

What Is Technical Writing Style Today?

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What are your guiding principles regarding style when you edit a research manuscript? If you have received journalism or English training, then you probably lean toward a style of writing consisting of personal pronouns, active verbs, direct phrasing...the old principles of accuracy, brevity and clarity. However, in many scientific journals you might find a passage such as this:

"As mentioned earlier, a major concern of these authors is whether the statistically significant differences ($P \leq 0.05$) in nutrient composition on a fresh basis are of sufficient magnitude to have a significant effect on the nutrient intake of consumers."

Such passages are "accepted" by journals, but does the scientific community really want and prefer them? We suspected that, given a choice, scientists would prefer to read a style of writing that is simpler and more direct than what they find in scientific journals.

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The authors acknowledge the help of Dr. John Kirkman, Institute of Science and Technology, University of Wales (Cardiff), for his Brown-Smith questionnaire; Dr. John Aleong, Vermont station statistician; Charles Bigalow, coordinator of computer services; and the 11 station coordinators in the Northeast.

Also, we suspected that factors other than readability might influence which style of writing scientists might actually use.

So we decided to test these two hypotheses.

Dr. John Kirkman of the Institute of Science and Technology, University of Wales, (Cardiff), is noted for his research on technical writing style. He permitted us to use one of his questionnaires in the Northeast. This questionnaire consisted of two passages written about the same subject matter but in considerably different styles. Respondents were asked to answer questions about the passages and about the authors.

AUDIENCES

In selecting the audiences for the study, we focused on editorial tasks here in Vermont. We must "review" every journal manuscript produced as a result of station research before it is sent to a journal. We make sure, at least, that the station is given credit for the research and that the manuscript fits the journal's format. Usually, though, we must also carefully edit the manuscript for style, grammar, and logical presentation. Some authors claim that we do not understand what style of writing journal editors demand today. Because of our nontechnical backgrounds, we probably look at writing differently than do station scientists who are technically trained. But what about journal editors? Do they identify more with professional communicators or with scientists?

So here was a natural set of audiences: Station scientists in the Northeast, station editors in the Northeast, and selected journal editors in North America (some to represent the various disciplines in Northeast experiment stations).

We asked the directors and editorial staffs of experiment stations in the Northeast to participate in the study. Eleven stations joined Vermont in this research: Connecticut (Storrs), Delaware, Maine, Maryland, Massachusetts, New Jersey, New York (Geneva), New York (Ithaca), Pennsylvania, Rhode Island, and West Virginia.

PROCEDURE

We developed three separate sets of questionnaires, one for each audience. Part One of the questionnaire asked specific "biographic" questions of each audience. Part Two was the original Kirkman questionnaire with the two journal passages and accompanying questions. To offset any bias that order of presentation might present, we had half of the questionnaires printed with one journal passage first and the rest with the other passage first.

Survey coordinators at each station determined their total number of scientists and editors (if they had any) who should receive the questionnaires. Then in January 1978, each coordinator distributed

the questionnaires (half with one passage first; half with the other first) to the participants in his or her station. Two weeks later, the coordinators were supposed to send a second, followup letter and questionnaire to pick up those people who had not yet responded.

The coordinators collected the questionnaires, maintaining the anonymity of the respondents, and returned them to us. In addition to surveying our staff here in Vermont, we handled the querying (initial and followup) of journal editors, who returned their completed questionnaires to us in our self-addressed stamped envelopes.

THE QUESTIONNAIRE

PART ONE

In an earlier study, Kirkman (1971) asked the respondents certain biographic questions such as age and job function and then checked to see if these factors influenced the responses. He found that engineers in Great Britain preferred by at least three to one a style of writing that consists of short sentences, active verbs and personal pronouns. He also discovered that managers, administrators and senior engineers (those, he pointed out, who must read the writing of their subordinates) preferred this simpler style of writing by a five to one margin.

Following his lead, we developed our own set of biographic questions to help us interpret the data. We wanted to know the educational background of the respondents, what prepared them to become authors or editors, and how they saw their journal or communications activities.

For example, we asked station scientists how many articles they had had published in refereed journals between January 1, 1975, and December 31, 1977; how they rated themselves as technical writers; and what factors influenced their technical writing style. We asked station editors whether they had been trained as communicators or scientists; whether they review scientists' journal manuscripts before they are sent to the journals; and whether their station scientists are required to have published a certain number of manuscripts each year. And we asked journal editors what best prepared them to become editors; what is the quality of the manuscripts they receive; and whether this quality reflects more on the author or on the author's institution.

PART TWO

We left this part of the questionnaire, which contained the sample passages, essentially unchanged because we respected Dr. Kirkman's expertise in technical writing surveys. However, we did change the phrasing of the responses to simplify our keypunching

task.

Here are the two passages supposedly from the middle of similar articles on the hormonal basis of aggression in animals. One passage was said to have been written by Mr. Brown and the second by Mr. Smith.

BROWN'S VERSION

In the first experiment of the series using mice it was discovered that total removal of the adrenal glands effects reduction of aggressiveness and that aggressiveness in adrenalectomised mice is restorable to the level of intact mice by treatment with corticosterone. These results point to the indispensability of the adrenals for the full expression of aggression. Nevertheless, since adrenalectomy is followed by an increase in the release of adrenocorticotrophic hormone (ACTH), and since ACTH has been reported (P. Brain, 1972) to decrease the aggressiveness of intact mice, it is possible that the effects of adrenalectomy on aggressiveness are a function of the concurrent increased levels of ACTH. However, high levels of ACTH, in addition to causing increases in glucocorticoids (which possibly accounts for the depression of aggression in intact mice by ACTH), also result in decreased androgen levels. In view of the fact that animals with low androgen levels are characterised by decreased aggressiveness the possibility exists that adrenalectomy, rather than affecting aggression directly, has the effect of reducing aggressiveness by producing an ACTH-mediated condition of decreased androgen levels.

SMITH'S VERSION

The first experiment in our series with mice showed that total removal of the adrenal glands reduces aggressiveness. Moreover, when treated with corticosterone, mice that had their adrenals taken out become as aggressive as intact animals again. These findings suggest that the adrenals are necessary for animals to show full aggressiveness.

But removal of the adrenals raises the levels of adrenocorticotrophic hormone (ACTH), and P. Brain (2) found that ACTH lowers the aggressiveness of intact mice. Thus the reduction of aggressiveness after this operation might be due to the higher levels of ACTH which accompany it.

However, high levels of ACTH have two effects. First, the levels of glucocorticoids rises, which might account for P. Brain's results. Second, the levels of androgen fall. Since animals with low levels of androgen are less aggressive, it is possible that removal of the adrenals reduces aggressive-

ness only indirectly: by raising the levels of ACTH it causes androgen levels to drop.

Although you might object to parts of both passages, they do represent different approaches to technical writing (see Table 1).

Table 1. Differences in phrasing and sentence length between the Brown and Smith passages.

Item	Brown	Smith
Average sentence length (words)	36	17
No. of paragraphs	1	3
No. of active-verb phrases	3	12
No. of passive-verb phrases	9	4
No. of prepositions	37	21

Style, or the way that one writes, definitely affects how readable a passage is. Sentence length, one element of style, generally indicates readability (Klare, 1975). The Brown passage, with an average sentence length of 36 words, is categorized as very difficult reading (Perrin and Smith, 1955; Flesch, 1946; Rathmore, 1972; Council of Biology Editors, 1972). In contrast, the Smith passage, with an average sentence length of 17 words, is of standard difficulty, suitable for a high-school-trained audience. The Smith passage approaches the standard (average sentence length in the low 20's) set by professional writers (Perrin and Smith; Houp and Pearsall, 1977).

After reading the two passages, respondents were asked which version they preferred and which is more appropriate for technical writing. They also were asked their impressions of the authors, such as which author appears more competent as a scientist and which one inspires more confidence. Finally, the respondents answered questions about the author-reader relationship, such as which version is more difficult to read and which author appears to have more consideration for his readers.

In the next section, we will discuss the responses to Part Two of the questionnaire (the Brown-Smith passages), followed by information gathered from Part One. For more detailed information, see Wales and Ashman (at press).

RESULTS AND DISCUSSION

RESPONSES

Of the 1,738 people who received the questionnaire, 1,168 (or 67 percent) responded. This represented about 86 percent of the journal editors (59 of 69), 83 percent of the station editors (20 of 24), and 66 percent of the station scientists, (1,089 of 1,645). Scientists'

responses from the various stations ranged from 41 percent from New York (Ithaca) to 92 percent from Massachusetts.

We found that 67 percent of the total group preferred the Smith version, 28 percent preferred the Brown version, and 5 percent found no discernible difference between the two passages. Station editors preferred the simpler, more direct Smith version by the largest margin, followed by journal editors and station scientists. Almost all of the questions followed this preference pattern.

Similarly, all three groups responded that the Smith passage is easier and more interesting to read and that it explains things better. They also felt that Smith has a more dynamic personality, is more stimulating, has a better-organized mind, communicates his thoughts more successfully, and has more consideration for his readers.

Regarding the style of writing they thought more appropriate for scientific writing, the respondents, by a 55 to 32 percent margin, chose the simpler, more direct style used by author Smith. Note that we did not ask the respondents which style they thought is better for articles in their own discipline or, conversely, for articles that they might read in some other discipline.

However, despite their favorable impressions of the Smith style and author Smith, the respondents thought Brown is the more competent scientist (33 to 26 percent; the rest found no discernible difference). This was the only time that author Brown or the Brown passage received a higher rating than author Smith or the Smith passage. Apparently some of the respondents associate scientific competency with the long sentences and passive phrasing of the Brown passage, even though they may prefer Smith's style of writing.

ORDER OF PRESENTATION

The order of the passages significantly influenced (P less than .01) the responses. Of the 310 scientists who preferred the Brown style of writing, 90 percent had read the Smith passage first (Table 2). We cannot be certain of the reason for this relationship. However, we

Table 2. Order of passage and preference of style by station scientists.

Style preference	Read Brown	Read Smith	Total
	first	first	
Preferred Brown	41	269	310
Preferred Smith	418	300	718

surmise that when respondents read the more simply phrased version first, they had less difficulty understanding (and thus looked more favorably upon) the more complex version because it is what they are used to seeing in journals.

STATION SCIENTISTS

We found that a person's rank did not appear to affect his or her choice of Smith or Brown. This contradicts Kirkman's findings (1) that senior staff prefer a simpler, more direct style of writing to a greater degree than do the rest of the staff.

About 44 percent of the scientists had published fewer than one article per year in a referred journal between January 1, 1975, and December 31, 1977. Only about one in ten had published more than one article, on the average, in such journals during this time.

Table 3 lists how influential certain items have been on the scientists' technical writing style. Nearly 83 percent stated that

Table 3. What most influenced the writing style of station scientists.

Item	% rating as "very influential" or "influential"
Looking at scientific journals	82.6
Taking English composition	67.6
Interacting with thesis adviser	61.0
Doing what seems right	52.6
Taking science classes	42.8
Working with a technical editor	34.7
Taking technical writing course	24.1
Other (includes peer review)	12.8

what they learned from looking at scientific journals was "very influential" or "influential." considering that most journals contain articles written in the Brown style, it is curious that only a third of the scientists said the Brown style was more appropriate than the Smith style for technical writing. The influence of technical editors is not very great. This may be because some stations do not have station editors, and of those that do, in only two cases do the editors look at journal manuscripts.

STATE EDITORS

Of the 20 station editors who responded, 12 majored in journalism or English. None reported that scientists at their station were required to have published a certain number of manuscripts each

year. However, two editors indicated that promotion depends heavily on the number and quality of scientific papers published.

JOURNAL EDITORS

Of the 59 journal editors who responded, the majority (56 percent), unlike station editors, were trained as scientists or engineers. Similarly, 56 percent consider themselves to be primarily scientists. This perhaps explains why journal editor's responses more closely resemble those of station scientists than of station editors.

What journal editors felt best prepared them for editing was not training in writing or editing but knowledge of the subject matter.

More than 60 percent of the journal editors responded the quality of the manuscript reflects more on the researcher than on the institution; 27 percent felt it reflects on both equally.

We asked station scientists to rate their ability as writers on a scale from excellent to poor. Likewise, we asked journal editors to rate on the same scale the general level of the manuscripts they receive (see Table 4). While only 29 percent of the journal editors felt that the quality of the manuscripts they receive are "excellent" or "above

Table 4. Quality of manuscripts by journals versus station scientists' self-evaluation of writing ability.*

Journal editors rate quality of manuscripts received		Station scientists rate their ability as writers
14%	Excellent	9%
15	Above average	58
32	Average	27
29	Below Average	4
2	Poor	0.5

*Some respondents did not answer this question.

average," 67 percent of the station scientists rated themselves as "excellent" or "above average" writers. These figures, although not directly related, perhaps indicate that station authors of scientific manuscripts may not write as well as they think they do.

CONCLUSIONS

The first of our two hypotheses was that, given a choice, scientists would prefer to read a style of writing that is simpler and more direct than what is usually found in scientific journals today. Our results show that Northeast station scientists (66 percent) and selected journal editors (70 percent) prefer the simpler, more direct Smith style for technical writing.

When it came to the question of which style is more appropriate, 54 percent of the scientists and 59 percent of the journal editors selected the Smith style. Only 33 to 25 percent, respectively, thought that the Brown (or more complicated) style is more appropriate. The remainder found no discernible difference or did not answer.

Therefore, editors seem to be correct in suggesting that station scientists use personal pronouns, active verbs, and direct phrasing.

Our second hypothesis—factors other than readability influence which style of writing scientists might actually use—is not as easily supported. Of those station scientists who had a preference, more felt that Brown is more competent as a scientist than Smith. They were much more ambivalent when it came to the questions of which author inspires more confidence in what he says, which author seems more objective, and which style is more precise. For these questions, it is almost as likely that a scientist might select Smith or Brown or find no discernible difference between the two.

Therefore, it is conceivable that scientists might choose to write in a complex style that they associate with competency, confidence, objectivity, and precision, even though they might prefer to read another, simpler style.

However, journal editors were much less likely to associate these characteristics with Brown or the Brown passage. For example, twice as many station scientists as journal editors thought that Brown appears more competent as a scientist than does Smith.

It is very likely, then, that scientists would increase their chances of getting published if they not only had something important to say but said it accurately, briefly and clearly. The question is, how do we convince them to do this?

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