CHANGE: **STEREOTYPE THREAT: CAUSES, EFFECTS, AND REMEDIES**

Overview of Stereotype Threat

A phenomenon, known as "stereotype threat" was first described by Steele and Aronson in the mid-1990's [1]. It stated that minority representation in a course may lead students to feel as though their performance becomes the litmus test for the intelligence of their group. More explicitly, stereotype threat occurs when members of negatively stereotyped groups, such as women in STEM, face the possibility of confirming the stereotype about their group (i.e. women are not as talented in engineering, math or physics). Moreover, stereotype threat is known to emerge if a test is introduced as a diagnostic of one's innate ability [1,2,3,4]. For example, a woman in male-dominated classrooms such as those common in engineering, might feel as though any deficiencies in her test performance might negatively reflect on the abilities of all women [2,5]. This could cause her to underperform on tests due to stress and test anxiety [6].

Because high-stakes testing comprises a large portion of student performance measures in university engineering classrooms, this could create barriers to women's and/or minorities' full academic performance. This concern may be more pronounced in women who are talented and believe that STEM comprises a part of their academic self-identification (e.g., I am talented in engineering!). As Steele and Aronson [1] explained, "the existence of such a stereotype means that anything one does or any of one's features that conform to it make the stereotype more plausible as a self-characterization in the eyes of others, and perhaps even in one's own eyes," (p. 797).

Research on Stereotype Threat

Stereotype threat has been measured under several conditions. Spencer and Steele [3] conducted the first studies designed to examine if women's math test performance could be negatively impacted by this threat. In one study, male and female math-identified students were asked to take a challenging math test under one of two conditions: the stereotype threat condition, where participants were told that the math test had shown gender differences in the past. In the second condition, no threat was introduced. Consistent with their expectations and with the theory of stereotype threat, women's math test performance was worse than men's under stereotype threat. Moreover, portions of gender differences in SAT-M scores may be attributable to stereotype threat [7]. Also, if women are placed in a situation which evokes stereotype threat, they perform worse than men on difficult tests of mathematics as compared to easy tests of mathematics [8]. Other recent evidence indicates that stereotype threat endangered test performance for women in engineering [2]. Some have argued that spatial visualization and mental rotations give men and boys an advantage in engineering because they often excel in this task. However, recent evidence also points to this gender discrepancy as the consequence of stereotype threat [9].

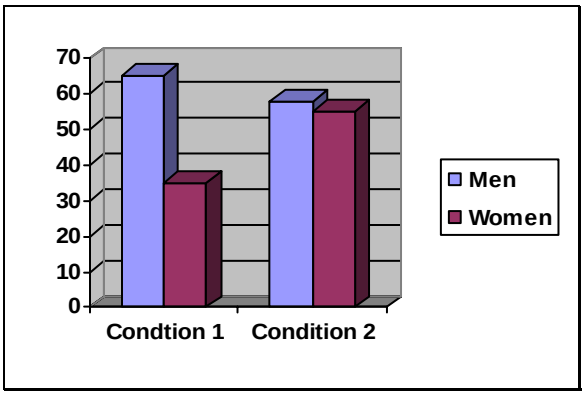

Figure 1. Stereotype Threat by Gender under Two Conditions
In the first condition, stereotype threat was introduced and a large difference was shown in math test performance. In the second condition, a teaching intervention was performed to inoculate women against the consequences of stereotype threat [7].

Stereotype threat effects have now been shown to emerge with a host of stereotyped group members:

- African-Americans [1], and Latinos [5,10] when in the minority compared to Whites;
- Students with low socioeconomic status [11] on tests labeled as indicators of intellectual ability;
- White men on a test of mathematical abilities when reminded of Asian-Americans' superior performance in mathematics [12] and,
- Asian women, when positively stereotyped for their ethnicity or race, performed well but worse when negatively stereotyped for being women [13].

A rich body of research suggests that socialization and discrimination contribute significantly to the observed gender differences in scientific domains [14]. These subtle prejudices might result in adverse effects in which pervasive unexamined gender bias could limit women's academic and career choices. Although some may consider these issues resolved, just recently the past president of Harvard stated that gendered STEM discrepancies possibly originate from innate attitudes and ability. These serve to strengthen the barriers for women in male domains.

Academic barriers usually begin in childhood, where girls begin to differentiate particular academic content by gender. These correspond to the academic areas where women have been persistently under-represented. To remedy, researchers [7,14,15,16] have staged interventions to reduce the negative effects of stereotype threat including changing educational environments so

girls and women feel less concern that they will be viewed stereotypically. Other interventions include self-affirmation and changing one's susceptibility and responses to stereotype threat through self-awareness. In another study Aronson [17] demonstrated that when giving students the impression that intelligence was not fixed but could be changed, students showed a significant improvement in their grades as well as greater enjoyment and engagement in their studies. Also, women might be reminded that verbal skills may be a better predictor of success in engineering—a skill in which women usually excel [9].

Based upon the research, recommendations for change include the following:

- **Maintain positive student/faculty interactions:** Treat all students with respect and avoid labeling some students as better than others; they may simply be more confident and efficacious, not brighter. Expect that *all* students have strengths and will succeed. Reassure students frequently. This could minimize students' insecurities about their engineering ability [14].
- **Become aware of gender biases in teaching and advising practices:** Take workshops or a training to understand how to change a classroom to make it more "female friendly". Remember, females may be uncomfortable due to their minority status, which may create stereotype threat [14].
- **Explain that effort is the most important component of success and that all students will have to work hard to succeed:** Use examples from history such as the hundreds of attempts by Edison to create the light bulb. Explain most research takes years of effort to perfect no matter how bright an individual may be [18].
- **Encourage students to take a "how to learn" course:** When possible teach students effective study and self-regulation strategies by fostering realistic expectations about the time to learn and master difficult concepts regardless of one's perceived ability [18].
- **Help students to combat test-anxiety by creating a classroom which minimizes competition:** Develop alternatives to traditional tests, give practice tests or study guides, and ensure that all students understand the testing format [6].

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