Technical Writing for Construction Science Graduates

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The purpose of this study was to determine the perceptions of the construction industry as well as the construction educators regarding the need for technical writing skills among Construction Science graduates. An instrument was prepared to gather the data related to the technical writing skill set of construction science graduates. This instrument was sent to the CEO's of the construction companies, identified from the career fair database of a large south-central university, and faculty members of in the Associated Schools of Construction. The results of the survey were used to determine the importance of different construction documents used within the construction industry for which good technical writing skills are essential. The data was analyzed using stepwise and multiple regression techniques. The results from the study indicate that capability of writing business letters, request for bid information, e-mails, and schedule of values are important in terms of technical writing. All these factors were found to be related to the overall capability of technical writing skills among Construction Science graduates at a level of significance of 0.05.

Key Words: Construction Science, Construction Documents, Technical Writing, Undergraduate Education.

Statement of the Problem

Ability to communicate effectively through the use of technical, written, communication skills can greatly affect a person's career. An individual's capacity to write effectively is usually regarded as a first-rate attribute. It can be categorized equally with a person's professional skills and knowledge. Professionals in all disciplines, including construction, spend a considerable amount of their time in writing technical reports. It is a critical component to all tasks of significant importance.

Given this importance, industries report that students graduating from technical programs are generally not well prepared for the writing requirements of the contemporary workplace (Bradney & Courbat, 1998). Industries naturally have their own set of terminology committed to the specific requirements and situations exclusive to their form of business. Communicating effectively within an industry is a direct result of an individual's ability to understand and use the industry's vocabulary and communication practices. Effective written communication skills can assist in the acquisition of sought-after contracts and clients as well as assist in maintaining optimal relationships with vital customers.

Project documentation is critical to the success of many companies. Understanding and learning how to prepare a variety of construction documents is of utmost importance to construction professionals. The purpose of this study was to ascertain the importance of technical writing skills for construction science graduates and to identify the particular topics that are perceived to be important both by the industry and the academia that may be included in a technical writing course in a construction science curriculum.

Literature Review

Overview

With the growth of the U.S. college student population in the 1960s and early 1970s universities and community colleges recognized that a high percentage of students had problems writing effectively (Ray & Stilter, 2000). Leaders in industry have stated that for nearly 50 years that a major weakness of graduating technical students is their lack of written communication skills (Bradney & Courbat, 1998).

The inability to communicate effectively does little to enhance the image of a company. In fact, it proves to be detrimental. Good writing skills are necessary in order to communicate with clients, as well as with partners and co-workers. How successfully a company communicates potential problems and issues will largely depend on the writing and communication skills of the company employees (Ray, 1999). In the construction profession, reading and writing are paramount to an individual's performance in successfully completing a project (Ray, 1998).

Every industry has an undefined list of terms that are essential to the specific requirements and situations unique to that industry. An individual can successfully communicate within an industry when they have mastered the terminology and methods of communication relevant to that industry. When students graduate from their respective programs, they will be given a wide range of activities and projects that will require them to exhibit acceptable documentation and writing skills (Ray & Stilter, 2000). There are few commercial endeavors that use and rely on written language skills as much as construction contracting does (Maher, 1990).

Being unable to acceptably execute these basic skills, new graduates will find themselves at a considerable disadvantage (Maher, 1990). Many construction programs offer courses in subject areas ranging from building materials and methods to structures and environmental systems. It would be logical to believe that these are the skills essential to one's success in the construction industry (Maher, 1990). In reality, the most important skill to be taught is the ability to write effectively (Maher, 1990).

It is no secret that construction education graduates are deficient in possessing adequate writing skills for entering the business community (Wright, 1987). Understanding that these skills need to be improved is the first step in correcting the problem (Ray, 1998).

Teaching Relevant Material

In order to fill the void in writing skills educators must focus their attention on writing as a fundamental communication skill (Wright, 1987). It is important not only to make students write, but to have them write on subject areas relevant to their studies (Ray, 1998). It appears to be nonproductive to teach writing without concurrently teaching the subject matter (Wright, 1987). If educators expect writing skills to be developed only in English specific-type courses, it is imperative that such courses be provided relevant content and set the context in the students' limited experience in language usage (Wright, 1987).

Employers expect entry-level employees to be capable of writing effectively the matters related to specific conditions of a particular project (Ray, 1998). Professionals spend approximately 20 percent of their time writing reports of some sort. Graduates must know how to write competently and exhibit this competency immediately on entering the industry in order to be successful (Maher, 1990).

If the problem has been readily identified it would be the assumption of many that colleges and universities would make the development of first-rate writing skills an important goal and assign some of their best instructors to the accomplish the task. Unfortunately, this is typically not the case (Bradney & Courbat, 1998).

Many professors in English departments usually specialize in a particular form of literature and not in English composition. Many will privately admit that they do not nor want to know how to teach composition writing courses. Many of these professors are not adequately prepared to evaluate the obscure information usually entailed in technical topics. Since the information cannot be judged on content, most instructors will invariably revert to issues of format and technique. In short, the writing in many areas of composition and technical writing courses does not reflect the kinds of writing that the modern workplace expects students to do (Bradney & Courbat, 1998).

Writing Across the Curriculum

Regardless of the style and amount of writing in specific English courses, the evidence was apparent. A "gap" appeared between the writing competency displayed in a composition course and the writing performance in the type used by the individual students' professional disciplines (Ray & Stilter, 2000). The response to this performance gap has led to what is now termed as writing in the discipline (WID) (Ray & Stilter, 2000), which part of a broader pedagogical movement known as writing across the curriculum (WAC). This method of writing allows students to become accustomed to the style of writing associated with their disciplines and immerses them in the professional dialogue of their field.
Writing across the curriculum at its onset uses the approach that every teacher, instructor or professor should become aware and should introduce into the respective classroom and curriculum, the requirement of student participation by writing (Ray & Stilter, 2000).

Writing across the curriculum is a theory of writing rested on the basis of deeming writing as a revised process, not a consecutively manufactured product. Other theoretical components of writing across the curriculum can be summarized as follows:

- An interdisciplinary dialogue on writing that brings writing into as many classrooms as possible.
- Brief and varied (cross-disciplinary) writing forms that receive both instructor and peer responses.
- A focus on writing as learning – the principle that cognitive processes involved in writing and knowledge acquisition are very similar (Ray & Stilter, 2000).

Without a requirement to master writing skills, the graduate is initially handicapped in his/her chosen professional world. This handicap continues until these skills are acquired (Wright, 1987). This is despite dramatic increases in mandatory reading, writing, and speech courses; writing across the curriculum initiatives; and the heavy emphasis placed on writing skills by business and industry. It is unknown as to why this crucial skill has been and is still being so inadequately addressed. This is considered by some to be the greatest failure of the higher educational system (Bradney & Courbat, 1998).

Need and Promotion

By not teaching our students to read critically and to write logically and clearly, we unsuspectingly limit their personal and professional horizons (Bradney & Courbat, 1998). An employee's ability to advance in an organization may be dependent on that person's ability to communicate both verbally and with the written word (Maher, 1990). Most help-wanted advertisements for technical people specifically require well-developed written communication skills (Bradney & Courbat, 1998). It is important to note that the ability to write effectively assumes a much larger role as one advances in a technical career. This causes the problem to grow to unsuspected heights.

Without adequate written communication skills, an employee may be passed over for promotion (Ray, 1999). Almost every technical person can recall cases of ambitious and technically adept colleagues passed over for promotion because they could not write well enough to meet the demands of a higher position (Bradney & Courbat, 1998).

Methodology

Data Collection Procedure

A total of 400 Chief Executive Officers were selected from the career fair database of a large south-central university, using simple random sampling procedure. Another 400 of faculty members teaching at different schools of construction were selected from the web site of Associated Schools of Construction using the same procedure. A survey instrument was prepared to collect the data. It was administered via email in hopes for a speedy response, but individuals had the opportunity to mail in their responses as well. Some chose this option. Respondents were given two weeks to respond. A few days prior to the deadline, an email reminder was sent. Due to a poor response rate relative to the population, an extension of a week was given to those who had not yet had the opportunity to respond. The total number of responses was 81—57 from the industry and 24 from the faculty.

Variables and Their Operationalization

Overall Technical Writing Skills (*TECWRITE*): It is the reported importance of overall technical writing skills for construction science graduates.

Bid package (*BID*): It is the reported importance of skill for writing complete bid proposals by construction science graduates.

Business Letters (*LETTER*): It is the reported importance of skill for writing business letters by construction science graduates.

Change order (*CHANGE*): It is the reported importance of skill for writing requests for changes in construction items by construction science graduates.

E-mail (*EMAIL*): It is the reported importance of skill for writing e-mail by construction science graduates.

Internal memorandum (*MEMO*): It is the reported importance of skill for writing internal correspondence documents of specific project information by construction science graduates.

List (*LIST*): It is the reported importance of skill for writing comprehensive crew and drawing distribution lists by construction science graduates.

Log (*LOG*): It is the reported importance of skill for recording written accounts of inspections, meetings, or telephonic communications by construction science graduates.

Notices (*NOTICE*): It is the reported importance of skill for notices of safety, compliance, etc. by construction science graduates.

Report (*REPORT*): It is the reported importance of skill for writing job-related reports by construction science graduates.

Request for Information (*RFI*): It is the reported importance of skill for writing request for information by construction science graduates.

Schedule of Values (*VALUE*): It is the reported importance of skill for writing schedule of values by construction science graduates.

All the variables were measured using a 5-point unidimensional scale, ranging from "strongly disagree" to "strongly agree." A value of 1 was assigned if the respondents "strongly disagreed" with a particular statement, elevating to a value of 5 if the respondents "strongly agreed" with the statement.

Analysis and Results

A stepwise regression analysis was performed using a forward-selection procedure setting the significance level of entry at 0.2. This was done in order to determine the relative importance of the predictor variables with respect to their contribution in explaining the variance of overall technical writing skills (*TECWRITE*) of construction science graduates. The following model was used for the analysis;

$$TECWRITE = \beta_0 + \beta_1 BID + \beta_2 LETTER + \beta_3 CHANGE + \beta_4 EMAIL + \beta_5 MEMO + \beta_6 LIST + \beta_7 LOG$$
$$+ \beta_8 NOTICE + \beta_9 REPORT + \beta_{10} RFI + \beta_{11} VALUE + e \qquad\qquad (1)$$

where

β_0 = Intercept
β_1, β_2, etc. = Regression coefficients, and
e = error term.

The results of the analysis indicated that only the skills for writing business letters, schedule of values, request for information, e-mail, and notices (entered in the model in that order) are correlated with overall technical writing skills at the level of significance of 0.2. The results are shown in Table 1.

TABLE 1

Summary of Stepwise Regression Analysis for *TECWRITE*

Variable Entered	Step	Partial R^2	Model R^2	*F*-Value
LETTER	1	0.4174	0.4174	56.60
VALUE	2	0.1002	0.5176	16.21
RFI	3	0.0400	0.5576	6.95
EMAIL	4	0.0141	0.5717	2.50
NOTICE	5	0.0153	0.5870	2.79

Further analysis was performed using a multiple regression analysis for a reduced model that included only the variables selected by the stepwise regression procedure. The results of the analysis are shown in Table 2.

TABLE 2

Summary of Multiple Regression Analysis for *TECWRITE*

Variable	Intercept	Regression coefficients	*T*	$p > |T|$	Critical value of $|T|$ @ $p \leq 0.5$
Intercept	0.64141		1.48	0.143	1.98
LETTER		0.31447	3.30	**0.002**	
RFI		0.27084	2.46	**0.016**	
EMAIL		0.29769	2.26	**0.027**	
VALUE		0.19502	2.20	**0.031**	
NOTICE		0.19178	1.67	0.099	
F-value of the model		p>F		Model R^2	Adjusted R^2
21.32		<0.0001		0.59	0.56

The *F*-value of the model used for the multiple regression analysis was found to be statistically significant at a level much lower than 0.05. This statistic basically tests how well the model, as a whole, accounts for the dependent variable's behavior. The predictive efficacy of the model was found to be moderately high with an R^2 of 0.59 and an adjusted R^2 of 0.56. R^2 is the coefficient of determination of the model. The larger the value of R^2, the better the fit of the model, and higher is its predictive efficacy.

The results indicated that writing skills for business letters, requests for information, e-mail, and schedules of values were perceived to be important for construction science graduates. These independent variables were related to overall technical writing skill at the level of significance lower than 0.05. The only variable included in the reduced model found not related to overall technical writing skill at this level of significance was writing of notices.

Discussion

The results of the study indicate that the construction science graduates are expected to be efficient in writing business letters, requests for information, e-mail, and schedules of values. This is not surprising in view of the evidence obtained from the literature in support of the need for teaching the students to write effectively on subject areas relevant to their discipline.

Business letters are a basic means of communication between organizations. Even at entry-level positions, people are expected to write letters on a regular basis. The message is expected to be persuasive. Like any other type of technical communication, it is also required to be accessible, concise, correct, professional, and accurate. A skilled writer of business letters is expected to thrive in the industry.

Most construction projects undertaken by organizations begin with a proposal. To write a good proposal, one has to clearly ascertain the requirements of the client. This calls for a request for information. A requestor should specify as clearly as possible the particular information sought. The request should allow the client to clarify what documents or information is being sought. Without any clear information, it is not possible to submit a winning proposal. It is, therefore, only logical that writing skills for request for information was found to be important for construction science graduates.

Electronic mail, in both corporate and personal domains, is gradually becoming a communication medium of choice. It is cheaper and faster than a letter, less intrusive than a phone call, less hassle than sending a fax. Differences in location and time zone are less of an obstacle to communication when email is used. There is also evidence that an email leads to a more egalitarian information structure. Like other forms of communication, an email has to be read and understood. There are certain principles that are required to be followed while writing an email. Among other principles, one must follow the netiquette (etiquette on a network) appropriate for the medium, and this skill has to be learned.

The finding of a statistically significant relationship between overall technical writing skills and preparation of schedule of values is also quite logical. For every construction project, a contractor has to furnish a schedule of values for review and approval of the client. It shows the amount included for each principal category of work. Unit price items in the schedule of values should be consistent with any bid item listing contained in the contract. No progress payment is usually made to the contractor unless this schedule has been submitted and approved. A graduate in construction science should have adequate knowledge of how to prepare a schedule of values.