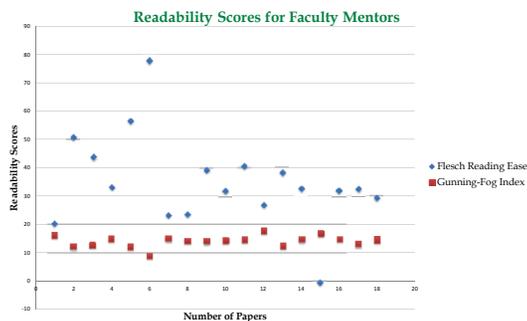
We ran each abstract through a readability score program to collect data on the readability of each type of abstract. We then organized this data into groups to draw conclusions based on the trends.



The Gunning-Fog scores tended to cluster around 19, while the Flesch Reading Ease scores were more variable.



Based on the graph, the physics papers were the most readable according to the FRE score, and microbiology was the most readable according to the FOG score.



The faculty papers tended to have higher Flesch-Reading Ease scores and lower Gunning-Fog scores, suggesting that they are more readable than student papers.

CONCLUSIONS

- The average readability scores for the students' abstracts were lower than the average readability scores for faculty mentors' published work
- The readability scores by major showed that the microbiology students' abstracts were the most difficult to read, while physics students' abstracts were the easiest to read.
- As a group, all of the reading scores for the students' abstracts exceeded college levels of understanding.
- The faculty papers had more readable abstracts, we believe, because some influential journals (*Science* and *Nature*) have a set of guidelines that the author is required to follow in order to make their work easier to read. Also, their abstract will go through a set of editors when submitted to these journals, thus making it more readable.

Results for Student Papers	Flesch Reading Ease	Flesch-Kincaid Grade Level	Gunning-Fog Index
Mean	17.0132	16.44906	18.64509
Standard Deviation	11.33697	1.801028	2.410986
Variance	126.1019	3.24370	5.703176

Results for Faculty Papers	Flesch Reading Ease	Flesch-Kincaid Grade Level	Gunning-Fog Index
Mean	35.0722	10.5556	14.07222
Standard Deviation	16.40935	2.32587	1.991099
Variance	254.3076	5.109136	3.744228

Based on these results, there is no statistical difference between the faculty papers and the student papers on the Flesch Reading Ease and the Gunning Fog scores; however, there was a difference in the grade level.

FUTURE DIRECTIONS

- In this study, we focused on the hard sciences such as physics, microbiology, biochemistry, and others. In the future, it would be interesting to examine abstracts within the humanities or social sciences fields to determine whether results match.
- These results may influence scientists and researchers to write more plainly, so that the public and people beyond these scientific fields can understand the results.

Limitations

- This is an exploratory study. In the future, it would be ideal to look at more papers to see if there is a significant difference in the readability of the students' versus their faculty members' paper.
- Although we were limited by the number of papers in the study, we did notice a trend showing that the faculty papers were written at a high school level rather than a post-graduate level of understanding.
- The numbers of papers within disciplines ranged from 2 in Physics to 13 papers for Molecular, Cell, and Developmental Biology. Therefore, a larger analysis with more papers in each field would be ideal to draw conclusions.

REFERENCES AND ACKNOWLEDGEMENTS

Reference:

Weeks WB, Wallace AE., "Readability of British and American Medical Prose at the Start of the 21st Century." *BMJ* 325.7378 (2002): 1451-452. Web.

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*These students contributed equally to this project