What Can Be Done?

Potential Solutions to Ameliorating Social Identity Threat for Women Scientists

Tarani Merriweather Woodson

Teachers College, Columbia University

Rouen Business School

Although it is not a new question, how to address the varied issues faced by women in the sciences is yet relevant. Indeed, progress has been made as the number of women earning doctorates in engineering and sciences has been on the incline for nearly half of a century (Malveaux, 2005). Presently, women account for approximately half of scientists in science and engineering-related occupations; however, women scientists in the STEM (Science, Technology, Engineering, and Mathematics) fields are proportionally fewer in number in academia representing approximately 31% of academics, and decreasingly so in positions of leadership (National Science Foundation, 2013). This marked advancement is not yet complete in terms of demonstrating women’s rightful place in academic science. As recently as January of 2005, Larry Summers, the then-president of Harvard University, provoked a firestorm of opposition from and on behalf of women scientists, a mark of progress in and of itself. In his remarks at the National Bureau of Economic Research (NBER) Conference on Diversifying the Science & Engineering Workforce, Summers ironically and carefully suggested that though the underrepresentation of women in science is due to many factors, innate ability could be one of them:

*“It is after all not the case that the role of women in science is the only example of a group that is significantly underrepresented in an important activity and whose underrepresentation contributes to a shortage of role models for others who are considering being in that group…It does appear that on many, many different human attributes-height, weight, propensity for criminality, overall IQ, mathematical ability, scientific ability-there is relatively clear evidence that whatever the difference in means-which can be debated-there is a difference in the standard deviation, and variability of a male and a female population. And that is true with respect to attributes that are and are not plausibly, culturally determined.”*

This instance is evidence of a persistent, negative stereotype against which women scientists contend that suggests that they are not as capable as their male counterparts of achieving in the sciences. Negative stereotypes, in turn, lower performance via the phenomenon of stereotype threat, reinforcing this cycle of perception (Steele & Aronson, 1995). Stereotype threat has been documented in hundreds of lab studies (see Nguyen & Ryan, 2008 for a review), but the investigation of long-term exposure to sustained stereotype threat is in its nascent stages (Block, Koch, Liberman, Merriweather, & Roberson, 2011). Being identified with the domain of science only furthers the likelihood that they are to experience this threat (Spencer, Steele, & Quinn, 1999). Women scientists, who have contended against this negative stereotype against their social identity for prolonged periods as demonstrated by their existence as scientists where they are likely to be in the demographic minority, are exemplary sources for what they believe should be done to mitigate the effects of this threat.

Following the seminal MIT (Massachusetts Institute of Technology) study on the status of women faculty in science (1999) and a book published by the National Academy of Sciences’ Committee on Maximizing the Potential of Women in Academic Sciences and Engineering (2006), in 2008, as one of many Advance projects of the National Science Foundation, we posed this question to 25 women scientists from an elite research university in the northeast in extensive interviews. In addressing this query in the past, reports and findings have largely and arguably rightfully focused on what can be done at the institutional level in order to mitigate the effects of this threat to women scientists. What emerged from our question were potential solutions at multiple levels: individual, group, institutional, and societal.

*How to Ameliorate the Threat at Multiple Levels*

*Individual.* In addition to demonstration that stereotype threat lowers short-term task performance, researchers have also documented strategies for reducing the effect of stereotype threat in situations. As such, many of the solutions are at the individual level of implementation. These include reframing the task such that negative stereotypes are irrelevant (Steele & Aronson, 1995; Spencer et al., 1999), emphasizing an incremental view of ability (Dweck & Leggett, 1988), even specifically naming stereotype threat as a way to alleviate the fear and providing a way to attribute anxiety externally (Johns, Schmader, & Martens, 2008; Johns, Inzlict, & Schmader, 2008). Other research affirms that the use of self-affirmation (Martens, Johns, Greenberg, & Schimel, 2006) and providing role models (real or imagined) may also ameliorate the threat (McIntyre, Paulson, & Lord, 2003).

Individual-level strategies, however, have varying levels of effectiveness. Some attempt to fend off the stereotype (Block et al., 2011) through invigoration or increased effort on the task (Oswald & Harvey, 2000), which can be effective if the task is relatively simple and less so the more complex the task (Steele & Aronson, 1995), and if done long-term can adversely affect one’s health (James, LaCroix, Kleinbaum, & Strogatz, 1984). Others make internal attributions about lowered performance perhaps to deny the relevance of the negative stereotype (Block et al., 2011) and in order to regain a sense of control (Branscombe & Ellemers, 1998). Conversely, making external attributions can serve to protect one’s self-asteem (Crocker & Major, 1989) though doing so over long periods of time can invoke feelings of powerlessness over performance (Nussbaum & Steele, 2007).

*Group.* At the group-level of responding to stereotype threat exist the strategies that seek to engender resilience against the persistence of the negative stereotype, such as challenging the stereotype through educating others and holding them accountable for their stereotypes (Blocks et al., 2011; Roberts, 2005). Another group-level strategy is taking collective action against the factors that create the likelihood of stereotype threat to occur, such increasing representative diversity (Block et al., 2011). Though these strategies can work to mitigate the group-level experience of stereotype threat, engaging in these activities can also detract away from the task-at-hand, thus also lowering objective task performance (Roberts, 2005). Moreover, being typecast as a trouble-maker can also have detrimental consequences on improving group standing, as well as gaining access to resources necessary to achieve equitable outcomes (Branscombe & Ellemers, 1998). However, in the long-term, group-level strategies are more effective than individual-level strategies of contending against stereotype threat (Block et al., 2011).

*Institutional.* In his accumulative book on stereotype threat, Steele (2011) offers potential solutions to this experience of existing negative stereotypes against a social identity, including ensuring a critical mass of representation. When the committee on women faculty was established at MIT in 1996, the purpose was to study the status of women faculty. This opened the door for many researchers and other institutions to do the same, shedding light on the reality that women were not as supported or represented as men faculty were and the myth as to why that was the case. The recommendations they reported to the administration have echoed over the years, laying out details for what could be done at the institutional level such as improving the status of and ensuring equity for senior women faculty, improving the professional lives of junior women faculty, and increasing the overall number of women faculty (MIT, 1999).

Methods

The primary goal of the research was to understand what women scientists experience and how they respond to being in the demographic minority at work at different stages in their careers. Data were collected through semi-structured interviews, as well as a demographic survey administered at the conclusion of the interviews. Participants were 26 women scientists employed at a top tier research university sampled both by by specialization (biology, geology, engineering, and earth sciences) and by career stage (post-doc through full professor). 4 women were biologists, 5 were in climate, 8 in engineering, and 9 in earth sciences. 7 women were post docs (ranging in age from 28-46 years, 4/7 married/living with partner, 1 had children, 3 being American), 10 women were junior researchers/pre-tenure (ranging in age from 31-43 years, half were married/living with partner, 2/10 had children 3/10 were American), and 9 women were senior researchers/post-tenure (ranging in age from 41-51 years, 8/9 were married/living with partner and had children, 5/9 were American). It appears that our sample yielded women scientists who followed a traditional career and family trajectory.

The main research questions were as follows:

1. Do women scientists have a perception of stereotype threat? If so, how pervasive are those perceptions?
2. At what point in their career or lifecycle do they become aware of stereotype threat?
3. What are their reactions and strategies for coping with stereotype threat?
4. How do their reactions and strategies change over time?

Additional Questions for Research were:

1. What role does having a spouse play?
2. What role does having a child play?
3. What role does pressure to date play?
4. What are the potential solutions?

This last research question is the focus of this paper. 25 women were asked the question, “What would you like to see change to ameliorate this situation for women scientists in the future?” Their answers were phenomenologically coded to consensus by 2 researchers, who were also involved in data collection. What emerged from the data were solutions at multiple levels of implementation.

Results

As seen in Table 1, the women scientists we interviewed offered solutions at individual, group, institutional, and societal levels. At the individual level, the three high-level codes were work-life balance (n=15), building confidence (n=8) and navigating the system (n=5). Work-life balance included balancing how to successfully have both a career and family, as one woman asserted,

*“Just the ever-increasing pressures and demands of work and balancing those with raising a family. We’re in an environment where the expectations are that you’re working 50 to 70 hours a week and to have a family in that circumstance is very, very stressful. So that’s the biggest one.”*

Work-life balance also includes balancing work with life outside of the family as one woman stated, *“It is nice to go hiking every now and then, you know, and do some exercise, and just hang out and do nothing, read a book…watch a movie.”*

At the group-level, the high-level codes were social support (n=12), which includes role-modeling and mentorship, and networking and building community (n=11). As one woman noted concerning the effect of role-modeling and mentorship,

*“Say you’re going to university, and lots of your professors are actually women, then that will make you feel more motivated. It’s like, ‘Oh, if she can do it, why not me?’, in that kind of way. So, obviously the more women become professors, the more women may want to stay in science and carry on and all that.”*

This sentiment was echoed by another woman scientist in terms of building community and networking, *“Definitely try to interact more, and interaction between female faculty and female students.”* And another woman stressed how necessary networking is, *“I think networking is fundamental. I mean, it's fundamental in science, and it's fundamental to survival in these types of institutions.”*

At the institutional-level, women scientists offered the most solutions. All of the women who were asked this question mentioned representation of women (n=25), including having women in leadership, increasing representation and retention. As one scientist illustrated how powerful more women in leadership positions would be and the adverse effects of not having representation,

*“I think we really need a lot more women in management, even at the director's level, even if it means creating just two director's posts tied to have that. And to have a woman who's actually gone through the system so that we can see that as a possibility. And at the moment it's like, you know, the directors offices are behind glass doors. And it's just like penetrating that glass door is just really hard. And I think, because of the feeling that you have to give that extra effort to get through, people just get discouraged. You feel that your whole biology is fighting against you.”*

In addition to women in leadership positions, having more women in general is a shared sentiment that would better the situation for all as one women affirmed, “*I think really the thing that has to change is the numbers. And whatever needs to be done to get the numbers—because once the numbers are different, it will happen. It will not happen without the numbers.”* And another pointed to evidence of the effectiveness at more equitable representation,

*“So, here in the computer science department, there are—I forget how many. Maybe four or five women. And I talked to some of my colleagues there and it really changed the way faculty meetings are run and different discussions—there’s just different points of view. It’s not necessarily just women and men, but there’s just a diversity of points of view.”*

One clear way to increase representation is to prevent attrition or increase retention, some women scientists pointed at the pipeline as reasons to the low numbers in their fields,

*“I think one thing would be how do we get women from graduate school to post-doc and post-doc to professors. I think that's one of the biggest challenges right now in academia for women, because I think a lot of women just are leaving, or they're very regimented…you're told in grad school you either have to have kids before tenure or after tenure…And so a lot of women leave, because they're like, ‘Well, I don't have time to have kids before, and I can't wait till after, so I should just not be an academic.’ So I think that's one challenge that is really pervasive.*

Also at the institutional-level, women mentioned the need for resources (n=18), including training and programs such as Advance,

*“There’s so much work out there done on how women are perceived different in academia. And so, I don’t know why [as] a premier institution, why we can’t have someone come in and speak with us, or have some ongoing training for young professors to facilitate that. If [the university] really is serious about bringing in women and retaining them, then why not provide them with some extra resources?”*

Many women mentioned that clarifying the tenure process as a necessary solution (n=17),

*“I think the university could also do a lot more to make the system more objective. I know they can’t completely make it objective, but – and they won’t, they will never make tenure or promotion prescriptive. But they can at least ensure that people write down their opinions, and document them. And I think that does make people less likely to put opinions on paper that are not appropriate.”*

And another woman affirmed, *“make the tenure process more transparent and more automatic. I think that would be great.”*

In addition to improving the tenure process, almost half of the scientists also mentioned the need for flexible career options for both women and men (n=12),

*“In some ways I think our academic training programs maybe ought to prepare students in general, not just women, but men as well, for other options. We tend to think about just replacing ourselves and having people do what we do. And we think of that as being better than other options. It might be good to just disabuse themselves of those notions and think about other ways in which people can use their talents, that are also socially responsible, that are good for – I mean, there are lots of things that people can do.”*

And not only have flexible career options, but feeling successful in choosing other career paths, as another woman noted the psychological difficulty in doing so,

*“The thing to do was to get a professorship at a good university. So, anything less than that was less. It wasn’t different, it was less. But that’s really kind of unfair. It might just perpetuate feelings of lack of self-confidence or disappointment in the women who take these other jobs.”*

Having flexible career options not only affects scientists, but can also be costly for institutions as well, as one woman pointed out,

*“I think it really has to do with recognition of the different avenues by which we get from the point A of being a young scientist to the point B of being a full professor or a senior research scientist, whatever that endpoint might be. And that the way in which institutions deal with accommodating our schedules and our lives in order to get to that point needs to change. They need to make it more flexible or more accommodating, or else they're training people, and it's very expensive to train people, and then losing them to god knows what alternative career. I think that is just a waste of resources. From purely economic point of view it's a waste of resources to do that.”*

The reality of gender bias and the need to combat that at the institutional level was a solution with which many women agreed (n=11), including equitable treatment between men and women.

*“There's another thing that's somehow different how men and women think or conduct themselves, I'm not sure which. And again it's not true for everybody of course but men seem to be a lot more secure. A colleague, actually a male colleague, said to me once, ‘When a woman says to me she didn't understand, all I derive from it is that she doesn't understand more than 90 percent. When a man says he understands everything, I'm sure he understood just half.’ And that's something to be aware of. When a guy comes to you and he says, ‘Oh, yeah, I did everything and everything's fine.’ And you are sort of still just trying to learn the subject. That doesn't actually mean you're not at the same stage. That just means he observes the world differently from the way you do…I don't know why more often men are okay with understanding 50 percent and women are not okay with understanding 90. I'm not sure where that comes from. But it is something that I have noticed.”*

Maternity and childcare benefits are relevant solutions to some women in the sample (n=9), for in the United States there exists no federal maternity leave. Therefore, there are no standard benefits that institutions offer to their employees. So one woman noted how she would like to see that addressed, *“I would like to see subsidized childcare. I mean, there is a source of subsidized childcare but it takes all of the salary of a senior scientist to pay for a child at the childcare [here]*.”

Finally, at the institutional-level, in addition to training and resources for women, a few of the scientists pointed out the men also would benefit from specific training,

*“I really wish that they made the male professors…maybe they could do it for everyone. But have sensitivity training. I really do, because they just seem not too sensitive sometimes. And when I say ‘sensitivity training,’ you know what I mean: training on how to work with different people.”*

Ultimately, some of the women scientists interviewed believe that the solution exists outside of the individual or institution and that change needs to occur at the societal level for there to be sustainable change. Many scientists noted raising awareness as a necessary solution (n=10) as one aptly noted, *“I think we’re battling an awful lot. I think, yes. I think we need to embark on raising awareness at all levels, which to some extent is moving towards societal change.”* Several of the woman scientists pointed towards early childhood and education as a solution for ensuring equity in the future (n=9) as a woman pointed out, *“I think everything starts in the family level. I think if you are raised such a way that you are told you have choices, you will make a good choice. I think that's important.”* And a couple of the more optimistic women scientists (n=2) believed that change is happening now,

*“I think in the next, I don't know, 20 years, it's going to look really different, and I think that will be really welcome and really nice. I think once the old guard moves out, it will be very different, at least in ecology. I can't say that's true of engineering or any, you know, but ecology, the women that are in their 30s and 40s, I think they outnumber the men right now. The only problem is that because they're younger, they don't have a lot of the power within the departments, and so yeah, I think once that old guard moves out, there are actually women in the higher positions within the ecology departments. I think it will look different, but I think it's starting to happen already, like that change is starting to occur already…you have to wait it out.”*

Discussion

In *Beyond Bias and Barriers* (2006) the National Academy of Science acknowledged the reality of negative stereotype of a group’s scientific or academic ability as precursor for discrimination and systemic disadvantage faced by those in the demographic minority, along with the lack of mentors and exclusion from the networks that aid in advancement. Many of the documented solutions for improvement to the situation of women scientists were echoed in our sample, particularly those at the individual and institutional levels of change. Notably, every woman in our sample mentioned representation of women needed to be changed at the institutional level, having both a critical mass (Steele, 2011), and women in leadership (Valian, 2000).

Optimistically, a few of our younger woman scientists commented that change is happening now. With the increase of both men and women being in dual-earner couples, change is occurring across the board. However, this change is slowest moving in the academic sciences where women face an additional stereotype against their gender identity. Hopefully, with the continuation of this line of research and the implementation of change in society and multiple institutions, the change that is sought is happening and will continue such that the negative stereotype of women’s scientific ability will completely be eradicated.

References

Block, C. J., Koch, S. M., Liberman, B. E., Merriweather, T. J., & Roberson, L. (2011). Contending With Stereotype Threat at Work: A Model of Long-Term Responses 1Ps7. *The Counseling Psychologist*, *39*(4), 570–600.

Branscombe, N. R., & Ellemers, N. (1998). Coping with group-based discrimination: Individualistic versus group-level strategies. In J. K. Swim & C. Stangor (Eds.), Prejudice: The target’s perspective (pp. 243-266). San Diego, CA: Academic Press.

Committee on Maximizing the Potential of Women in Academic Science and Engineering, Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, & Institute of Medicine of the National Academies. (2006). Beyond biases and barriers: Fulfilling the potential of women in academic science and engineering. Washington, DC: National Academies Press.

Dweck, C. S., & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95,* 256-273.

[Johns, M., Schmader, T., & Martens, A. (2005)](http://reducingstereotypethreat.org/bibliography_johns_schmader_martens.html). Knowing is half the battle: Teaching stereotype threat as a means of improving women's math performance. *Psychological Science, 16,* 175-179.

[Martens, A., Johns, M., Greenberg, J., & Schimel (2006)](http://reducingstereotypethreat.org/bibliography_martens_johns_greenberg_schimel.html). Combating stereotype threat: The effect of self-affirmation on women's intellectual performance. *Journal of Experimental Social Psychology, 42,* 236-243.

[McIntyre, R. B., Paulson, R., & Lord, C. (2003)](http://reducingstereotypethreat.org/bibliography_mcintyre_paulson_lord.html). Alleviating women's mathematics stereotype threat through salience of group achievements. *Journal of Experimental Social Psychology, 39,* 83-90.

[Nguyen, H.-H. D., & Ryan, A. M. (2008)](http://reducingstereotypethreat.org/bibliography_nguyen_ryan.html). Does stereotype threat affect test performance of minorities and women? A meta-analysis of experimental evidence. *Journal of Applied Psychology, 93,* 1314-1334.

[Nussbaum, A. D., & Steele, C. M. (2007)](http://reducingstereotypethreat.org/bibliography_nussbaum_steele.html). Situational disengagement and persistence in the face of adversity. *Journal of Experimental Social Psychology, 43,* 127-134.

Oswald, D. L., & Harvey, R. D. (2000). Hostile environments, stereotype threat, and math performance among undergraduate women. *Current Psychology: Developmental, Learning, Personality, Social*, *19*, 338-356.

Roberts, L. M. (2005). Changing faces: Professional image construction in diverse organizational settings. Academy of Management Review, 30, 685-711.

[Steele, C. M., & Aronson, J. (1995).](http://reducingstereotypethreat.org/bibliography_steele_aronson.html) Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology, 69,* 797-811.

[Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999)](http://reducingstereotypethreat.org/bibliography_spencer_steele_quinn.html). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35,* 4-28.

Summers, L. 2005. Remarks at the NBER Conference on Diversifying the Science & Engineering Workforce: http://www.harvard.edu/president/speeches/summers\_2005/nber.php

Table 1. Coding by Level for Potential Solutions with Ns

|  |  |  |
| --- | --- | --- |
| **Level** | **Solution** | **n = 25** |
| Individual | Work-Life Balance  Building Confidence  Navigating the System | 15  8  5 |
| Group | Social-Support   * Role-modeling * Mentorship   Networking and Building Community | 12  11 |
| Institutional | Representation   * Women in Leadership * Increase in Representation * Increase Retention   Resources   * Training for Women * Advance   Clarity of Tenure Process  Flexible Career Options  Combatting Gender Bias   * Equitable Treatment   Maternity and Childcare Benefits  Training for Men | 25  18  17  12  11  9  5 |
| Societal | Raising Awareness  Early Childhood and Education  Change is now | 10  9  2 |