AC 2007-1856: COMMUNICATION APPREHENSION IN UNDERGRADUATE ENGINEERING STUDENTS: THE INFLUENCE OF PERFORMING ARTS PARTICIPATION

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Communication apprehension in undergraduate students: The influence of performing arts participation

Abstract

Engineering students often display varying levels of communication apprehension (CA) when it comes to communication situations such as meeting participation, group discussions, presentations, and general public speaking. This study investigated the potential positive role that previous participation in the performing arts (instrumental and vocal music, theater, and dance) had on CA in freshmen/sophomore engineering students. A hypothesis of this study was that such participation would manifest in lower levels of CA since participating students would have had to face CA, performance anxiety, and related phobias prior to college entry. The Personal Report of Communication Apprehension was employed in this study, combined with a self-reported inventory of middle school and high school participation in the performing arts. The results indicated that students who had previous performing arts participation had significantly lower levels of CA relative to students who had no such participation. The possible benefits of engineering/performing arts interactions in terms of addressing CA is also addressed.

Introduction

Many engineering students deal with some form of communication apprehension (CA), with the more severe experiences often centered around public speaking and presentations. Other investigators have used the phrase "communication anxiety" as synonymous with communication apprehension; we will adopt the "apprehension" definition. Recognizing that communication skills are indeed an important skill for engineering graduates, ABET includes "the ability to communicate effectively" (criterion "g" of the "a-k" criteria - ABET 2007-2008[1]). With the advent of the 21st century, communication effectiveness has received even more attention as the concept of the "global engineer" influences the engineering profession[2]. Many engineering programs address communication skills through a specific required course in communications, often administered by a non-engineering department (see reference 3 for an overview of communication in current engineering curricula). Such a course will typically address both nonverbal and verbal communication skills. However, it is well recognized that communication skills must be integrated into the engineering curriculum to be effective[4]. For many institutions, where written communication is often a significant activity in engineering courses, verbal communication skills (individual and group-related activities) are often rather limited. As a result, employers of engineering graduates often cite low skill levels in public speaking/presentations as a significant problem.

McCroskey defines communication anxiety as: "an individual's level of fear or anxiety associated with either real or anticipated communication with another person or persons"[5]. Richmond and McCroskey have identified four categories of CA: 1) traitlike CA which relates to personality orientation (which reflects both genetics and environment); 2) context-based CA which relates to a specific communication mode such as public speaking; 3) audience-based CA which reflects the specific audience being addresses (for example, peer-to-peer may be less stressful than employee to management team); and 4) situational CA which focuses on very

specific situations such as a thesis defense or job interview[6] . Daley opines that the causes of CA include a genetic influence (related to personality orientation), lack of skill development and deficient reinforcement of communication skills during the educational process, and the individual's lack of identified communication role models[7] .

As Drinkwater and Vreken have observed, individuals with a high level of CA may actually make choices to avoid communication situations where possible[8]. Psychological studies have shown a correlation between high CA and low self-esteem, low assertiveness, and general academic performance, the latter which may be inversely correlated[6]. CA also generally relates to social phobia[9].

In the performing arts world, many performers often deal with "performance anxiety"(PA), very closely related to CA. Wilson observes that "stage fright" symptoms are very similar to general phobia or fear reactions, involving activation of the sympathetic branch of the autonomic nervous system[10] . Specific symptoms may involve the heart pumping harder and faster, an energy burst, the lungs and breathing becoming more aggressived (often leading to breathlessness), GI reactions leading to "butterflies" and a feeling of nausea, "dry mouth", vision blurring, perspiration (e.g., "sweaty palms"), and "pins and needles" skin sensitivity. Indeed, many engineering students with a high level of CA express similar experiences prior to giving a speech.

Many performers will acknowledge that good performance is often intimately related to some anxiety or stress arousal[10]. This observation has lead to the description of the relationship between stress/anxiety and performance as an inverted-U relationship, basically the Yerkes-Dodson Law in psychology. This means the following: with no stress/anxiety, the performance is often dull and uninspired. As stress/anxiety increases, so does the quality of the performance until a maximum in the inverted-U curve is achieved ("point of maximum performance"), after which further increases lead to a deterioration in performance quality. Citing a catastrophe model, Hardy and Parfitt feel that performers quickly deteriorate when performance anxiety kicks in beyond the maximum performance point as opposed to more of a gradual tailing off in performance indicated by the inverted-U model[11].

Simple models of CA and performance anxiety are often two-dimensional models, with stress or anxiety the independent variable and some quality of the situation such as presentation or performance effectiveness the dependent variable. The inverted-U Yerkes-Dodson type of model is one example. More sophisticated three dimensional models have been proposed where two independent variables such as situational stress and task difficulty may be included (see reference 10 for an overview).

It is a basic hypothesis of this investigation that undergraduate engineering students who have participated in the performing arts (instrumental and vocal music, theater, and dance) during their secondary education years will have relatively low levels of CA at the start of their college education. More specifically, they will have lower CA levels relative to other engineering students with no previous participation in the performing arts or other activities such as forensics, debate, or related clubs and organizations. Students with such prior performing arts experiences will have been in situations that forced them to deal with CA and related

performance anxiety, often within an environment where such anxiety was expected and (to some extent, at least) addressed. Such experiences would obviously have positive effects on college-level CA.

Methodology

Freshman and sophomore engineering students were candidates for inclusion in this study. The specific inclusion criteria were: 1) engineering major; 2) the student had not completed any communications courses to date (at this institution, communication courses are required); and 3) the student had not participated in any forensics, debate, or similar oral-based club or organization. Table 1 summarizes information on the actual participants in this study. This study was conducted during three consecutive semesters starting in the Fall of 2005. As Table 1 indicates, 40 students (20.4% of total students) self-reported some previous participation in the performing arts (students could cite experience in one or more of the performing arts areas). Instrumental music was the most frequently cited area (67.5% of the 40 students), followed by vocal music, dance, and theater (11, 8, and 6 students or 27.5%, 20.0%, and 15.0% of the 40 students respectively).

The Personal Report of Communication Apprehension (PRCA) was employed as the main survey instrument in this study. The development and validation of this instrument has been reported by McCroskey and others[12-14]. The PRCA is designed to evaluate trait-like CA rather than state-like CA. "Trait" refers to long-term personality-related CA and "state" refers to CA "at this moment" (this present state). In its present form, the PRCA consists of 24 statements that the subject evaluates using a five-value scale: (1) strongly agree; (2) agree; (3) undecided; (4) disagree; and (5) strongly disagree. An algorithm is specified that derives scores in four categories: 1) group CA; 2) meetings CA; 3) interpersonal CA; and 4) public speaking CA. A total score is also obtained by adding up all the responses. Scores are interpreted as follows:

	Range of values	Low CA	High CA
Group CA	6 - 30	< 11	> 20
Meetings CA	6 - 30	< 13	> 20
Interpersonal CA	6 - 30	< 11	> 18
Public speaking CA	6 - 30	< 14	> 24
Total CA	24 - 120	< 51	> 80

Students also completed a "Performing Arts Activities" questionnaire where they indicated the extent of their involvement in each of the following categories: 1) Instrumental music; 2) Vocal music; 3) Theater; and 4) Dance. The following scale was used:

0 No experience/participation
1 Approximately ½ year participation
2 Approximately 1 year participation
3 Approximately 2 years participation
4 Approximately 3 years participation

This score was determined for the middle school (grades 6-8) years and high school years (grades 9-12) separately. As such, the minimum possible score was a zero and the maximum 16 for either the middle school or high school years, or 32 for the two added. Students who reported "0" for the questionnaire were classified "PA nonparticipants" (non-PA); students who reported a "1" or higher were classified "PA participants" (PA).

Results

Table 2 presents a summary of the results for all respondents combined and the PA and non-PA respondents separately. For all respondents, none of the mean scores exceeded the value for "high CA" for the four communication categories individually or the total score; one mean score (interpersonal) was less than the "low CA" value. Therefore, the group overall had some CA for group discussion, meetings, and public speaking in addition to overall (total score). For all respondents, the highest score was for public speaking (mean 17.7) which was closes to the required "high CA" score for any of the categories or total score. When broken out into the PA/non-PA groups, several observations were made: 1) PA students had significantly lower CA scores relative to the non-PA students in all four categories and total score, with $p < 0.01$ for all comparisons except interpersonal ($p < 0.02$); 2) none of the PA scores exceeded the "high CA" value (the public speaking score mean 13.1 was closest to the required "high CA" score of 14) ; 3) all PA scores were less than the required "low CA" values in all communication areas and total score; 4) the non-PA scores did not exceed the "high CA" values in any of the categories or total score (the public speaking mean of 23.4 was close to the "high CA" required value of 24); and 5) only interpersonal was less than the "low CA" score.

Table 2 also presents information on the number of individuals with scores either below the "low CA" score or above the "high CA" score for the four communication categories and overall, for all respondents and broken out into PA and non-PA students. For public speaking and total scores, the non-PA students had significantly more "high CA" individuals than the PA students ($p < 0.05$). Also, the PA students had significantly more "low CA" students than the non-PA students ($p < 0.03$) for interpersonal.

Table 3 presents the results of a correlation analysis that explored the correlation between the four communication categories plus total score and the extent of previous performing arts experience, broken out into middle school, high school, and total (middle and high schools added). Inspection of the results indicate: 1) for total pre-college extent of performing arts participation, meetings, public speaking, and total scores correlated with the extent of participation; 2) for high school extent of participation, meeting, public speaking, and total scores correlated with the extent of participation; 3) for middle school extent of participation, only public speaking scores correlated with the extent of participation; and 4) the public speaking correlation with extent of participation was stronger for the high school participation extent than the middle school participation extent.

Discussion

The results clearly indicate that prior performing arts experiences have a positive effect on CA for engineering students. For PA engineering students, CA scores were significantly lower for

all four communication categories and total score relative to the non-PA students. Furthermore, PA student CA score means were less than the "low CA" values throughout. Regarding public speaking and total CA score, significantly more non-PA students had "high CA" scores. In general, CA scores for meetings, public speaking, and total score correlated with pre-college performing arts experience level, with the correlation stronger for high school experience relative to middle school experience.

A number of publications and references have addressed how to reduce CA and performance anxiety. Recognizing that CA is a type of social phobia, one popular intervention involves so-called systematic desensitization where the subject is continuously exposed to the object of fear (such as public speaking) in conjunction with a supportive system of instructors/coaches and peers. Psychologists also cite the value of cognitive restructuring, where the negative reinforcers of CA may be specifically identified and subsequently dealt with. Performing arts groups often involve such interventions as part of the education and growth of the performing individual. Thus it would logically follow that engineering students with previous involvement in a positive performing arts environment would benefit in later years. The results of this study presents evidence that this is the case.

Given the often limited opportunities for engineering students to face their "object of fear" (i.e., a presentation or talk), it is not surprising that many engineering students have high level of CA. As noted above, communication skills and experiences need to be integrated into the entire engineering curriculum, not just "farmed out" to a single non-engineering course with subsequent limited verbal communication experiences. The performing arts students experience more "fear exposures" and benefit accordingly. This leads to two recommendations: 1) encourage engineering students (and pre-engineering students) to participate in the performing arts; and 2) integrate communication skills and increase the frequency of verbal communication experiences for engineering students. This will lead to more effective communicators who will serve their future employers well.

Engineering educators may indeed learn much from their performing arts counterparts about how to deal with CA, performance anxiety, and related phobias. Like the engineers, performing artists know that such anxiety can have a very negative impact on performances and in the progress of the talent in general. From one viewpoint, an engineer "performs" not that unlike a musician, dancer, or actor in that he/she must interact with other individuals and groups, "performing" their "art". The "fear" is not all that different; in fact, the "fear" is very similar.

This study focused on the positive effects of performing arts participation. It is recognized that there are other activities that may also have similar positive effects, such as participation in forensics-type clubs and organizations. This study focused on the arts and part of a larger on-going investigation into the positive effects of performing arts participation on engineering education, including positive effects CA and other aspects such as stress management and general academic performance.

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Table 1

Summary of survey participants

Total engineering students:	196
Males	111 (56.6%)
Females	85 (43.4%)
Freshmen	143 (73.0%)
Sophomores	53 (27.0%)
HS Performing Arts participation:	
Total participants:	40 (20.4%)
Instrumental music	27 (13.8%)
Vocal music	11(5.6%)
Theater/acting	6 (3.1%)
Dance	8 (6.1%)

Table 2

Summary of the PRCA scores

	Mean score (standard deviation)				
	Group discussion	Meetings	Inter-personal	Public speaking	Total Score
All respondents (n = 196)	12.6 (5.4)	14.4 (6.6)	9.9 (4.0)	17.7 (6.9)	55.7 (14.7)
Performing Arts participants (n = 40)	9.6 (2.4)	10.2 (2.5)	8.3 (2.3)	13.1 (5.4)	42.2 (9.4)
Performing Arts nonparticipants (n = 156)	16.2 (5.9)	19.5 (6.5)	10.2 (4.6)	23.4 (6.2)	72.4 (13.1)
No. respondents with Low or High CA scores:					
All respondents					
Low CA	74	66	85	43	46
High CA	5	17	1	33	16
Performing Arts participants					
Low CA	23	18	25	13	13
High CA	0	3	0	3	0
Performing Arts nonparticipants					
Low CA	51	48	60	30	33
High CA	5	14	1	30	16

Table 3

Correlation coefficients (responses from all 196 participants)

	Pearson correlation coefficient (r) (probability of significance)		
Variable (Range)[1]	Grades 7-9 PA participation (0 - 12)	Grades 10-12 PA participation (0 - 12)	Total (Grades 7-12) participation (0 - 24)
Group (6 - 24)	-0.126 (0.255)	-0.165 (0.137)	-0.156 (0.159)
Meetings (6 - 27)	-0.114 (0.307)	-0.348 (0.001)	-0.249 (0.023)
Interpersonal (6 - 22)	-0.066 (0.553)	-0.132 (0.234)	-0.249 (0.337)
Public Speaking (6 - 30)	-0.276 (0.012)	-0.518 (0.001)	-0.427 (0.001)
Total CA score (28 - 98)	-0.176 (0.115)	-0.355 (0.001)	-0.285 (0.009)

[1] Range is the value displayed by the actual data.