Communication Styles in Engineering and Other Male-Dominated Fields

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Introduction

At the end of a student team project, Veronica and David commented on their team's dynamics:

> *Veronica: It was a headache because the things that I said weren't being heard. If someone asked a question and I tried to answer it, David, especially, would interrupt me . . . so I just started to sit back and not say anything because I got tired of, you know, having to shout to be heard. It felt like it didn't matter what I said—they're not going to listen.*

> *David: Well, I think Veronica, she might have the worst view of me because she and I just come from different places. With her I kind of felt like I had to watch what I said because there were some issues there. Do you understand what I'm saying? Whereas with other people, I didn't have to make sure. If I ignored or interrupted them, it wasn't this big issue* (Wolfe, 2010, p. 80).

At the heart of the tension between Veronica and David is a conflict of communication styles. Where Veronica takes offense at David's interruptions and interprets them as a sign of disrespect, David implies that Veronica is making a "big issue" out of what he views as normal communication patterns. Focus groups of engineering students suggest that Veronica and David's team experiences are far from unusual: Women often feel that the men on their teams fail to listen to them. This consequent frustration often leads many women, like Veronica, to stop participating (Natishan, Schmidt, & Mead, 2000). For their part, male students in the focus groups complain that they have to be careful and diplomatic with women, whom men perceive as responding poorly to criticism. Such communication conflicts can contribute to a sense of social isolation that erodes women's sense of belonging and leaves them vulnerable to dropping out of STEM programs.

A communication style defines both how an individual prefers to communicate *with* others and how they interpret or perceive communications *from* others. When individuals have conflicting communication styles, they hold different ideas about what "normal" conversation should sound and be like. They have different perceptions of what is productive or unproductive communication and different standards for judging what is polite, rude, or outright dismissive behavior.

Communication styles, like clothing styles, are situational. How an individual communicates is in part a function of the context. For instance, a physician will likely adopt one communication style when interacting with patients in her practice and a different one when talking with her family at home, much as she will dress differently in these two contexts. Both men and women vary their communication to fit the social context, and both genders are able to use language features typical of the opposite gender when the situation calls for such use (Palomares, 2004, 2008; Reid, Keerie, & Palomares, 2003; Janssen &

Murachver, 2004; Thomson, 2006). As a result, similarities in how men and women respond to various social contexts are presumed to overshadow differences between the genders (MacGeorge, Graves, Feng, Gillihan, & Burleson, 2004; Dindia, 2006; Burleson & Kunkel, 2006).

Yet, while men and women display many communication similarities, many communication styles (like clothing styles) are perceived as strongly gendered. Examining how gender interacts with communication styles is important to understanding and changing the culture of STEM—and engineering in particular— because these fields favor communication styles stereotypically associated with men. One way to begin to decouple engineering identities from masculine ones is to moderate the stereotypically masculine communication norms in this profession.

Changing engineering communication norms is not just an equity issue, but changing the norms can improve the profession as a whole. Multiple studies have found that workplace managers are normally satisfied with the technical preparation of undergraduates from U.S. engineering schools, but dissatisfied with their communication and teamwork skills (see Reave, 2004, for an excellent overview of this research). Moreover, recent research suggests that engineering students actually develop habits and identities during their undergraduate years that make them *worse* team players than they were when they entered (Leonardi, Jackson, & Diwan, 2009). Given that female engineers are stereotypically perceived as superior communicators and team players than men (Faulkner, 2000; Thaler, 2005), it seems likely that changes that will make the communication norms of engineering less reliant on stereotypically masculine communication styles will lead to improved perceptions of engineers' communication competence.

At the same time that we seek to change communication norms in engineering, we need to also find ways to help women deal with the norms that currently exist. Thus, practitioners must also help women develop individualized strategies that will help them manage how they are perceived in these environments. Doing this is no easy trick. Women cannot simply be advised to adopt the masculine communication styles that dominate these settings, because women who cross gender-communication stereotypes tend to be perceived as unlikeable, socially incompetent, and difficult to work with (Bowles, Babcock, & Lai, 2007; Farley, 2008; LaFrance, 1992; Phelan, Moss-Racusin, & Rudman, 2008; Rudman, 1998; Rudman & Fairchild, 2004).

Because communication in engineering is often described as favoring "aggressive" or "competitive" communication styles associated with masculine identities (Demaiter & Adams, 2009; Leonardi et al., 2009; Miller, 2004; Natishan et al., 2000; Woodfield, 2000), the remainder of this literature overview focuses on two forms of competitive communication that cause particular problems for women engineers: self-promotion and interruptions. The review discusses the problems that these two communication norms cause not just for women but for the profession as a whole, briefly addresses some related communication styles, and recommends changes that can reduce the communication conflicts and double bind that these styles cause.

2. Self-Promotion vs. Self-Deprecation

2.1 Self-promotion
Self-promotion is a stereotypically masculine communication style involving aggressive displays of confidence that assert one's own superiority—often at the expense of others. It includes boasts and insults and shuns expressions of uncertainty. The following are examples of self-promotional speech:

A. *I found that [my team] kept looking toward me. Whenever we would get bogged down, when something wasn't right, it seemed to invariably come to me to be fixed* (Wolfe, 2010 p. 94).

B. *I got an 80 on that first assignment. I have programmed professionally in Java before, so that wasn't a problem for me. I wouldn't say that the first project was too difficult. I think that a lot of people were overwhelmed by the learning of Java. It can be, you know, a daunting task* (Leonardi et al., 2010, p. 406).

C. Students are discussing their textbook's model for writing a proposal (Wolfe & Powell, 2009, p. 12)*:*

Geoff: *Yeah, and then you try to follow the outline of the book and it's like, well, I know how I would write a proposal, and it would not be anything like that.*

Leah: *But the more you go through it, the more sense it starts to make. Like, the other night, when I did the progress report, it just kind of put everything together.*

Geoff: *Well, see, the thing is though, see . . . I'm used to seeing proposals at work, and they set it up on a memo, and there is no little headline that says "introduction"; there is no headline of "this." It's just a simple "here's the problem, here's the task. . . ." [Leah laughs] You know what I'm saying? I mean, that's not a proposal, it's a book report.*

D. Physics students are discussing a problem set (Guzzetti & Williams, 1996, p. 10):

Jason   *Number 11 is acceleration. Number 12. Inertia is mass. . . ..*
Betty: *Is 13 B?*
Jason: *[sarcastically] Yes, Betty, you are learning. Number 14 would be less. 16 is B. 15 is A. Stacey, did you get B for 17?*
Betty: *Isn't 18 B? Because gravity is interacting . . .*
Jason: *[interrupting] Betty, put in a number before you talk to me. Number 18 is C. I just proved it to you with a number. 2 = 10/5. This is a democracy; the majority wins. Quit slowing us down!*
Sally: *[to Jason] Why do you confuse everyone with your formulas?*
Jason: *They work for everything else.*

The first two examples show students contrasting their superior competence and ability to that of their peers. The student in A casts himself as the hero who rescues his less competent teammates; the student in B contrasts his expertise in Java with that of his classmates, whom he characterizes as "overwhelmed" or "daunt[ed]." In both cases, the students set up a competitive hierarchy in which their own expertise is promoted by talking about their peers' shortcomings.

In C, a student promotes his own workplace knowledge as superior to textbook knowledge. Rather than acknowledging that there may be multiple ways to write a proposal, the student simply belittles the textbook (and his teammate's acceptance of the textbook) as inferior to what he knows. Example D provides a

particularly extreme instance of self-promotion. Jason insults and then silences Betty, suggesting that she is unworthy to talk to him. He then brushes off Sally's criticisms by asserting the superiority of his formulas.

Self-promotion, such as we see in the examples above, is bound up with stereotypical expressions of masculinity: Not only have researchers found that men generally tend to self-promote more than women do (Rudman, 1998; Tonso, 2006; Wolfe & Powell, 2006), but both men and women self-promote more when discussing stereotypically male topics (Thomson, 2006). Self-promotion becomes particularly pronounced when work involves the masculine realm of technology (Ely & Meyerson, 2010; McIlwee & Robinson, 1992; Wolfe & Alexander, 2005).

In engineering, where both men and technology dominate, researchers have described self-promotional communication styles as both expected and rewarded (Ely & Meyerson, 2010; Leonardi et al., 2009; Miller, 2004; McIlwee & Robinson, 1992). Self-promotional communication styles are consistent with interpersonal qualities—including aggressiveness, authority, and competence—valued in male-dominated professions (Demaiter & Adams, 2009). Moreover, in a setting where most work is collaborative, self-promotion provides a way to recognize and rank individuals (Leonardi et al., 2009).

Women's abilities to successfully self-promote are often inhibited by fear of backlash or social sanctions for counterstereotypical behavior (Moss-Racusin & Rudman, 2010; Amanatullah & Morris, 2010). These fears of backlash are justified. Bowles et al. (2007) found that a woman who followed the exact same self-promotional negotiation script (with the exact same intonation and body language) that a man followed was perceived as less likeable and more difficult to work with. Likewise, Phelan and colleagues (2008) found that while applicants of both sexes applying for a computer manager position were perceived as stronger candidates when they stressed their technical competence, the female candidates were perceived as having weaker social skills than were male candidates following the same script. The researchers conclude that when faced with women who do not display stereotypical feminine modesty, potential employers tend to see interpersonal skills as more important than technical competence to the hiring process.

2.2 Self-deprecation
Given that self-promotion is bound up with stereotypical expressions of masculinity, it should not be a surprise that its opposite—self-deprecation—is associated with stereotypically female communication styles. Self-deprecating speech is characterized by exaggerated displays of modesty, talking about one's own shortcomings, and excessive apologizing. The following from Wolfe (2010, p. 95) are examples of self-deprecating speech:

> **E.** *Probably Stephen made the most valuable contribution 'cause he came up with the main idea and I know that I would never have been able to come up with that.*

> **F.** *I did learn quite a bit about computers, and I'm saying that only because I knew so little about that beforehand.*

Researchers have found that women are more likely than men to make such self-effacing statements (Ingram & Parker, 2002; Rudman, 1998; Wolfe & Powell, 2006) and that both men and women increase their use of self-deprecating speech when discussing a stereotypically female topic (Thomson, 2006).

As example F above suggests, women are particularly likely to be self-deprecating about their technical competence (Ingram & Parker, 2002; McIlwee & Robinson, 1992; Woodfield, 2000). Such self-deprecation about technological skill may be a way for women to avoid backlash for violating gender stereotypes. Rudman and Fairchild (2004) found that fear of backlash for performing well on gender-atypical tasks caused individuals to hide these successes. This fear of backlash can explain why women tend to be self-deprecating about their technological skills.

In addition to hiding their successes in the masculine realm, women may downplay technological competence as a way of indirectly asserting their competence in the more stereotypically feminized area of social interaction. Faulkner (2000, 2006) has described a cultural tendency to perceive technological and social competence as binary opposites. Where she found male engineers taking pride in their "nerdy" image through statements such as "I understand machines better than people" (2000, p. 767), the female engineers she observed often seemed to play down the extent to which they had fun with technology as a means of distancing themselves from such masculine stereotypes.

But this self-deprecation comes at a cost. Female engineers are often seen as lacking confidence in their technical abilities (Ingram & Parker, 2002; McIlwee & Robinson, 1992; Woodfield, 2000). Moreover, Wolfe & Powell (2009) found that self-deprecating communication styles had greater negative consequences in engineering than in other settings. The engineering men they surveyed were significantly harsher than other demographic groups—including engineering women and nonengineering men—in evaluating both male and female speakers who criticized themselves in some way. This relative intolerance for self-deprecation was particularly pronounced when evaluating speakers who admitted to making a technical mistake. Male engineers were much more likely than other groups to see these speakers as generally incapable of doing good work and were less likely than others to want to be on a team with them. The prejudice against self-deprecating female speech styles even extended to situations in which the speaker clearly seemed to be using self-deprecation as a strategy to soften criticism of a teammate's work—a strategy that many texts on conflict management appear to recommend (Cairnes, 2000; Brownwell, 1999).

2.3 Consequences of a self-promotional culture

Clearly, the self-promotional culture of engineering creates a double bind for female engineers who are caught between trying to project masculine norms of self-confidence while working to avoid backlash or social sanctions for counterstereotypical behavior (Demaiter & Adams, 2009; Miller, 2004; Moss-Racusin & Rudman, 2010; Rudman & Fairchild, 2004). One female engineer illustrated an acute awareness of this double bind when she described herself as adopting "a male approach to negotiating, not a female approach" but nonetheless acknowledged she must "recognize that I'm a female, so I would be confident, but not aggressive in that conversation" (Miller, 2004, p. 67). Such attention to impression management has been found to raise anxieties that can diminish task performance (Moss-Racusin & Rudman, 2010). Thus, fear of backlash costs female engineers considerable effort as they try to walk the tightrope between the self-promotion expected in their profession and feminine cultural norms.

But women are not the only ones affected by the self-promotional communication norms in engineering— the profession as a whole suffers. Recent research suggests self-promotional behaviors inhibit individuals from assessing their own shortcomings, learning from their mistakes, and asking others for help (Crocker & Park, 2004; Ely & Meyerson, 2010). When an oil rigging company made cultural changes to create an environment where individuals could productively discuss mistakes and admit fears (the opposite of the aggressive self-confidence found in self-promotional styles), they reduced accidents by 84% while

increasing productivity, efficiency, and reliability (Ely & Meyerson, 2010). This company, not coincidentally, also appeared to be more welcoming to female coworkers than did other similarly male-dominated work settings.

Self-promotion also inhibits successful teamwork and encourages other counterproductive work habits (Leonardi et al., 2009; Nowaczyk, 1998). Leonardi and colleagues found that students procrastinated on projects and failed to read directions not out of laziness, but because beginning an assignment late or working without a work plan or instructions made the task more difficult, and it thus became an occasion to assert their expertise and mastery of technical skills. Such demonstration of mastery was more important than good work habits. These individualistic and counterproductive behaviors actually increased as students progressed through their education. A higher proportion of seniors than freshmen engaged in these counterproductive practices, suggesting that school engineering cultures foster such tendencies, even while the official curriculum emphasizes good communication and teamwork.

3. Interruptions

Competitive communication styles are characterized by frequent interruptions, which are a way of exerting dominance. Thus, higher status individuals in a group make more interruptions than do low status individuals, and those who successfully interrupt are seen as more influential (Hall, Coates, & LeBeau, 2005; Farley, 2008). Conversely, being interrupted is seen as a sign of low status (Farley, 2008).

Interruptions—especially intrusive interruptions that silence other speakers—are associated with masculinity. A meta-analysis of 43 studies on gender and interruptions found that men make more such intrusive interruptions than women do (Anderson & Leaper, 1998), a finding supported by more recent research (Hall et al., 2005; Rhoades, McFarland, Finch, & Johnson, 2001). Women are also more likely than men to be the target of an interruption (James & Clark, 1993; Rhoades et al., 2001), a factor that may weaken their status in others' eyes (Farley, 2008).

Moreover, while both men and women who interrupt are perceived as less likeable than those who do not interrupt, these social consequences are particularly pronounced for women. A woman who interrupts is perceived as less likeable than a man who interrupts. These social consequences are most pronounced when a woman interrupts a man (Farley, 2008; LaFrance, 1992).

Some evidence suggests that African-American women are less likely than White women to be silenced by interruptions and other behaviors characteristic of competitive discussions (hooks, 1989; Kochman, 1981; Wolfe, 2000). Thus, this research on gender and interruption is likely limited to middle-class European-American norms.

Given that women are more likely than men to be the target of an interruption and more penalized for interrupting, it should not be surprising to find that women have negative reactions to what they perceive as the aggressive and rude nature of this communication style (Miller, 2004; Natishan et al., 2000; Woodfield, 2000). When women complain about competitive communication styles, men often respond by saying that women need to "toughen up" or by perceiving their dissatisfaction as a sign of technological insecurity (Natishan et al., 2000; Woodfield, 2000). Some women then respond by declining to participate in competitive conversations (Guzzetti & Williams, 1996; Natishan et al., 2000; Woodfield, 2000; Wolfe, 2010), while others respond by figuring out the "rules" that will allow them to participate as women in a masculine

domain (Miller, 2004; Sherman, 2005). Again, however, such impression management costs women who must exert effort to negotiate these situations—effort that could be better spent in other areas (Moss-Racusin & Rudman, 2010)

4. Related communication styles

This review has already shown how self-deprecation is a stereotypically female communication style that conflicts with the masculine, competitive styles favored in engineering. Other stereotypically feminine communication styles include tentative language (Reid et al., 2003; Palomares, 2009), indirect requests (LaFrance & Harris, 2004; Mulac, Bradac, & Gibbons, 2001; Wolfe & Powell, 2006), and apologies (Bataineh & Bataineh, 2005). Not only do these studies show that women use more of these styles (particularly when encouraged to think about gender), but the more women use them, the more stereotypically feminine they appear to men (Reid et al., 2003).

Other stereotypically masculine communication styles not already discussed include excuses (Hirt, McCrea, & Boris, 2003; Wolfe & Powell, 2006) and use of metaphors (Janssen & Murachver, 2004; Hussey & Katz, 2006; Hussey, 2009). Excuses can be viewed as the flip side of self-promotional communication. Where self-promotion involves self-praise, excuses avoid self-blame by blaming failures on external factors. Metaphors have also been linked to competitive communication, though of a playful variety (Hussey & Katz, 2006), and research on engineering settings has found extensive use of masculine metaphors dealing with war or sports (Comeau & Kemp, 2007).

5. Strategies for intervention

5.1 Work to change the self-promotional culture in engineering

As discussed above, the tendency towards self-promotion in engineering not only creates barriers to female participation but also impedes learning, fosters poor work habits, and leads to stereotypes of engineers as poor communicators. Research is clearly needed to determine the best ways to change these counterproductive habits. One promising approach is to use stereotype regeneration—a process by which behaviors and traits associated with a group are modified or redefined—to link stereotypically masculine communication styles to poor performance in engineering (Kray & Galinsky, 2002). Thus, self-promotional communication could be linked to poor work habits, low self-esteem, and individualistic mentalities that thwart effective teamwork.

Ely and Meyerson (2010) provide a compelling case study of how to "undo" gender in a masculine setting by creating a learning-oriented rather than a performance-oriented culture. The following features helped undo a self-promotional culture:
- Observing others' work followed by feedback on performance
- Making formal, collaborative reviews of mistakes in a learning environment
- Encouraging nondefensive responses to questions and challenges
- Rewarding employees for being "good listeners" and "thoughtful"

Such features could be implemented in an educational environment by requiring the videotaping and collaborative review of group work sessions or other work where interpersonal communication is important.

Practitioners should focus on undoing masculine communication styles rather than promoting feminine styles since doing so runs the risk of reinforcing stereotypes that female engineers should be primarily valued for interpersonal—not technical—skills (Faulkner, 2006; Thaler, 2005). Moreover, overly stressing female traits can penalize women who are not stereotypically feminine. Rudman and Glick (2001) found that when teamwork and interpersonal skills were emphasized in hiring criteria, women who were not stereotypically modest suffered even worse backlash than when these traits were not emphasized. Thus, overemphasizing teamwork and interpersonal skills can have the unanticipated effect of penalizing confident women.

5.2 Provide women with models for negotiating competitive communication environments

One of the most common and successful strategies for retaining women in STEM is to provide examples of individuals who have performed successfully in the domain (Lockwood, 2006; Marx & Roman, 2002). Research is needed to determine if providing women with examples of how other women have successfully negotiated competitive speech situations will help them succeed. For instance, Rudman and Glick (2001) found that women who tempered their more assertive behaviors with communal values—such as declaring that they were "team players" and more interested in "helping others" than in getting ahead—were able to convey competence without risk of backlash.

Likewise, one president of a technology company claims to use a "soft" interruption technique so that her interruptions "don't seem overly rude or pushy" but are "couched in humor to give a softer edge" (Sherman, 2005). Other businesswomen recommend forestalling potential interruptions by saying "I'm not finished yet" or holding up a hand like a stop sign (Sherman, 2005). Sharing such strategies with other women may increase their self-esteem and give them tested strategies for avoiding backlash.

Women might also be coached to avoid self-deprecation and excessive apologizing, tendencies that are viewed more harshly in engineering than other settings (Wolfe & Powell, 2009) and that some successful women have observed "really holds us back" (Commonwealth Club, 2003). Sherwood (1994) for instance, advocates a four-part strategy when accepting guilt: (1) Make a *brief* statement of contrition, (2) accept guilt, (3) explain briefly how you are going to solve the immediate problem, and (4) explain how you are going to prevent this from occurring in the future.

While such explicit instruction may run the risk of increasing stereotype threat—or the subconscious tendency to conform to negative expectations of one's group (see Singletary, Ruggs, Hebl, & Davies, 2009)—such threats can be reduced by emphasizing that external factors are responsible for women's difficulties in these speech situations. For instance, Johns, Schmader, and Martens (2005) effectively reduced gender differences on a mathematics test by telling students that any anxiety they felt was related to negative stereotypes about women's performance. Similarly, practitioners may try to reduce stereotype threat by letting women know that any anxiety they feel about promoting their technical competence is due to gender stereotypes.

5.3 Consider moving conversations online

Online conversations make interruption impossible and provide documentation of antisocial speech and thus may be more amenable to women's participation than face-to-face discussions. For instance, Lind (1999) found that women in virtual teams perceived their groups as more cohesive and supportive—and were more satisfied with their group experience—than did women in face-to-face teams. Other research suggests that women in technical settings prefer online communication (Alha & Gibson, 2003), although

these preferences may not be shared by women of all ethnic backgrounds (Wolfe, 2000). Moreover, other good reasons exist to encourage student teams to conduct more of their work online: Wolfe (2005, 2010) found that student teams over-relied on face-to-face collaboration in settings in which they would have been more productive working asynchronously.

5.4 Teach everyone about gender differences in communication

Most pressingly, students need to be made aware that women and men are often judged by different standards for engaging in identical communication. To counter this tendency, engineering students might be coached to re-examine stereotypes suggesting women are naturally nicer and more modest than men (Rudman & Glick, 2001) and to perceive women's failure to engage in certain competitive communication styles as a strategy for avoiding backlash and not a sign of insecurity or incompetence. Increased self-awareness among students will enable them to recognize and try to change traditional communication patterns.

6. State of current research and directions for future study

Current research has documented the prevalence of competitive communication styles in engineering and the ways in which fear of backlash prevents women from fully engaging in these styles. Much more research is needed, however, on how to change the communication styles that dominate a given environment. While Ely & Meyerson (2010) have presented some strategies for undoing stereotypically masculine styles in workplace settings, more research is needed on how to change a wider range of workplace and educational environments. In addition, future research should examine how to encourage gender-blind evaluations of communication acts. For instance, does making managers aware of patterns that cause them to judge women and men by different standards help mitigate the backlash experienced by assertive women? More studies are also needed to discover linguistic strategies that enable women to negotiate competitive speech situations. Finally, most research on gender and communication has focused on White women, but some evidence suggests that African-American and Hispanic women have different sets of concerns (hooks, 1989; Kochman, 1981; Wolfe, 2000). Additional research should examine barriers faced by women of other ethnic groups and assess whether the interventions that work for White women are effective in helping those from other backgrounds.

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