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Family-Friendly STEM: Perspectives on Recruiting and Retaining Women in STEM Fields

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ABSTRACT

The under-representation of women in STEM has received considerable research attention as scholars attempt to uncover predictors of girls' and women's choice of STEM careers. Our work suggests that congruity between one's family goals and the perception that STEM careers afford those goals may be important in increasing girls' and women's interest and motivation toward STEM. In this paper, we discuss women's family goals as a factor that affects career choice and the perception that STEM fields may not be compatible with caring for one's family. We then present studies that have aimed to increase the congruity between these constructs, and suggest ways that STEM careers can be perceived as "family-friendly" and ultimately change in themselves to become "family-friendly."

KEYWORDS

family roles; STEM; gender; recruitment; retention

Family-Friendly STEM: Perspectives on Recruiting and Retaining Women in STEM Fields

The under-representation of women in science, technology, engineering, and mathematics (STEM) fields is a concern among scholars, educators, and policy-makers that has generated a wealth of research in the last 10 years. As a result of this research, intervention efforts, and changes in educational practices, the percentage of women earning advanced STEM degrees has risen, yet under-representation remains, especially in the fields of engineering, physical science, and computer science (NSF, 2014). In addition, scholars and policy-makers note the presence of a "leaky pipeline" – a trend in which women become more and more under-represented as the career level in STEM becomes more advanced (Jacobs, 2005).

The plausible reasons for gender disparities in STEM career attainment are abundant, and examination of their developmental trends offers insights. Gender differences in interest in STEM careers emerge in young adolescence and become larger in young adulthood. Various factors have been documented as contributing to gender gaps in STEM interest. Boys report higher self-efficacy in science and math than do girls, and parents' gendered expectations for success influence their children's achievement (Simpkins, Fredrick & Eccles, 2012; Watt et al., 2012). Crucial to increasing interest and self-efficacy, however, is the motivation that boys and girls have to engage in STEM (Valla & Ceci, 2013). Self-efficacy and interest come not only from the intellectual challenge of STEM fields, but also from opportunities involving others – both in the work itself (collaboration, mentorship) and in roles that co-exist (family). However, attention to communal or other-oriented goals has largely been missing from the discussion of why people pursue STEM fields. In this paper, we focus on family roles in particular as a point of theory-building and intervention. We will discuss the psychological literature that examines women's perceptions and desires concerning family roles and their perceptions of STEM fields as allowing them to have and care for a family. In addition, we will suggest intervention strategies that may help women (and men) to see an increased level of congruity between these two factors.

WOMEN'S FAMILY GOALS

In older adolescence and adulthood, men and women often look to their future and may, for the first time, consider how their occupational aspirations will interface with their future family roles. Because most emerging adults expect to marry and have children, their career goals may be affected by projected family roles. The gendered division of labor leads people to expect different roles for self and spouse: both men and women who imagined themselves as a future provider particularly valued a future spouse's homemaking qualities, and both men and women who imagined themselves as a future homemaker particularly valued a future spouse's ability to provide economically (Eagly, Eastwick & Johannesen-Schmidt, 2009). Consistent with gendered social roles, men and women may view future family roles in different ways (Fulcher & Coyle, 2011). That is, men's involvement with

family roles may lead them to choose a job with a high salary to provide for their family; women's involvement with family roles may lead them to choose a job that allows them to spend time with their family members. In fact, in adolescence and adulthood, women are significantly more likely than men to say that they want a job that allows them to spend time with their family, work part-time when their children are young, and be the primary caregiver for their future children (Weisgram, Bigler & Liben, 2010; Weisgram, Fulcher & Dinella, 2011). The congruity between one's occupational values and the perceptions that one's future career promoteaffords those values has been shown to influence the occupational choices of emerging adults in both correlational and experimental studies (Diekman, Clark, Johnston, Brown & Steinberg, 2011; Weisgram et al., 2010; Weisgram & Bigler, 2006).

COMBINING STEM CAREERS AND FAMILY ROLES

If women's future goals include spending time with and caring for their future family, they may opt in or out of STEM fields based on their perceptions of whether these jobs are "family-friendly". Indeed, research by Frome, Alfeld, Eccles, and Barber (2008) found that the primary predictor of whether a woman has opted out of a masculine career by age 25 is whether she endorses family goals at age 18. Accordingly, scholars and policy-makers have begun investigating whether STEM careers impede one's ability to achieve family goals and whether family roles impede, or bolster, one's advancement and productivity in STEM careers.

Mary Ann Mason and colleagues have conducted extensive interviews and studies with graduate students and faculty members across academia including STEM fields (Mason, Wolfinger & Goulden, 2013). In their work, they note that female academics in STEM fields are especially likely to pay a "baby penalty" – that is, female scientists with children are less likely to complete their graduate or postdoctoral programs, to attain a tenure-track STEM position, and to earn tenure than childless females, and males with and without children. The convergence of women's graduate and postdoctoral training, demanding tenure-track requirements, and women's prime fertility and child-rearing period makes career advancement in academia challenging – especially for women in STEM fields, whose research may involve extensive time commitments to laboratory or field research. In fact, the majority of parents (both men and women in STEM positions) reported taking less time off than they needed (Villablanca, Beckett, Nettiksimmons & Howell, 2011). Indeed, owing to these challenges, women may leave academic STEM jobs for jobs in industry that have more regular hours and a less demanding probationary period. This research suggests that current policies and practices present particular – though not insurmountable – challenges for women in combining STEM jobs with family roles, compared to their male and childless female peers.

Although women face these challenges as they advance through academic careers in STEM fields, little research has examined whether young women and adolescents are aware of these challenges and, if so, whether these perceptions negatively affect interest in STEM fields. In their work, Weisgram and colleagues (2010) asked

children, adolescents, and adults to rate various jobs on how much they allow them to achieve money, power, family, and altruistic goals. There was a high level of agreement among age groups, and the job of "scientist" was rated lower on affording family goals than on the other three goals assessed. In addition, Weisgram and Diekman (2014) have recently found that the perception of STEM careers as affording family goals decreases from young adolescence to early adulthood. This decrease in the perception that STEM affords family goals happens at the same time that young women are increasingly focusing on such goals, thus leading to STEM careers being seen as particularly incongruous with valued goals.

INCREASING THE PERCEPTION THAT STEM FIELDS ARE FAMILY-FRIENDLY

The literature reviewed above demonstrates that many women endorse family goals and choose jobs that allow one to spend time caring for one's family, and also that girls and women may not perceive STEM fields as allowing for these goals to be met. This incongruity may be one of the factors that are leading girls and women to opt out of STEM fields and into other fields that are more family-friendly, such as nursing or education. For example, the *goal congruity* theory of interest and engagement in STEM fields (e.g., Diekman & Steinberg, 2013) suggests that a high level of congruity between one's goals and the perception that STEM fields afford those goals increases interest and participation, whereas incongruity between these factors can decrease interest and participation. Diekman and colleagues' recent experimental work has shown that increasing the perceptions that STEM fields afford communal goals increases positivity toward entry-level science careers (Diekman et al., 2011; Diekman, Weisgram & Belanger, in press).

In our research, we have recently examined the effects of an intervention in which young adults are presented with a "day in the life" of two female scientists: (a) one who lives independently and performs various science tasks during the day; and (b) one who has a husband and children and performs the same science tasks during the day (Weisgram & Diekman, 2014). We found that women who are family-oriented and who heard about a family-oriented scientist were more positive about science careers than those who heard about a scientist in whose life these aspects are not emphasized. Other research has also demonstrated that emphasizing the work–life balance of workers in a science lab can serve to recruit women to research labs (DeFraine, Williams & Ceci, 2014).

Taken as a whole, this work suggests that intervention programs aiming to recruit girls and women to STEM fields may be successful at doing so if they increase the perception that STEM jobs are aligned with family caregiving roles. This type of intervention might take a number of forms. Given that many programs include female scientists presenting to young girls about their jobs (e.g., Weisgram & Bigler, 2006; 2007; see Liben & Coyle, 2014 for a review of STEM intervention research), program organizers could also ask these presenters to explain how they have navigated the work–life balance. For undergraduate and graduate students enrolled in STEM programs, pairing young women with mentors who share their family goals and can illuminate the ability of many scientists to achieve a work–life balance may be a successful way to maintain their enrollment and encourage

continuance in STEM programs. This mentoring mechanism may also be beneficial for early-career scientists paired with mid- or late-career scientists who have successfully navigated the tenure process and, perhaps even simultaneously, raised small children. In addition, educational materials depicting scientists (both male and female) could do more to present them as a whole person – a person with a scientific career, hobbies, and even a family. Such presentations will not only target the family goals we have focused on here, but are also likely to work against the "geeky" scientist stereotype that inhibits interest in STEM (e.g., Cheryan, Plaut, Handron & Hudson, 2013). A note of caution is warranted, however, because family-oriented scientists might face real obstacles in achieving their family goals, as noted above. Those who wish to broaden participation in STEM must thus work to change the underlying challenges faced by family-oriented individuals, as well as publicizing the successes of family-oriented individuals in STEM.

INCREASING THE "FAMILY-FRIENDLINESS" OF STEM

Increasing the *perception* that STEM careers afford family goals is certainly an important intervention mechanism for recruiting a broader pool of people into these fields. In addition to increasing this perception by way of select role models and mentors, however, scholars and policy-makers should strive to *actually make* STEM fields more family-friendly and decrease the baby penalty that women with children pay. Without this step, increased recruitment will not result in increased retention. In her advocacy work, Mason has lobbied for universities to implement family-friendly policies to benefit parents across academic fields (Mason et al., 2013). For example, policies such as stopping the tenure clock and extending maternity and paternity leave have been implemented at many universities. For STEM faculty in federally funded research programs, family-friendly policies have recently been introduced for grant awardees, including allowing for deferment of grant awards and extra funding for research lab managers to continue research while the principal investigator is on parental leave (NSF, 2011a). The director of the U.S. National Science Foundation, Subra Suresh, has indicated that these policies are "essential to our future innovation, economic prosperity and global leadership" (NSF, 2011b).

We believe that these formal policies are an excellent start to creating opportunities for women and men who seek to advance in STEM careers while balancing family obligations. However, many scholars and policy-makers note that men with children often do not take advantage of these opportunities, and women may, therefore, be reluctant to take advantage of them as well for fear of being seen as uncommitted to their field or as taking a "handout" that their male counterparts do not take (Villablanca et al., 2011). For example, in a study of women and men in biomedical professions (e.g., School of Medicine, Veterinary Medicine, and Biological Science), women were more aware than men of policies to accommodate family roles (e.g., parental leave, stopping the tenure clock), but use of these policies was remarkably low for both groups and notably lower among men than women. In the School of Medicine, 6.7% of women took advantage of family-friendly policies compared to 0% of men, and in the School of Veterinary Medicine, 11.5% of women versus 2.4% of men took advantage. Both women and men – but women in particular –

were concerned about using these policies owing to fears that they could not stop working on research projects (especially grant-funded ones) and worries that their career progress would be slowed. We commend these researchers for documenting the use and perceptions of these family-friendly policies and hope that future research will continue to do so across many STEM disciplines and research institutions. Thus, this research demonstrates that even the presence and knowledge of family-friendly policies may not be enough to encourage women (and men) to use these policies to achieve a desirable work–life balance.

We believe that a *cultural* shift in STEM fields is needed, such that family-oriented women and men are perceived as valuable assets and as committed to their field and career advancement. There are specific steps that organizations can take to achieve this culture. Policies mentioned above such as stopping the tenure clock and funding lab managers to keep research going are an important start. In addition, departments and universities can support parents in low-cost ways by scheduling meetings during school hours, providing candidates and new hires with information about local child-care centers and schools, and allowing for flexible scheduling of classes for all faculty members, especially for parents and those in dual-career academic positions. We argue that research and teaching institutions should implement family-friendly policies such as those noted above, remove any stigma or perception of stigma surrounding their use, and also use the presence of these policies for recruiting top talent to their programs – talent that may include family-oriented women and men. In addition, these programs and institutions should educate and encourage both women and men to take advantage of these policies should they have children, thus becoming family- friendly institutions themselves. Perhaps, if these policies are implemented, encouraged, and taken advantage of, workers in STEM fields will feel that their job offers a desirable work–life balance and the *perception* of these fields as family-friendly will subsequently increase among adolescent and young adult girls and women, in society at large.

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