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ABSTRACT

A study examined attitudes toward writing that affect productivity and the extent of their influence. Subjects, 160 engineers practicing in the Chattanooga, Tennessee region, completed a questionnaire concerning writing attitudes, including anxiety and confidence, and levels of productivity. Findings show that confident engineers produce significantly greater amounts of written work, that years of education and years of employment correlate positively with productivity, and that the engineers in the study rarely revise their first draft, preferring to make corrections as they move along. The results suggest that the surveyed engineers are confident writers who consider themselves to be nighly productive, who possess a traditional orientation toward the writing process, and who are characterized by a need for immediate control. The questionnaire is appended. (EL)

A SURVEY OF ENGINEERS: WRITING ATTITUDES AND PRODUCTIVITY

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Abstract

This study gives th[illegible]ults of a survey of the writing attitudes of 160 engineers practici[illegible] in the Chattanooga, Tennessee, region. Specifically, the study addresses the attitudes toward writing that affect productivity and discusses the extent of their influence. Various statistical tests were used and showed significant relationships between levels of education and career experience with writing attitudes. The data showed a positive relationship between productivity and the level of confidence the engineers reported.

Introduction

Attitudes toward writing have been the focus of composing process rese[illegible]ch particularly since 1975 when Daly and Miller coined the term "w[illegible]g apprehension" to denote a constrictive behavior, "a tendency to appr[illegible]ach or avoid situations perceived to potentially require writing accompanied by some amount of perceived evaluation." As one would expect, this anxiety appears in attitudes toward writing, the writing process itself, and in the written product. And although research has shown that writing attitudes, specifically apprehension, [illegible]nfluence occupational and academic choices (Daly and Shamo, 1976; 197[illegible]), most studies on this topic have relied on high school or university students as participants. Few have chosen to focus on practicing engineers in an effort to examine the empirical relationship of these attitud[illegible] to measures of writing productivity. And there are no studies exploring the interweaving of the cognitive, affective, and contextual frameworks within which professional writing occurs. This paper is one of the first to address these concerns.

Purpose of the Study

The purpose of this study was to investigate [illegible]e relationships betwe[illegible]n writing attitudes and writing productivity [illegible]n a career field such as engineering. Educators are responsible for training students to enter critical fields where, according to The Harvard Business Review, the ability to produce well-written material is a prime requisite for promotable executives. As educators, we were challenged by a statement

concerning the dilemma facing science and engineering students which was addressed in an article in the College Board Review. According to the author, "The single, greatest complaint our students make when polled about their undergraduate preparation consists of questions of the form: "Why didn't you teach us how to write?' They have found, much to their amazement, that one of their main jobs in the 'real' world is writing, and that they are woefully unprepared to fulfill that part of their duties" (David, 1982). We wanted to know what attitudes toward writing professionals had and what affect those attitudes might have on writing productivity.

For purposes of this pilot study, the field of engineering was selected. Salient research questions included the following:

- Do engineers with a more confident attitude toward writing produce more written documents than those who indicate they feel anxious?
- Do an engineer's position, training and/or years of employment have an affect on general writing attitudes? On anxiety levels? On peer involvement with writing?
- Does a relationship for engineers exist between adoption of a writing process and a confident attitude toward writing?

Methodology

Questionnaire

The study was conducted using a 76-item questionnaire specifically devised to address questions concerning writing attitudes, including anxiety and confidence, and levels of productivity. The instrument consists of four pages (see Appendix A) divided into two sections: Part A asks 16 demographic questions, including native language, degrees received, job function, position title, and average number of memos/letters, reports, articles, and books written within specific time frames.

Part B consists of 60 statements phrased in a 6-step rank-ordered format. The instructions asked participants to circle the number, ranging from 1 ("Never") to 6 ("Always"), which represented the response most accurately reflecting their attitudes about writing.

Participants

The participants were 160 engineers belonging to one of two groups: the Chattanooga Engineers Club (117) and the University of Tennessee Space Institute (43) in Tullahoma, Tennessee. All participants are currently practicing engineers, and all volunteered to complete the questionnaire as an opportunity to learn more about their writing attitudes as well as the collective attitudes of those in the profession. The researchers explained the project at a luncheon meeting of the Chattanooga Engineers Club and promised to share the results of the study at a future meeting.

The participants represent a spectrum of engineering occupations but are predominantly mechanical (26 percent) or electrical (25 percent) engineers. As would be expected, almost all possess a bachelor's degree, with 42 percent having also a M.S. degree and 16 percent having also a Ph.D. Ninety six percent are male. On the average, the participants have been employed as engineers for 19 years (std. dev =10), most often working in the area of research (21 percent) or design (13 percent).

Procedures

One set of questionnaires was enclosed with a regular mailing to all members of the Engineers Club; a second set was distributed to engineers employed at the Space Institute. In all, 600 questionnaires were mailed out. Participants were encouraged to return the completed questionnaire to the Engineering School at the University of Tennessee at Chattanooga by folding the instrument so that the last page revealed the return address and mailing permit. The return rate was 29 percent; of the 174 questionnaires returned, 14 were removed from the data collection because of invalid demographic responses (e.g., respondents were retired or not engineers).

Data Analysis

The data were analyzed with the use of the SPSS programs on a HP-3000 model 48 computer made available by the Center for Computer Application at the University of Tennessee at Chattanooga. First, Spearman's Rho, a rank ordered correlation coefficient data in the form of was computed for variable pairs from Part A (8; 13-18, the items with numeric values) and Part B of the questionnaire. The .01 level of

significance was utilized. Second, linear regression analysis was used to investigate the possibility of relationships among demographic variables and attitudinal variables. Again, alpha was set at the .01 level. Third, a series of t-tests were performed to probe possible differences in productivity between those people whose pooled responses classified them as "anxious writers" and those who could be called "confident writers." In these final tests, the .05 level of significance was used.

Results

The findings of the study can be examined by classifying the questions into categories relevant to demographic information, attitudes of the writers, the writing environment, the writing process itself, and the quantity of the product.

Education

Analysis of the calculated correlation coefficients indicates that those engineers with the highest level of post high school education exhibit the following significant ($p<.01$) characteristics: They enjoy writing tasks, find it easy to organize their writing, do not worry about making errors in grammar and mechanics, receive compliments from their peers about their writing, do not feel they learn to write better by seeing examples of good writing, do not feel other engineers write better than they do, type their own reports, and do not develop outlines as they progress in their writing. (The results are summarized in Table 1.)

Career Experience

The longer engineers have been practicing, (i.e, the higher the number of years of professional experience), the more they rely entirely on their own ideas when they write and the more firmly they believe that the ability to write well reflects on their professional competence. Moreover, they report that when they work, they are not easily distracted. After their first draft is typed, they rarely change it. (See Table 2.)

Writing Attitude

A high correlation exists between number of years of post high school education and enjoyment of writing tasks. Those who have written the

most books report feeling the most relaxed when they write; concomitantly, these same people also enjoy writing short memos or letters. Engineers who write a high number of reports state that writing is important to them. (See Table 1.)

Confidence

Those engineers who have been employed the longest and those who write a significant number of articles and books rely entirely on their own ideas when they write. Those who produce the greatest number of memos and letters report that they are relaxed when they write and that they like to share their writing with their colleagues. Moreover, they do not feel self conscious about their writing efforts. Those who produce the most articles and books per year do not feel that other engineers write as clearly as they do. The productive memo and report writers like to have other engineers comment on their writing. The memo writers, in particular, feel in control of the process when they write. (See Table 3.)

Anxiety

The participants in this survery, on the average, gave responses on the low end of the scale to the items that were targeted to identify anxiety. Even so, data show a correlation between anxiety and productivity. Those who produce the most memos feel the least self-conscious about their writing efforts. They affirm this feeling when they state that they are not afraid of having their writing evaluated. Those who produce the most books state that they make each sentence perfect before they go on to the next sentence. In addition, a significant correlation exists between years of education and lack of worry that writing will show errors in grammar and mechanics and a corresponding lack of concern that other engineers write better. (See Table 4.)

Writing Environment

Both those engineers who write the greatest number of articles and those who write the most articles and books per year do not write at their desks. The questionaire does not ask where else they write; but wherever they do, the engineers report that they are not easily distracted.

The Writing Process

A positive correlation exists between the recognition that organizing material for a report is easy and the variables of years of post high school education and high productivity for writers of memos, letters, articles, and books. Engineers who produce many letters and memos find that having many notes of their ideas on a topic helps them write. The engineers do not think that it takes them longer than their colleagues to complete writing tasks. Those with the most years of post high school education and those who write many articles report that they rarely change a draft version after it has been typed. Moreover, many of these engineer writers state that they type their own reports. (See Table 5.)

Writing Productivity

Those engineers who write the highest number of memos or letters per week state that they turn out more writing than do other engineers in similar jobs. They report no difficulty with beginning or finishing writing tasks. While they feel that they have more responsibilities for writing in their jobs than their colleagues do, they believe that the ability to write well reflects on their professional competence. They enjoy writing short letters and are not easily distracted when they write. (See Table 6.)

Engineers who write longer products, particularly reports, feel strongly that they write well. They claim that they turn out more writing than their colleagues and that writing is important to them.

Characteristics common to those engineers who produce the highest numbers of articles and books a year include the following: a sense that organization is easy and a reliance on typing their own work.

In this study, we set out to explain productivity through certain attitudinal measures, but regression analysis could explain only 23 percent of the variance on memo/letters; 10 percent on journals; and 5 percent on books. The high level of variance attributable to error may be due to factors other than attitude--perhaps job function. T-tests run on job function support this possibility.

When, however, the engineers are grouped into "confident" writers and "apprehensive" writers on the basis of scaled values on predetermined items in the questionnaire, t-test results show that on every measure of

productivity, the "confident" writers have higher mean values. When a composite measure of productivity is used for the four productivity items, the differences are significant ($p<.05$, $df=11$).

Discussion and Recommendations

The results of this study arebcth satisfying and surprising to us. From our teaching experience and participation in a writing across the curriculum program, we hypothesized that confident engineers would, indeed, produce more written documents. Free from apprehensive or blocking behaviors, these engineers would turn out significantly greater amounts of written work. The results of our pilot study confirm our original idea. The engineers acknowledge feelings of assuredness: they are relaxed when they write and willing to share their work with others.

We are pleased to note, also, that years of education and years of employment correlated positively with productivity, again a confirmation of our hypothesis.

What is disappointing, however, was the low rate of return (29 percent). We wonder if the respondents, 22 of whom can be classified as confident writers and only 5 of whom can be labelled anxious, may well have pre-selected themselves. In other words, perhaps the less confident writers were so apprehensive that they did not want to acknowledge their attitudes on a questionnaire and thus did not return it. As partial explanation, we know that the hallmarks of confident writers are a willingness to share their writing (and perhaps their ego involvements) with others; the converse is probably true for anxious writers.

Also surprising in the results is the possible contradiction between the feelings of confidence and the need for control, namely the need to make every sentence perfect before writing further. Concern for the writing process, as educators teach it today, is not important for these practicing engineers. While they feel comfortable using many informational notes to guide their writing--perhaps encouraged by a prewriting stage in the process--they move quickly to a drafting stage which becomes, in effect, their final product. According to their survey responses, they rarely revise their first efforts, preferring instead to make corrections as they move along. An additional explanation may lie in the average years of work experience these engineers possess. Nineteen

years ago--the average years of their work experience--the teaching emphasis in all written subjects, not just English, was on the product rather than on the process. The confident engineer-writers may well be practicing what they were taught.

In conclusion, we acknowledge that, while there is not a strong pattern for our statistical findings, what attitudes have been determined, given the small return, are significant. Our pilot study shows the need to gather more information on the prior writing experiences of engineers and the need for a higher rate of return so that the sample more closely approaches the whole population. At this point, we cannot draw general conclusions; but we will suggest that the practicing engineers whom we surveyed are confident writers, ones who measure their own productivity as high. They are also writers who possess a more traditional orientation toward the writing process, one characterized by a need for immediate control.

The pilot study points toward a further study with two important changes. First, the survey instrument needs to be refined and tightened. We will use factor analysis to help us reduce the number of questions asked by indicating which questions elicit responses of parallel strength. This revision will shorten the questionnaire, and we hope that it will also increase the rate of return.

Second, we will ask senior engineering students at the University to participate in a similar survey so that we can compare writing attitudes of current students with those of practicing engineers. The specific aim of this comparison will be to see if the contemporary way of teaching composition (process oriented) as contrasted to the more traditional way (product oriented) is observable in the students' attitudes toward writing.

Works Cited

Daly, J. A. and Miller, M. D. The empirical development of an instrument to measure writing apprehension. Research in the Teaching of English, 1979, 13, 37-44.

Daly, J. A. and Shamo, W. Writing apprehension and occupational choice. Journal of Occupational Psychology, 1976, 49, 55-56.

——— Academic decisions as a function of writing apprehension. Research in the Teaching of English, 1978, 12, 119-126.

APPENDIX: QUESTIONNAIRE

DIRECTIONS FOR PART A: Please use the blanks to answer the following questions.

1. What sex are you? ___male ___female

2. Is English your native language? ___yes ___no

3. How many years of post high school education have you completed? _____

4. In what fields of engineering did you major? _____

5. What degrees have you received? _____

6. Are you an engineer-in-training? ___yes ___no

7. Are you a registered professional engineer? ___yes ___no

8. How many years have you worked as an engineer? _____

9. What is the function of your job? _____ Construction, _____Consulting, _____Design, _____Education, _____Production, _____Research, _____Other.

10. What is the title of your present position? _____

11. Where did you learn to write? _____

12. Where do you go for help when you have problems with writing? _____

13. What is the average number of engineering reports you write a year? _____

14. What is the average number of memos and letters you write a week? _____

15. How many articles have you had published in journals? _____

16. How many books have you written? _____

DIRECTIONS FOR PART B: Please answer the following questions by circling the number that is the most accurate response for you at this time.

	Never (very little)					Always (very much)
1. I enjoy the writing tasks in my job.	1	2	3	4	5	6
2. Organizing material for a report is easy for me.	1	2	3	4	5	6
3. I rely entirely on my own ideas when I write.	1	2	3	4	5	6
4. I am relaxed when I write.	1	2	3	4	5	6
5. I enjoy discussing my writings with others.	1	2	3	4	5	6
6. I ask other engineers to evaluate my draft versions of my writings.	1	2	3	4	5	6
7. I have trouble organizing my ideas.	1	2	3	4	5	6
8. I worry that my writing will show errors in grammar and mechanics.	1	2	3	4	5	6
9. I like to share my writing with colleagues.	1	2	3	4	5	6
10. I feel very self-conscious about what I write.	1	2	3	4	5	6
11. I enjoy writing memos.	1	2	3	4	5	6
12. I revise my writing even when I'm not asked to do so.	1	2	3	4	5	6
13. I write less well than my colleagues.	1	2	3	4	5	6
14. I find it valuable to let a report "sit" in my mind a while before I get started.	1	2	3	4	5	6

2

	Never (very little)					Always (very much)
15. I usually don't get reports submitted on time.	1	2	3	4	5	6
16. I write best at my desk.	1	2	3	4	5	6
17. Many reports I write have the same organizational format.	1	2	3	4	5	6
18. Summarizing other people's work is difficult for me.	1	2	3	4	5	6
19. I form the conclusions of my report before I begin writing.	1	2	3	4	5	6
20. I make each sentence perfect before I go on to write the next sentence.	1	2	3	4	5	6
21. The last thing I write is the introductory section of a report.	1	2	3	4	5	6
22 It takes me longer than my colleagues to complete writing tasks.	1	2	3	4	5	6
23. I turn out more writing than do other engineers in similar jobs.	1	2	3	4	5	6
24. I have trouble beginning writing tasks.	1	2	3	4	5	6
25. I have trouble finishing a writing piece.	1	2	3	4	5	6
26. I frequently read my colleagues' writing.	1	2	3	4	5	6
27. I have received compliments from my peers about my writing.	1	2	3	4	5	6
28. I have trouble organizing the material I write.	1	2	3	4	5	6
29. I learn to write better by seeing examples of good writing.	1	2	3	4	5	6
30. I can better plan my writing if I understand the expectations others have for the assignment.	1	2	3	4	5	6
31. I have more responsibilities for writing in my job than my colleagues do.	1	2	3	4	5	6
32 Other engineers write better than I do.	1	2	3	4	5	6
33. I find it easy to revise my early drafts to improve my writing.	1	2	3	4	5	6
34. I enjoy writing technical reports.	1	2	3	4	5	6
35. I avoid writing tasks.	1	2	3	4	5	6
36. I am afraid of having my writing evaluated.	1	2	3	4	5	6
37. Others tell me that I express my thoughts clearly.	1	2	3	4	5	6
38 I am the harshest critic of my writing.	1	2	3	4	5	6
39. My ability to write well reflects on my professional competence.	1	2	3	4	5	6
40 Other engineers don't write as clearly as I do.	1	2	3	4	5	6
41. Writing a report of work done is more satisfying than actually doing the work.	1	2	3	4	5	6

	Never (very little)					Always (very much)
42. Having many notes of my ideas on a topic helps me write.	1	2	3	4	5	6
43. After a first draft is typed, I rarely change it.	1	2	3	4	5	6
44. I usually like to work intensely on a report to get it finished.	1	2	3	4	5	6
45. I cannot write until I have all my materials collected.	1	2	3	4	5	6
46. I enjoy writing reports of work I've done.	1	2	3	4	5	6
47. I like to have other engineers comment on my writing.	1	2	3	4	5	6
48. I type my own reports.	1	2	3	4	5	6
49. I like a quiet area to write.	1	2	3	4	5	6
50. I develop the outline (organization) of my writing as I progress.	1	2	3	4	5	6
51. I edit my writing before submitting it.	1	2	3	4	5	6
52. I feel in control of the process when I write.	1	2	3	4	5	6
53. I enjoy writing short letters.	1	2	3	4	5	6
54. I feel confident about the way I express my ideas in writing.	1	2	3	4	5	6
55. I tend to use others' ideas as a base for gathering my own.	1	2	3	4	5	6
56. I am easily distracted when I write.	1	2	3	4	5	6
57. Writing is important to me.	1	2	3	4	5	6
58. Writing is important to my supervisor.	1	2	3	4	5	6
59. I enjoy thinking about writing.	1	2	3	4	5	6
60. I enjoy answering questions about writing.	1	2	3	4	5	6

COMMENTS: Please share any additional ideas about writing in the space below. _____

_____

_____

_____

THANK YOU FOR YOUR COOPERATION. We will share the resulting information with you later.

PLEASE MAIL THIS QUESTIONNAIRE AFTER YOU HAVE FOLDED AND STAPLED IT SO THAT THE UTC ADDRESS SHOWS.

Deborah Arfken
Jim Henry

Dr. Deborah Arfken (755-4497)
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TABLE 1	Correlation Coefficients of Variable Pairs Years of Post-high School Education
Enjoy writing tasks	.19
Find organizing writing easy	.19
Do not worry about grammar, mechanics	.23
Receive compliments about their writing	.19
Do not feel they learn to write better by seeing examples of good writing	.19
Do not feel other engineers write better	.23
Type their own reports	.25
Do not develop outlines as writing progresses	.19

(p<.01)

TABLE 2	Correlation Coefficients of Variable Pairs Years as Engineer
Rely on own ideas	.25
Believe ability reflects competence	.19
Rarely change first draft	.19
Are easily distracted	-.19
($p < .01$)	

TABLE 3 Correlation Coefficients of Variable Pairs
Writing Attitude: Variables Indicating Confidence

	Relaxed feeling	Lack of self-consciousness	Others write as clearly	Sharing with colleagues	Reliance on own ideas	Appreciation of others' comments
Yrs. employment			.23		.25	
High productivity (articles/books)				.24	.19	
High productivity (memos/reports)	.24	.26				.20
High productivity (memos)						.20

(p< .01)

TABLE 4 Correlation Coefficients of Variable Pairs
Writing Attitudes: Variables Indicating Apprehension

	Worry/ grammar, mechanics	Fear others write better	Fear of evaluation	Need to make sentences perfect
Yrs. of education	- .23			
High productivity (memos)			- .21	
High productivity (reports)		- .19		
High productivity (books)				.22

(p< .01)

TABLE 5 Correlation Coefficient of Variable Pairs The Writing Process

	Find organizing easy	Use many notes	Do not change draft	Type own reports
Yrs. education	.19			.19
High productivity (memos/letters/books)	.24			
High productivity (memos/letters)	.24	.20	.19	
High productivity (articles)	.26			

(p< .01)

TABLE 6 Correlation Coefficients of Variable Pairs Productivity Measures

	Memos/ letters per year	Reports per year	Articles per year	Books per year
Write more than others in similar jobs	.32			
Trouble beginning	-.27			
Trouble finishing	-.25			
More writing responsibilities	.24			
Writing reflects professional competence	.28			
Enjoy writing short letters	.24			
Easily distracted while writing	-.24			
Write better than colleagues		.19		
Turn out more writing		.22		
Writing is important to me		.23		
Organizing material is easy for me			.21	
I type my own reports			.27	.24

(p<.01)