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Why so few?: The role of social identity and situational cues in understanding the underrepresentation of women in STEM fields

Kathryn L. Boucher & Mary C. Murphy

Indiana University

Consider this scenario. Sarah is beginning her first year of college. She is excited to be an engineering major. Sarah feels prepared for her coursework as she got great grades in her past advanced math and science courses and received high scores on her college entrance exams. Although there were slightly more male students than female students in her math and science classes, Sarah felt like she belonged and was accepted in them. However, when she arrives at her first college classes, she is surprised to find that the vast majority of her classmates in her math and science classes are male, and most of her instructors are also male.

She has rarely considered her gender and the stereotypic expectations tied to this social identity before college; now these are unwelcome but constant thoughts as she sits in her math and science classes. Several professors make comments as to how their courses are “weeder” classes that delineate who the promising students and poor performers are, the people who “should” and “should not” be in a science or math major. These messages, coupled with the few other women present in class, signal to Sarah that she may not have what it takes to excel in math and science and, by extension, to excel as an engineer. Moreover, even if she does well, it is unclear whether other people will believe that she belongs in engineering.

Her existing knowledge and the numerous hours she spends studying results in early success in her math and science classes, but when the course material gets more difficult, her performance starts to suffer. Sarah's double concern of performing well for herself and for her gender, in spite of gender stereotypes, makes class difficulties a greater blow to her self-esteem and leads to questions of whether or not she should stay in her courses and her major. Sarah wants to ask for help, but she is afraid she would look dumb if she reaches out to her predominately male professors and classmates. Instead of dreading her attendance and spending countless hours struggling to understand the material in the math and science courses she once loved, Sarah decides to change her major to a field where she feels she has a better chance of excelling, one that is free from the identity concerns that arose in math and science.

### **Gender representation in science, technology, engineering, and math**

Unfortunately, this hypothetical scenario echoes the real life experiences of many women who enter science, technology, engineering, and math (STEM) classrooms, majors, and careers (Ceci & Williams, 2007; Margolis & Fisher, 2003). Women who have the necessary skills and interest in STEM disproportionately drop out of STEM courses and majors (Hill, Corbett, & St. Rose, 2010; National Science Foundation, 2013). Among women who graduate with degrees in STEM fields, a smaller number enter STEM careers (NSF, 2013; United Nations Educational, Scientific and Cultural Organization, 2007; U.S. Department of Labor, 2009). Women in STEM careers advance to higher positions at a slower pace and leave STEM fields at higher rates than their male counterparts (Hill et al., 2010; UNESCO, 2007). At every critical transition point, fewer and fewer women remain in STEM.

Women's underrepresentation is not solely due to highly STEM-identified women, like Sarah, leaving these fields. There is also a gender gap in students' early interest in STEM (Hill et

al., 2010; UNESCO, 2007). Although middle and high school girls and boys in the United States now take nearly equal numbers of STEM courses and receive similar grades (Brainard & Carlin, 1998; U.S. Department of Education, 2000), girls remain less interested in pursuing STEM majors in college than their male classmates. It is imperative to understand why such a large portion of the population does not appear interested or becomes disinterested in pursuing the knowledge and skills that lead to highly esteemed, plentiful, and good-paying careers.

The possibility that a female student's choice in whether to pursue and stay in STEM is constrained by societal stereotypes about who excels and belongs in STEM has spurred many questions: How are these stereotypes communicated? How are women impacted by them? How can we mitigate their influence for women? In this chapter, we review existing empirical, social psychological evidence that addresses these central questions. We focus on how individuals' social identities and the environment interact to influence their experiences in STEM contexts and, in turn, their decisions to enter and stay in STEM. Additionally, we introduce new questions that arise from applying a person-by-situation, social contextual approach to the problem of women's (and other social groups') underrepresentation in STEM.

### **Explanations for women's underrepresentation in STEM**

Multiple explanations have been posited for why women are underrepresented in STEM (for reviews, see Ceci & Williams, 2007; Halpern et al., 2007). The view that biological differences between women and men drive this underrepresentation has been supplanted by evidence revealing the importance of socialization and gender bias (Eccles, 1994; Hyde, Lindberg, Linn, Ellis, & Williams, 2008; Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman, 2012). Cultural expectations about what interests and occupations women and men

should hold as well as prejudice toward successful women in traditionally male-dominated fields are indeed influential factors in women's underrepresentation in STEM.

However, these explanations cannot fully explain the issue of underrepresentation as the percentage of women in many historically male-dominated disciplines (e.g., medicine, law) has greatly increased over the last few decades. Yet, most STEM fields have not enjoyed similar increases in women's representation (NSF, 2013; Snyder & Dillow, 2013). So what factors explain this pattern? Although social norms and prejudice undoubtedly sway women's recruitment and retention within STEM fields, we argue that how one's social identity is perceived and valued in STEM classrooms and careers plays a powerful role in whether women seek and remain in these environments.

### **Experience of social identity threat**

People are members of multiple social groups (e.g., gender, race/ethnicity, occupation). These social identities can be viewed positively (i.e., non-stigmatized group memberships) or negatively (i.e., stigmatized group memberships), and how one's group membership is valued in a particular context greatly impacts experiences within it (Tajfel & Turner, 1979). People are especially likely to be concerned that their social identity is devalued when negative stereotypes or a history of bias or exclusion exist for their social group (e.g., the "women are bad at math" stereotype; gender bias in evaluation and treatment of students in STEM classrooms; Major & O'Brien, 2005).

When an identity is perceived to be devalued, people can experience social identity threat, the worry and uncertainty that they will be viewed in terms of their social group—and not as an individual (Steele, 2010; Steele, Spencer, & Aronson, 2002). Even if individuals do not personally espouse negative views of their social identity, knowing that others, and society more

broadly, devalue this identity in a particular context is enough to evoke social identity threat when considering that context (Kiefer & Sekaquaptewa, 2007; McKown & Weinstein, 2003; Nosek et al., 2009). Thus, many women experience social identity threat when considering joining or remaining in STEM settings (Schmader, 2010; Steele et al., 2002).

*Who is most vulnerable to social identity threat?* Although anyone who is a member of a stereotyped or devalued social group can experience social identity threat, not all members of the group are equally likely to experience social identity threat or to experience it with the same intensity. People can differ in the extent to which they identify with a group membership (Tajfel & Turner, 1979; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Individuals can view a group membership as an important part of how they see themselves, as an identity they care about and highly value (i.e., higher identification). Conversely, individuals could perceive a group membership to be less important to their self-concept (i.e., lower identification).

As group identification increases, vulnerability to social identity threat increases. For example, female students who highly identify with their gender or with STEM fields are more likely to experience and are more greatly impacted by social identity threat in STEM environments than women who do not highly identify with these social identities (Cadinu, Maass, Frigerio, Impagliazzo, & Latinotti, 2003; Kiefer & Sekaquaptewa, 2007; Schmader, 2002; Spencer, Steele, & Quinn, 1999). Moreover, female students who are highly identified with both their gender and STEM fields are the most vulnerable to social identity threat. Given that individuals who are highly identified with a domain have usually experienced some level of success in it, the likely targets of social identity threat in STEM are, ironically, those who may have the strongest skills and the greatest motivation to excel in STEM classes (Good, Aronson, & Harder, 2008).

*Many forms of social identity threat.* Knowing what concerns social identity threat evokes is as important as understanding who is most impacted by it. When people perceive that they will be viewed in terms of a stigmatized group membership, they can experience a wide range of concerns that are linked to this group membership: stereotype threat concerns, belonging concerns, social exclusion concerns, and trust and fairness concerns (Murphy & Taylor, 2012). For instance, stigmatized group members can worry about confirming negative stereotypes that exist for their group, a specific form of social identity threat called stereotype threat (Steele & Aronson, 1995; Steele, 1997).

The explicit mention that male students usually perform better on STEM tasks than female students or that gender differences are likely to occur on STEM tasks reliably elicits stereotype threat concerns (Beilock, Rydell, & McConnell, 2007; Brown & Pinel, 2003; Johns, Schmader, & Martens, 2005; Keller, 2002; McIntyre, Paulson, & Lord, 2003). Even less explicit cues such as viewing stereotypical depictions of women in the media and interacting with subtly-biased individuals can lead to stereotype threat concerns (Adams, Garcia, Purdie-Vaughns, & Steele, 2006; Davies, Spencer, Quinn, & Gerhardstein, 2002; Logel et al., 2009; Mendoza-Denton, Shaw-Taylor, Chen, & Chang, 2009). For example, almost exclusively calling on male students to answer questions or asking female students if they need help in STEM classes can signal instructors' expectations and, thus, prompt concerns about gender stereotypes and one's academic performance. Female instructors' personal levels of math anxiety can also communicate gendered expectations in STEM classes as students construe their anxiety as weaker math ability (Beilock, Gunderson, Ramirez, & Levine, 2010; Gunderson, Ramirez, Levine, & Beilock, 2012).

Aspects of STEM tasks can give rise to stereotype threat concerns. Just being asked to identify one's group membership in a stigmatized group (e.g., indicating one's gender or race on a form) prior to completing an academic task invokes stereotype threat (Danaher & Crandall, 2008; Schmader & Johns, 2003). Moreover, evaluation in and of itself can elicit stereotype threat concerns, especially when the task is difficult and the stakes for success are high (e.g., getting into college or getting a good job; Jamieson & Harkins, 2010; Martens, Johns, Greenberg, & Schimel, 2006; Schmader, Forbes, Zhang, & Mendes, 2009; Schmader & Johns, 2003).

Stigmatized group members are additionally concerned as to how comfortable they will feel within a setting and to what extent they will fit in interpersonally (Cheryan, Plaut, Davies, & Steele, 2009; Murphy, Steele, & Garcia, 2014; Walton & Cohen, 2007). These belonging concerns can be triggered by many types of situational cues such as numerical underrepresentation or the presence of items associated with dominant groups that exclude one's own group. For instance, being one of few female students in a STEM class or student group can lead to belonging concerns (Inzlicht & Ben-Zeev, 2000). Cues in classroom environments like posters of famous scientists and mathematicians that only include men or stereotypically male activities can signal to female students that they may not fit in these environments (Cheryan et al., 2009; Murphy, Steele, & Gross, 2007).

Relatedly, educational contexts can communicate the extent to which members of stigmatized groups can be themselves—free from representing their larger social group (Steele et al., 2002). Stigmatized group members look for cues that suggest whether their behavior will be taken as representative of their group or whether they will be viewed as individuals (London, Downey, Romero-Canyas, Rattan, & Tyson, 2012). As one of few in a STEM class, women can become concerned that they will be expected to provide “the female perspective” on course

topics and feel the need to present the image of a woman who does not struggle with course material—proving their group’s worthiness and standing in the class. Moreover, in contexts like these, choices that are usually trivial—such as what to wear—become important decisions as they signal one’s identity (Pronin, Steele, & Ross, 2004; Seymour & Hewitt, 1997).

Although stereotype threat and belonging concerns have received the most empirical attention, members of stigmatized groups are vigilant for evidence in the environment as to how they will be treated by others (Kaiser & Miller, 2001; Major, Quinton, & McCoy, 2002). Social exclusion and discrimination concerns arise when physical and social segregation occurs along group lines. When female students are assigned to work groups with only other female students or when leadership roles in the classroom are predominately held by male classmates, female students likely experience social exclusion and discrimination concerns.

Stigmatized group members do not just wish to be included numerically, they are also vigilant for cues that, once accepted into an environment, they can trust the current environment and be treated fairly and with respect (Bergsieker, Shelton, & Richeson, 2010; Emerson & Murphy, 2014a, 2014b; Purdie-Vaughns, Steele, Davies, Dittmann, & Crosby, 2008). Few women in esteemed authority positions (e.g., principals, deans), inaction to instances of sexism, and unwillingness to discuss gender or cultural issues can instigate trust and fairness concerns. Specifically, members of stigmatized groups worry as to whether they will be afforded the same opportunities as members of non-stigmatized groups and whether they will be targets of disrespect and harassment. When it is uncertain that fair treatment will be afforded, interpersonal and institutional trust (e.g., trust in the instructor and in the education system more generally) is diminished.



Environments can vary in the number of the social identity concerns they trigger. While some situational cues may prompt a single type of social identity concern, many cues—such as numerical representation—likely spark multiple concerns at once as they raise many questions about why the cue is present in the environment. For instance, taking a STEM course with few other female classmates can lead women to have stereotype threat and belonging concerns and could possibly elicit other types of concerns. Moreover, having multiple concerns could result in greater social identity threat than having few concerns, and different concerns may be more strongly linked to certain consequences of social identity threat (e.g., underperformance, disidentification or leaving the field) than others.

*Consequences of social identity threat.* Social identity concerns have a deleterious impact on important psychological and behavioral outcomes, which have been especially well-documented for women in STEM (Nguyen & Ryan, 2008). Worrying can usurp cognitive resources needed for STEM tasks: women experiencing stereotype threat are less able to suppress their concerns and perform the cognitive operations necessary to solve difficult problems (Cadinu, Maass, Rosabianca, & Kiesner, 2005; Schmader & Beilock, 2012). In turn, reduced cognitive resources lead to poorer learning and performance (Beilock et al., 2007; Schmader & Johns, 2003; Schmader, Johns, & Forbes, 2008). Learning of novel STEM tasks, the transfer of what is learned to similar tasks, and performance on a wide range of STEM tests are impaired under stereotype threat (Nguyen & Ryan, 2008; Rydell, Rydell, & Boucher, 2010; Spencer et al., 1999; Taylor & Walton, 2011).

Additionally, social identity threat influences the way women think about themselves in relation to STEM fields. After experiencing difficulty in STEM, women with stereotype threat concerns make more attributions to their ability (e.g., “I just suck at math”) than to the situation

(e.g., “The test was really difficult.”; Koch, Müller, & Sieverding, 2008). They are also more likely to psychologically and physically disengage from STEM activities, which are evidenced by reduced interest, motivation, and persistence during these activities (Cohen & Garcia, 2005; Davies et al., 2002; Good, Rattan, & Dweck, 2012; Murphy et al., 2007; Pronin et al., 2004; Steele, James, & Barnett, 2002; Wang, Eccles, & Kenny, 2013). Over time, the chronic experience of social identity threat can lead women to disidentify with STEM domains—to avoid these domains and no longer link one’s self-esteem with performance in them—and alter their career aspirations to no longer include STEM careers.

Importantly, evidence of threat’s pernicious impact on these important educational outcomes is found in laboratory experiments as well as in real world examinations of academic experiences, performance (e.g., grades, standardized test scores), and interests (Danaher & Crandall, 2008; Good et al., 2008; Good, Aronson, & Inzlicht, 2003; Good et al., 2012; Keller, 2007; Stout, Dasgupta, Hunsinger, & McManus, 2011; Walton & Spencer, 2009). Furthermore, when women are not thinking of themselves primarily in terms of their gender or when their gender is not devalued in the current STEM context, women’s experiences in STEM are positive and similar to men’s (Spencer et al., 1999; Steele et al., 2002). The negative outcomes described above, thus, occur in actual STEM contexts and result mainly from situational differences, not stable gender differences. For these reasons, social identity threat is argued to be one of several critical factors that independently, or in concert with other factors, contribute to women’s hesitancy to enter or stay in STEM fields.

### **Social contextual approach to social identity threat**

The types of concerns discussed above and the situational cues that prompt them are common to many STEM settings that female students encounter. Whether in lecture, visiting

office hours, or studying for exams, women in STEM are exposed to situational cues that subtly question whether their gender has what it takes to succeed, whether they belong, and how others will view them and their efforts. However, do women always notice these cues and perceive them as psychologically threatening?

The same situational cue can be present in different classrooms but only noticed and perceived as threatening in those where women have been traditionally stigmatized. For instance, a female student who is one of a few women in her engineering class is more likely to notice and be concerned about this numerical underrepresentation than if she is one of a few women in her English class—a domain in which women tend to be positively viewed. The same cue can have a different meaning based on the particular context. Therefore, one's group membership interacts with the local situation to determine whether a situational cue is perceived as threatening and, thus, likely to lead to social identity threat (Murphy et al., 2007; Murphy & Taylor, 2012).

In this social contextual approach, we propose that aspects of a local context can indicate the value or importance of one's group memberships within it. There are numerous situational cues in every context. Which situational cues influence our psychological and behavioral outcomes is determined by how relevant they are to one's group memberships. Situational cues that are relevant to one's social identities and signal the value of their social groups will be especially noticed, considered, and remembered. These group memberships then become the primary identities through which one experiences the setting (Branscombe, Ellemers, Spears, & Doosje, 1999; Brewer & Brown, 1998; Tajfel & Turner, 1979; Turner et al., 1987).

For example, female students can have several social identities that are relevant in a STEM classroom (e.g., being female, being a student, being a budding scientist or mathematician). However, a situational cue in the classroom such as gender segregation or

pictures of exclusively male scientists adorning the walls can call to mind stereotypes pertaining to women in STEM, making the female identity particularly central to how female students view themselves and/or think they will be viewed by others (Ambady, Paik, Steele, Owen-Smith, & Mitchell, 2004). Such cues serve as antecedents to social identity threat as they make the devalued aspects of social identities more accessible, which can prompt worries and concerns indicative of social identity threat.

Male students in STEM classrooms are less likely to pay attention to situational cues that are relevant to female students (Murphy et al., 2014; Murphy et al., 2007). Instead, male students will notice and be influenced by situational cues that are related to other group memberships. Men in a STEM class may focus their attention on situational cues such as the number of people taking notes or the examples given by the instructor, not their gender representation or the gender of people who raise their hands. Even if they become aware of situational cues that their male identity may be relevant in STEM contexts, male students are less likely to experience social identity threat in this setting because these cues do not signal that their male identity is devalued, and may even signal that their identity is valued, in STEM (Murphy et al., 2014; Spencer et al., 1999; Walton & Cohen, 2003).

Strong situational cues such as statements that women perform worse or do not fit in as well in STEM as men are unambiguous signals that a social identity is devalued and, in turn, elicit social identity threat (Nguyen & Ryan, 2008). However, as reviewed above, situational cues need not be explicit or blatant in order to evoke social identity threat. If a situational cue's meaning and influence in the current situation is unclear or uncertain, people seek additional evidence to determine whether a social identity, such as one's gender, is devalued and may be a liability in the situation (Cohen & Garcia, 2008; Schmader et al., 2008). Vigilance subsides when

appraisals of additional situational cues signal identity safety—women will not be judged in terms of their gender in the local setting. Conversely, vigilance increases when appraisals of additional situational cues confirm the possibility of experiencing social identity threat. As a consequence of this vigilance process, seemingly innocuous cues (e.g., instructor’s sex or race) may initiate social identity threat.

### **Situational cues that signal identity safety**

Social identity threat research clearly demonstrates that situational cues have a significant impact on the appraisals of educational environments and people’s experiences within them. However, some settings may not be perceived as identity-threatening because they offer few situational cues that point to the devaluation of important social identities. Some environments may even be “identity-safe” as they signal that one’s group membership will be affirmatively accepted and respected and will not pose a barrier to success. From its inception, social identity threat research has explored not only the situational cues that lead to identity threat but also cues that communicate identity safety (Steele et al., 2002). This work has examined the efficacy of strategies that aim to reduce the influence of identity-threatening cues or add identity-safe cues in important settings such as classrooms and other evaluative situations (Cohen, Purdie-Vaughns, & Garcia, 2012; Yeager & Walton, 2011).

Situational cues that signal identity safety include those that suggest that stereotypes have no bearing on people’s outcomes in the current environment. For instance, telling women taking STEM tests that gender differences do not exist on this particular exam or that the test is unbiased (i.e., “gender-fair”) buffers women from experiencing stereotype threat and the impaired learning and performance that stem from it (Boucher, Rydell, Van Loo, & Rydell, 2012; Spencer et al., 1999; Wout, Danso, Jackson, & Spencer, 2008). Explicitly refuting the link

between negative group stereotypes and students' performance leads to the greatest reduction in stereotype threat for women in STEM because it sends a strong and clear message that one's group membership is valued (Nguyen & Ryan, 2008; Walton & Cohen, 2003). Stereotype threat concerns are also allayed by more subtle situational cues that reduce evaluation apprehension present in high-stakes testing situations. Simply relabeling a test as a problem solving exercise or a puzzle places students' focus on the assignment instead of social identity concerns, thereby leading to better performance (Brown & Day, 2006).

Additionally, situational cues that reframe the meaning of difficulty are cues to identity safety; these cues communicate that experiencing difficulty during a test or assignment is not inherently bad or identity-relevant and that difficulties can be overcome. When instructors pair critical feedback with an emphasis on high standards and assurance that students can meet these high standards, students from stigmatized groups are more likely to accept and learn from this feedback (Cohen, Steele, & Ross, 1999). Feedback given in this manner increases motivation and identification within stereotyped domains like STEM fields.

Another way to reframe the experience of difficulty is to promote a growth mindset (Dweck, 2006; Dweck & Leggett, 1988). Instructors can convey that intelligence is malleable and can be expanded by hard work and effort. This message can be imparted to students by explicitly stating in course objectives and assignments that the goal of classwork is to facilitate learning and development. Instructors that ask students to focus on their improvement and growth, not grades, communicate that the value is on learning—not proving whether you, or your group, is capable and intelligent. Furthermore, teachers can provide feedback that praises effort instead of inherent abilities. By eliminating the pressure students feel to prove their (and their group's) intelligence, these identity-safe cues increase the enjoyment and value of education and

lead to better learning outcomes and higher grades (Blackwell, Trzesniewski, & Dweck, 2007; Good et al., 2012). Given that STEM lessons and assignments are perceived to be relatively difficult, these identity-safe cues that reframe the appraisals of difficulty are particularly important for mitigating threat's impact in STEM classrooms.

Identity-safe cues likely mitigate more than just concerns about confirming negative group stereotypes. Although much of the research examining identity-safe cues has focused on these stereotype threat concerns, identity-safe cues should also reduce or eliminate concerns related to belonging, trust, and being valued and treated fairly. Numerical representation and role models are potent cues to identity safety that alleviate multiple identity-relevant concerns (e.g., stereotype threat, belonging, fairness). Having a critical mass of individuals that share one's social identity lowers the possibility of experiencing social identity threat in the setting (Inzlicht & Ben-Zeev, 2000; Murphy et al., 2007; Steele, 2010). For women in STEM classrooms, majors, and careers, being in an evaluative setting (e.g., testing, presentation, or interview situations) with other women lessens their concerns about representing their entire gender group.

Moreover, sharing group membership with successful role models (e.g., instructors, advanced students) in potentially threatening environments can buffer students of negatively stereotyped groups from stereotype threat and belonging concerns. Seeing and interacting with female STEM instructors and upperclassmen leads younger female students to have enhanced identification and interest in STEM fields (Dasgupta, 2011; Marx & Roman, 2002; McIntyre et al., 2005; McIntyre et al., 2003; Stout et al., 2011). Interestingly, belonging concerns can be reduced for members of underrepresented groups by also considering the common experiences all students share (Walton & Cohen, 2007, 2011; Wilson & Linville, 1985). When students learn that the social and academic hardships that accompany the freshman year are experienced by

most students and lessen with time, stigmatized students experience fewer belonging concerns and better academic performance. Taken together, pointing to other successful group members and emphasizing commonalities across groups can contribute to the identity safety of educational settings (Rosenthal & Crisp, 2006).

These established cues hold great promise for transforming identity-threatening environments into identity-safe ones. Many of these identity-safe cues can be easily and inexpensively incorporated into educational settings. Indeed, research suggests that even a single identity-safe cue may be sufficient in changing the whole meaning of the situation. However, before the introduction of or change in any situational cue, it is imperative to have a solid understanding of the situational cues already at play in the environment. As one situational cue can shape the interpretation of others (Purdie-Vaughns et al., 2008), it is critical to know how new and established situational cues may interact and which types of cues are most impactful under different circumstances. Future research of this nature is needed in both controlled laboratory settings and the actual educational contexts we hope to transform.

### **Future directions for social identity threat research**

Social identity threat research has drawn heavily from broader social identity theory (Tajfel & Turner, 1979; Steele et al., 2002). As such, a more intensive focus on the strength and types of social identities suggests exciting new directions for the social contextual approach to social identity threat we have detailed in this chapter. Group memberships and the importance people place on them interact with situational cues to determine the meaning of these cues and, thus, individuals' vulnerability to social identity threat. Research from this person-by-situation approach has only begun examining how the situational cue detection and appraisal process may



differ when people identify with different social groups and do so with different levels of importance or strength in stereotyped domains like STEM fields.

Women who highly identify with STEM fields may notice different and a greater number of situational cues than women who are less identified. When the same situational cue is detected by both high and low identifiers, highly identified women may infer different meanings from the cues and have lower thresholds for perceiving STEM contexts as threatening than less identified women. For example, the situational cue of instructor's gender may not mean the same thing for female students who are turned off by STEM and are just taking the class as a requirement (i.e., likely low domain identifiers) and female students who have chosen to pursue a STEM major (i.e., likely high domain identifiers). Indeed, research shows that male and female role models can actually be equally effective for recruiting women into STEM, while female role models may be most beneficial for retaining women in STEM (Akcinar, Carr, & Walton, 2011; Drury, Siy, & Cheryan, 2011).

In addition to the strength of identification, new questions arise when considering how different types of available social identities influence the detection and appraisal of situational cues. One particularly interesting question involves the experiences of members of positively viewed or non-stigmatized groups. Given that past research has almost exclusively focused on the situational cues that make members of stigmatized groups aware of their group's devalued status, future research is needed to assess the consequences of activating the identities of members of non-stigmatized groups.

In STEM classrooms, men may not think of themselves in terms of their gender identity. If they do, it will be important to determine what situational cues lead them to think of their group membership and the effects of these cues, if any, on their educational outcomes.

Experiments show that male students in STEM who are aware of their gender's positive stereotypes in this domain can experience performance boosts, an effect called stereotype lift (Walton & Cohen, 2003); although if the pressure to confirm positive group stereotypes is too high, men can also show impairment or "choking" under pressure (Beilock, Kulp, Holt, & Carr, 2004). This focus on positively stereotyped group memberships is particularly necessary when trying to mitigate the influence of social identity threat for one group, such as women in STEM, without making another group, such as men in STEM, more vulnerable to it.

In this chapter, we have discussed the experience of social identity threat in terms of having a single social identity especially salient (i.e., being female). People have multiple social identities; therefore, it is possible to have several social identities that are relevant and accessible in a setting. When multiple group memberships are negatively stereotyped (e.g., Black women or Latinas in STEM), individuals are much more likely to experience social identity threat (Gonzalez, Blanton, & Williams, 2002). People who consider multiple stigmatized identities to be important to their sense of self (i.e., high identifiers) are especially likely to experience concerns about how they will be viewed by others.

However, when one of the social identities is negatively stereotyped and another social identity is positively stereotyped (e.g., being female and being Asian), social identity threat is often eliminated. Reminding female college students, who are concerned about negative gender-math stereotypes, about the positive stereotype pertaining to college students' math abilities, relative to non-college students, eliminates the experience of stereotype threat and its usual impairment of math performance (Rydell & Boucher, 2010; Rydell, McConnell, & Beilock, 2009; Shih, Pittinsky, & Ambady, 1999). Similarly, being able to affirm other valued social identities that are not relevant to STEM (e.g., family or sports) has a positive impact of

increasing overall self-esteem and buffering students from stereotype threat and belonging concerns (Cohen, Garcia, Apfel, & Master, 2006; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Martens et al., 2006; Miyake et al., 2010). These self-affirmation techniques put students' lives in a broader context by asking students to reflect upon the most important aspects of their life outside of the classroom.

Exploring the effects of multiple social identities in specific contexts can highlight the situational cues that lead to experiences of double stigma as well as those where one social identity has a protective influence. In the case of two devalued social identities, the same cues in the stereotyped context may make both more accessible. For example, numerical representation in the classroom could signal that one's gender *and* race/ethnicity are both lenses through which one may be judged. Under these circumstances, situational cues, even subtle ones, could be perceived earlier on and the threshold for threat could be lower when individuals experience double stigma. When negatively and positively stereotyped social identities are both relevant in an environment such as a STEM classroom, the cue detection and appraisal process could differ. Due to the negativity bias (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001), more explicit cues such as critical mass or statements referring to specific positive identities may be necessary for a positively stereotyped social identity to seem relevant. Furthermore, identification with this positive social identity may need to be relatively strong to mitigate the social identity concerns stemming from the negatively stereotyped social identity.

Lastly, a social contextual approach to social identity threat that illuminates the situational cues that communicate identity threat (or safety) can help explain an intriguing pattern in women's underrepresentation in STEM. More women have been entering and staying in STEM over the last few decades; however, the magnitude of this increase varies greatly across

STEM fields (NSF, 2013; Snyder & Dillow, 2013). Women are now well-represented in the life sciences (e.g., biology, chemistry), but they continue to be grossly underrepresented in STEM fields such as physics, engineering, and computer science.

This pattern points to the possibility that STEM fields may differ in the situational cues they contain and, thus, could differ in the extent to which these fields elicit social identity threat. Alternatively, life science contexts may have similar cues to social identity threat as traditional STEM fields, but they also may have more identity-affirming cues that mitigate this threat. Perceptions of the life sciences as more people-oriented and geared toward helping others could blunt the negative impact of threatening situational cues by aligning the goals of the disciplines with the female gender role (Diekmann & Steinberg, 2013; Woodcock et al., 2012); these disciplines may even call to mind other positive social identities (e.g., team member, difference maker).

## **Conclusion**

We presented evidence of social identity threat's role in the underrepresentation of women in STEM. While women in STEM was our primary focus, the reviewed research also illuminates how belonging to negatively-viewed social groups, in general, can lead to deleterious consequences for how individuals view themselves, the situation, and their place within it. Indeed, much research supports the idea that stigmatized ethnic and racial groups are vulnerable to similar cues, processes, and outcomes (Steele et al., 2002). By focusing on the situational cues in environments, the social contextual approach described here pinpoints the cues that trigger or diffuse social identity threat. This knowledge can be used to create or transform academic settings that are welcoming to all social groups and provide opportunities to excel without the burden of negative group-based expectations.



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