

The Readability of Published, Accepted, and Rejected Papers Appearing in *College & Research Libraries*

Cheryl Metoyer-Duran

This study examined the readability of papers that College & Research Libraries accepted, rejected, and published for 1990 and 1991. In addition to showing a statistically significant difference for the text of papers, but not for the abstracts, this investigation reports topics for further investigation and presents a procedure for others to follow in replicating the study.



Individuals conducting action research and evaluation studies, and wanting library managers to use the findings of these studies to produce change within the organization, must fit "information presentation formats to decision-making."¹ Clearly, researchers and scholars must know the audience with whom they intend to communicate. A research paper that is difficult to read and comprehend is not likely to be read (and presumably published). Readability offers insights into communication in that it addresses whether an audience will "understand" a paper, read it "at optimum speed," and "find it interesting."² Readability, therefore, is one indication of the effectiveness of a piece of writing in conveying the author's intended message to the audience.³

READABILITY FORMULAE

As Marie J. Abram observes,

The style of writing (or how the content of the writing is stated) can be measured in such a way that a numerical value can be assigned to each writ-

ing style. This qualification of style is an entirely separate dimension from the content of the writing. The numerical value that results from the measurement of style quantifies the ease or difficulty of the writing. With most formulas this numerical value has been translated into an educational skill level associated with the material (i.e., . . . ninth grade level . . .).⁴ Abram further observes that "many readability formulas exist."⁵

Three of the better-known formulae, all of which are available on Grammatik (Reference Software International, San Francisco), include the Flesch Reading Ease, Gunning's Fog Index, and the Flesch-Kincaid Grade Level. Each considers the average number of words per sentence and the average number of syllables per word.⁶

Both the Gunning's Fog Index and the Flesch-Kincaid Grade Level formula measure level of education necessary to understand a source, or paper. The level of difficulty of a source increases as the grade level advances. Because scholarly literature requires a higher level of understanding and attracts a specialized

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audience, a higher readability score may be acceptable up to a certain threshold. The Flesch Reading Ease score falls along a scale ranging from 0 to 100, with lower scores suggesting a more difficult to read source(s).⁷

In interpreting the Flesch-Kincaid Grade Level and Gunning's Fog Index, a researcher can equate increased readability with a lower grade level. However, application of the Flesch Reading Ease measure equates a higher level of readability with a higher (i.e., less difficult) score.

THE STUDY

The articles and features appearing in *College & Research Libraries* presumably require a higher level of education to understand than articles and features appearing in less scholarly and less research-oriented journals. Two questions are: "On an average, what are the levels of readability for the articles and features contained in specific scholarly and research journals?"; and "Has readability changed over time?" These questions, together with matters of journal content and policy, are most appropriate for an editor, editorial board, and publisher to address, especially in these times of information source proliferation and fiscal stringencies. Formal and informal readership surveys ensure that journals understand subscriber and reader preferences and learn about these individuals and organizations. Clearly, readability is an important variable to investigate and address, especially if editorial staff and authors rewrite papers to accommodate a specified level of readability.

The readability of scholarly or refereed journals might be examined from another perspective. Is there a difference in readability between accepted and rejected manuscripts? Because the editorial staff of *College & Research Libraries* copyedit all accepted manuscripts, two directional hypotheses might be ventured:

- The text of published papers is more readable than that of either accepted or rejected papers, and the text of accepted papers is more readable than that of rejected papers; and

- The abstracts of published papers are more readable than those of either accepted or rejected papers, and the abstracts of accepted papers are more readable than those of rejected papers.

A basic assumption in this study is that most, if not all, of the papers reflect at least a college level education. However, there is a point at which a higher level of difficulty suggests less readability. In effect, there are different shades of difficulty, ranging from most difficult to read (rejected papers) to less difficult (accepted but uncopyedited papers) and least difficult to read (published papers). The Flesch-Kincaid and the Gunning's Fog Index will indicate differences in grade levels among the three categories of papers—accepted, rejected, and published. At the same time, the Flesch reading ease score will show differences in the level of reading difficulty.

RESEARCH DESIGN

The editor of *College & Research Libraries* supplied the investigator with copies of all manuscripts accepted and rejected during 1990 and 1991, excluding the names of the authors and associated editorial correspondence. During these two years, 82 refereed papers appeared in print, 70 papers were accepted but not yet published, and 119 were rejected.

Given the hypotheses and the large size of a sample necessary to achieve a precision of + 5, with 95 percent confidence, the investigator examined all 271 papers and did not draw a sample. The research design necessary to investigate the study's hypotheses required analysis of each abstract and a random paragraph sampling, including the first and final paragraph of each paper. The investigator numbered the unique paragraphs in each paper and, after counting the number of paragraphs, consulted the Appendix to select the actual paragraphs for word processing and statistical analysis.⁸ (The Appendix has been reprinted in part to aid other researchers who intend to do readability studies but who do not want to develop their own schema.)

Some 9 accepted and 26 rejected papers did not contain abstracts. An ex-

TABLE 1
GRADE LEVEL OF THE TEXT AND ABSTRACTS

	Flesch-Kincaid		Gunning's Fog Index	
	Mean	Median	Mean	Median
<i>Five-paragraph text</i>				
a. Rejected papers	14.34	14	18.48	19
b. Accepted papers	15.27	15	19.41	19
c. Published papers	15.16	15	19.21	19
<i>Abstracts</i>				
a. Rejected papers	16.69	16	21.36	21
b. Accepted papers	16.38	16	21.08	21
c. Published papers	16.49	17	21.07	21

perienced word processor input the abstracts and text of the five paragraphs for each published, accepted, and rejected paper, exactly as presented in the submitted or published paper, including spelling, punctuation, and grammatical errors. The investigator verified the accuracy of data entry, ran the Grammatik software on each word-processed abstract and five-paragraph file, and computed the scores for the Flesch-Kincaid Grade Level, Gunning's Fog Index, and Flesch Reading Ease.⁹ Next, the scores were entered into StatPac Gold (Walonick Associates, Inc., Minneapolis), a statistical analysis software package, and statistical analyses were performed to examine the hypothesis.

LIMITATIONS

The study does not examine the reviewing process, the comments of referees, and the decision rendered by the editor. An unaddressed question is "To what extent does readability affect the decision to accept a paper for publication?" Papers reviewed prior to 1990 were not examined, nor were papers submitted in 1991 for which an editorial decision was not rendered that year.

Abram cautions that sentence length and word factors "do not cause reading ease/difficulty. Rather they are highly correlated with reading ease/difficulty. As such these variables can be used as indicators of changes that would reduce reading difficulty."¹⁰ Highly readable

writing may at times be boring to read because simple sentences may not fully convey the complexities of ideas expressed in scholarly writing.¹¹

FINDINGS

Table 1 depicts the grade level for both the five paragraphs from the papers and the abstracts. Although every indicator suggests a readability level of at least college, the Gunning's Fog Index produces higher scores than does the Flesch-Kincaid Grade Level. Both measures do not consider the same number of syllables per word (see note 6).

Readability . . . is one indication of the effectiveness of a piece of writing in conveying the author's intended message to the audience.

It appears that the first hypothesis concerning readability of papers is not supported since the scores for published and accepted papers are higher than those of rejected texts. Without applying the higher-ordered statistical tests used in the next section of this paper, the second hypothesis regarding the abstracts appears to be partially supported, as rejected abstracts score higher than published or accepted abstracts. The table further indicates that abstracts require a higher level of readability than do the extracts from the text.

TABLE 2
FLESCH READING EASE SCORES

	Mean	Median	Low to High Score
<i>Five-paragraph text</i>			
a. Rejected papers	30.77	31	9 to 53
b. Accepted papers	28.04	28	7 to 45
c. Published papers	27.56	29	1 to 46
<i>Abstracts</i>			
a. Rejected papers	18.43	18	0 to 47
b. Accepted papers	17.85	16	0 to 44
c. Published papers	17.93	17	0 to 50

TABLE 3
MATRIX DEPICTING CORRELATIONS AND T-STATISTICS

	Flesch Reading Ease		Gunning's Fog Index		Flesch-Kincaid Grade Level	
	Correlation	<i>t</i> -statistics	Correlation	<i>t</i> -statistics	Correlation	<i>t</i> -statistics
<i>Five-paragraph text:</i> *						
a. Accepted/ rejected papers	.141	40.714	-.195	84.788	-.216	69.136
b. Accepted/ published papers	-.027	32.842	-.048	66.402	-.064	51.774
c. Rejected/ published papers	-.164	36.877	.159	91.711	.169	74.426

*The following Pearson's Product-Moment Correlations and *t*-statistics are all significant ($p < .05$).

In table 2, the section on "low to high score" confirms that both the text and abstracts are "difficult" to "very difficult" to read. However, beyond this simple statement, tables 1 and 2 are not comparable. The measures of grade level do not coincide with the categories represented in the Flesch Reading Ease. The latter measure does not differentiate among precise years of college education. The data in table 2 do not appear to support either hypothesis.

Hypothesis Testing

Perusal of table 1 might suggest that the text of rejected papers has an appreciably lower reading level than does the text of accepted and published papers. Using analysis of variance (ANOVA) and the *t*-test, the investigator more closely examined the hypotheses concerning the text and abstracts of rejected, accepted, and published papers. The

ANOVA for the five-paragraph text indicated statistical significance according to the Flesch Reading Ease ($F = 3.4932, p < .05$), Gunning's Fog Index ($F = 4.7315, p < .05$), and Flesch-Kincaid Grade Level formula ($F = 5.7098, p < .05$). However, no statistical significance emerged for abstracts (Flesch Reading Ease, $F = .0539, p > .05$; Gunning's Fog Index, $F = .1772, p > .05$; and Flesch-Kincaid, $F = .1962, p > .05$).

The *t*-test indicates that regardless of the readability measure there is a statistically significant difference among the sample of five-paragraph texts for the three groups depicted in table 3. Although the texts of articles reflect a scholarly level of readability, there are significant differences. Because rejected papers are the most readable using the three measures, the first hypothesis is not supported.

In the case of the abstracts, the ANOVA, as already discussed, did not

disclose statistically significant differences for any readability measure. The *t*-test, as well, did not identify significant differences. Therefore, the second hypothesis is not supported. Abstracts for rejected, accepted, and published papers are all difficult to read. Tables 1 and 2 support this finding.

TOPICS MERITING INVESTIGATION

The readability of texts and abstracts merits further examination. An interesting question is: Why were rejected papers the most readable? Presumably, the copyediting of accepted papers results in a more readable published paper. However, further analysis of this question is needed. It is important to understand the readability of abstracts, as well as their content and form.¹² If one function of an abstract is to entice readership of a paper, the level of difficulty might be decreased.

This study might be duplicated using submitted and published papers for more than a two-year span. Both hypotheses might be tested using other journals, scholarly and perhaps popular as well. Instead of limiting data collection and analysis to a quantifiable technique, researchers might explore focus group interviews and other methods of qualitative data collection to obtain a complementary understanding of readability and subscriber preferences.

CONCLUSION

As journals strive to better address the interests and needs of their readership and to expand the number of readers and subscribers, readability becomes an important variable. As the reading level of the general public and perhaps some specialized publics declines, and as librarians and others become busier and read a smaller percentage of their professional literature, readability might be

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linked with "browse-ability" and, therefore, scholarly journals should strive for an easier level of reading difficulty and changes in presentation format. With increased interest in electronic publishing, two important questions become: "What is the readability of electronic journals?" and "Is there a difference in readability between electronic and nonelectronic journals?" More papers and scholarly journals, regardless of the medium in which they appear, might aim for the "fairly difficult" or "difficult" as opposed to the "very difficult" level on the Flesch Reading Ease (see note 7).¹³

REFERENCES AND NOTES

1. C. R. Bybee, "Fitting Information Presentation Formats to Decision-Making," *Communication Research* 8 (July 1981): 343-70.
2. Edgar Dale and Jeanne Chall, "The Concept of Readability," *Elementary English* 26 (Jan. 1949): 23.
3. Chaffai Tekfi, "Readability Formulas: An Overview," *Journal of Documentation* 43 (Sept. 1987): 262.
4. Marie J. Abram, "Readability: Its Use in Adult Education," *Lifelong Learning: The Adult Years* 4 (Jan. 1981): 8.
5. *Ibid.*
6. The Flesch Reading Ease formula considers the average number of words per sentence and the number of syllables per 100 words. Gunning's Fog Index includes the average number of words per sentence and the number of words of three or more syllables. The Flesch-Kincaid Grade Level formula examines the average number of words per sentence and the average number of syllables per word.

7. The scoring categories for the Flesch Reading Ease are as follows:

Score	Reading Difficulty	Grade Level
90-100	Very easy	4th grade
80-90	Easy	5th grade
70-80	Fairly easy	6th grade
60-70	Standard	7th-8th grade
50-60	Fairly difficult	Some high school
30-50	Difficult	High school and college
0-30	Very difficult	Minimum of college

8. The instructions for sampling paragraphs were as follows:

- a. Mark paragraphs in the article which cannot be measured due to special characters or whatever.
 - b. Number the remaining paragraphs from one to n .
 - c. Using n as the total number of paragraphs in a paper, turn to the Appendix and find that number. Then, select those five paragraphs for word processing. For papers having five or fewer paragraphs, take all the paragraphs.
 - d. Assign each paper a unique ID number and indicate whether the paper has been accepted, published, or rejected.
9. For reliability purposes, readability scores were computed using RightWriter (Que Software, Carmel, Ind.), a software package similar to Grammatik, and compared to the scores generated using Grammatik. There were no differences in the scores.
10. Abram, "Readability," p.9.
11. Robert Calfee and Priscilla Drum, "Research on Teaching Reading," in *Handbook of Research on Teaching*, ed. Merlin C. Wittrock (New York: Macmillan, 1986), 804-49.
12. See Tibor Koltay, "The Structure of Medical Papers and Their Author-Abstracts," *Health Information and Libraries* 1(1990): 55-60; Milica Milas-Bracovic and Jasenka Zajec, "Author Abstracts of Research Articles Published in Scholarly Journals in Croatia (Yugoslavia): An Evaluation," *Libri* 39 (Dec. 1989): 303-18; Timothy C. Craven, "Sentence Dependency Structures in Abstracts," *Library & Information Science Research* 10 (Oct./Dec. 1988): 401-10; Elizabeth Liddy, Susan Bonzi, and Jeffrey Katzer, "A Study of Discourse Anaphora in Scientific Journals," *Journal of the American Society for Information Science* 38 (July 1987): 255-61; and Elizabeth Liddy, "The Discourse-Level Structure of Empirical Abstracts: An Exploratory Study," *Information Processing & Management* 27(1991): 55-81.
13. It is interesting to note that this paper scored the following on the three readability measures:

	Five-Paragraph Text	Abstract
Flesch Reading Ease:	24	5
Gunning's Fog Index:	19	23
Flesch-Kincaid Grade Level:	16	20

APPENDIX
SELECTION OF FIVE PARAGRAPHS FROM A PAPER

No. of Paragraphs	First	Second	Third	Fourth	Fifth
6	1	2	3	5	6
7	1	2	4	5	7
8	1	2	4	6	8
9	1	2	5	7	9
10	1	3	5	8	10
11	1	3	6	8	11
12	1	3	6	9	12
13	1	3	7	10	13
14	1	4	7	11	14
15	1	4	8	11	15
16	1	4	8	12	16
17	1	4	9	13	17
18	1	5	9	14	18
19	1	5	10	14	19
20	1	5	10	15	20
21	1	5	11	16	21
22	1	6	11	17	22
23	1	6	12	17	23
24	1	6	12	18	24
25	1	6	13	19	25
26	1	7	13	20	26
27	1	7	14	20	27
28	1	7	14	21	28
29	1	7	15	22	29
30	1	8	15	23	30
31	1	8	16	23	31
32	1	8	16	24	32
33	1	8	17	25	33
34	1	9	17	26	34
35	1	9	18	26	35
36	1	9	18	27	36
37	1	9	19	28	37
38	1	10	19	29	38
39	1	10	20	29	39
40	1	10	20	30	40
41	1	10	21	31	41
42	1	11	21	32	42
43	1	11	22	32	43
44	1	11	22	33	44
45	1	11	23	34	45
46	1	12	23	35	46
47	1	12	24	35	47
48	1	12	24	36	48
49	1	12	25	37	49
50	1	13	25	38	50
51	1	13	26	38	51
52	1	13	26	39	52
53	1	13	27	40	53

(continued)

APPENDIX (continued)

No. of Paragraphs	First	Second	Third	Fourth	Fifth
54	1	14	27	41	54
55	1	14	28	41	55
56	1	14	28	42	56
57	1	14	29	43	57
58	1	15	29	44	58
59	1	15	30	44	59
60	1	15	30	45	60
61	1	15	31	46	61
62	1	16	31	47	62
63	1	16	32	47	63
64	1	16	32	48	64
65	1	16	33	49	65
66	1	17	33	50	66
67	1	17	34	50	67
68	1	17	34	51	68
69	1	17	35	52	69
70	1	18	35	53	70
71	1	18	36	53	71
72	1	18	36	54	72
73	1	18	37	55	73
74	1	19	37	56	74
75	1	19	38	56	75
76	1	19	38	57	76
77	1	19	39	58	77
78	1	20	39	59	78
79	1	20	40	59	79
80	1	20	40	60	80
81	1	20	41	61	81
82	1	21	41	62	82
83	1	21	42	62	83
84	1	21	42	63	84
85	1	21	43	64	85
86	1	22	43	65	86
87	1	22	44	65	87
88	1	22	44	66	88
89	1	22	45	67	89
90	1	23	45	68	90
91	1	23	46	68	91
92	1	23	46	69	92
93	1	23	47	70	93
94	1	24	47	71	94
95	1	24	48	71	95
96	1	24	48	72	96
97	1	24	49	73	97
98	1	25	49	74	98
99	1	25	50	74	99
100	1	25	50	75	100
101	1	25	51	76	101
102	1	26	51	77	102
103	1	26	52	77	103
104	1	26	52	78	104
105	1	26	53	79	105
106	1	27	53	80	106
107	1	27	54	80	107

No. of Paragraphs	First	Second	Third	Fourth	Fifth
108	1	27	54	81	108
109	1	27	55	82	109
110	1	28	55	83	110
111	1	28	56	83	111
112	1	28	56	84	112
113	1	28	57	85	113
114	1	29	57	86	114
115	1	29	58	86	115
116	1	29	58	87	116
117	1	29	59	88	117
118	1	30	59	89	118
119	1	30	60	89	119
120	1	30	60	90	120
121	1	30	61	91	121
122	1	31	61	92	122
123	1	31	62	92	123
124	1	31	62	93	124
125	1	31	63	94	125
126	1	32	63	95	126
127	1	32	64	95	127
128	1	32	64	96	128
129	1	32	65	97	129
130	1	33	65	98	130
131	1	33	66	98	131
132	1	33	66	99	132
133	1	33	67	100	133
134	1	34	67	101	134
135	1	34	68	101	135
136	1	34	68	102	136
137	1	34	69	103	137
138	1	35	69	104	138
139	1	35	70	104	139
140	1	35	70	105	140
141	1	35	71	106	141
142	1	36	71	107	142
143	1	36	72	107	143
144	1	36	72	108	144
145	1	36	73	109	145
146	1	37	73	110	146
147	1	37	74	110	147
148	1	37	74	111	148
149	1	37	75	112	149
150	1	38	75	113	150
151	1	38	76	113	151
152	1	38	76	114	152
153	1	38	77	115	153
154	1	39	77	116	154
155	1	39	78	116	155
156	1	39	78	117	156
157	1	39	79	118	157
158	1	40	79	119	158
159	1	40	80	119	159
160	1	40	80	120	160
161	1	40	81	121	161

(continued)

APPENDIX (continued)

No. of Paragraphs	First	Second	Third	Fourth	Fifth
162	1	41	81	122	162
163	1	41	82	122	163
164	1	41	82	123	164
165	1	41	83	124	165
166	1	42	83	125	166
167	1	42	84	125	167
168	1	42	84	126	168
169	1	42	85	127	169
170	1	43	85	128	170
171	1	43	86	128	171
172	1	43	86	129	172
173	1	43	87	130	173
174	1	44	87	131	174
175	1	44	88	131	175
176	1	44	88	132	176
177	1	44	89	133	177
178	1	45	89	134	178
179	1	45	90	134	179
180	1	45	90	135	180
181	1	45	91	136	181
182	1	46	91	137	182
183	1	46	92	137	183
184	1	46	92	138	184
185	1	46	93	139	185
186	1	47	93	140	186
187	1	47	94	140	187
188	1	47	94	141	188
189	1	47	95	142	189
190	1	48	95	143	190
191	1	48	96	143	191
192	1	48	96	144	192
193	1	48	97	145	193
194	1	49	97	146	194
195	1	49	98	146	195
196	1	49	98	147	196
197	1	49	99	148	197
198	1	50	99	149	198
199	1	50	100	149	199
200	1	50	100	150	200

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