



## Information Sheet: Increasing Diversity in STEM by Attracting Community College Women of Color



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*Sofia was a 36-year-old African-American mom and wife attending a local community college. Although she graduated from high school at 16, no one ever encouraged her to attend college, let alone pursue a degree in a science, technology, engineering, or mathematics (STEM) field. In fact, she was discouraged from science. Sofia became interested in forensic science, and while researching the field, she learned that chemistry was an important requirement. She then enrolled at the local community college while still working and found that she loved chemistry. She continued to work full time and attend the community college part time for two years until she learned about an undergraduate research experience (URE) at a nearby university. She was hesitant to quit her jobs because she felt compelled to pay her own way and contribute to the family finances. Sofia often wondered if she was smart enough to be successful in college. During an advising meeting required for admission to the URE program, she was relieved and excited to learn that if accepted, she would be placed in a paid internship working in a research laboratory and tutoring would be available for one year following her transfer. In interviews she revealed that these two factors were paramount in her decision to transfer into chemistry at the university. Peer mentoring from fellow transfer students in the URE program as well as her research experiences proved to be critical to her survival during that transition year and her subsequent graduation.*

### **Brief Review of the Literature**

The example above illustrates many of the circumstances of a typical woman of color who is attending a community college and considering whether to transfer into a STEM discipline at a university. Her journey includes discouragement away from STEM in her early education; a return to school after becoming a wife and mother who works part time to contribute to family finances; little to no exposure to STEM careers, role models, or mentoring; a lack of understanding about paid work and study opportunities in STEM; and concerns about her ability to succeed in STEM. Many women of color enter higher education through community colleges. Transfer rates of students of color to a university, however, are the lowest of all transferring students for a variety of complex reasons (Bailey & Weinger, 2002; Ornelas & Solorzano, 2004; Wassmer, Moore, & Shulock, 2004). Completion rates for transfer students in STEM at universities are lower still (7.3% after six years; Chen & Weko, 2009).

Chang (2006), Reyes (in press), and Valenzuela (2006) reveal an atmosphere in which women-of-color transfer students experienced attitudes and treatment signaling that they did not belong in universities because of age, ethnicity, gender, or preconceptions that transfer students are not adequately prepared or high quality students, and they were often treated as second-class citizens (Solorzano, Ceja, & Yosso, 2000). These attitudes are at times openly expressed by faculty and students and at other times indirectly by exclusion from activities such as study groups (Laanan, 1996; Reyes, in press; Valenzuela, 2006; Berger & Malaney, 2003). Additional challenges include first-generation college student status; extended family, social, and financial responsibilities; and culturally based gender-specific expectations (Ornelas & Solorzano, 2004). Programs and policies that integrate responses to these challenges could improve the

transfer rates and retention of women of color in STEM fields. Johnson (2005), Reyes (in press), and Valenzuela (2006) have focused on the specific needs, obstacles, experiences, and strategies for the recruitment and retention of women of color in STEM.

Collaborative programmatic efforts between two- and four-year schools for recruiting and retaining women of color in STEM from community colleges holds great promise for diversifying the STEM workforce (Rivera, 2010). Creating more seamless transfers and successful transition programs for underrepresented students from community colleges into STEM fields at universities requires concerted and collaborative leadership within and across two- and four-year higher education institutions (Rivera, 2010).

Studies have highlighted the importance of social networks (friends and peers) and social capital (access to information and opportunities for scholarships, research, and career development) on campus to integrate students and increase the sense of belonging (Auerbach, 2004; Hurtado, Carter, & Spuler, 1996; Hurtado, Han, et al., 2007). Safe or “counter spaces” that allow for gatherings, academic support, and discussion and strategies for dealing with experiences of perceived racist, sexist or other discriminatory experiences on campus have also been helpful for retention (Arbona & Nora, 2007; Heller & Martin, 1994; Reyes, in press; Tate & Linn, 2005; Wawrzynski & Sedlacek, 2003).

For students of color, off-campus social networks that include supportive family and community are also critical for persistence (Hurtado & Carter, 1997). Programming to engage K–16 youth and families and change the understanding of engineering should include community presentations by engineering professionals and students (Auerbach, 2004).

Assistance with financial aid questions (involving both students and their families) would improve persistence by diminishing the economic concerns that sometimes drive students to seek work off campus and creating “pull factors” away from studies (Arbona & Nora, 2007; Crisp, Nora, & Taggart, 2009; Nora, Cabrera, Hagedorn, & Pascarella, 1996). Financial assistance from paid undergraduate and bridge research opportunities contributes to the student’s social capital within STEM on campus and improves persistence (Crisp, et al., 2009).

### ***Practical Recommendations***

Recommendations that emerge from the literature cited in this paper are summarized below. Strategies for recruiting and retaining women of color transfers into STEM at universities arise from students’ stated needs, barriers, obstacles, and success stories.

1. Improve collaborative efforts between two- and four- year schools.
  - a. Create more articulation agreements between community colleges and universities that clearly delineate the disciplinary courses and transfer process for students.
  - b. Include courses and bridge research opportunities on the university campus like the model program at for Latinas transferring from Esperanza Community College to Smith College in California (Ornelas & Solorzano, 2004).
  - c. Provide academic skill-building workshops.
  - d. Provide workshops for women of color that focus on management of family and community responsibilities and relationships.
2. Increase the sense of belonging in STEM for women of color.

- a. Analyze the mission, website, recruiting programs, and college materials for gender- and race-free messages. For instance, are gender, ethnicity, ability, and sexual preference pictured or celebrated? Are examples of the social relevance of STEM careers highlighted?
  - b. Build awareness of family and cultural commitments among faculty and advisers to encourage inclusion of families in programmatic efforts.
  - c. Provide safe or counter spaces where women of color can discuss and create positive responses to perceived racism, sexism, and other forms of discrimination on campus.
3. Strengthen social networks and capital.
- a. Provide mentoring in multiple formats (graduate or undergraduate to high school student or middle-school student mentoring, professor to student mentoring, group mentoring, electronic mentoring). Foster cultural richness by encouraging participation with ethnic- or gender-affinity groups such as Society of Hispanic Engineers, National Society of Black Engineers, and Society for Advancement of Chicanos and Native Americans in Science.
  - b. Increase the presence of role models such as faculty of color (who are supported and acknowledged) on campus and networking with professionals of color in industry.
4. Help with financial aid.
- a. Provide financially supported bridge and undergraduate research opportunities for STEM transfers.
  - b. Provide workshops for students and families in navigating financial aid and university application processes with a special focus on students who don't fit the stereotypical student profile (e.g., married students, single parents, older returning students, transfer students, returning military, handicapped students) to increase recruitment as reported in Auerbach (2004) with Latino families.

Assessments of efforts that compare participants and nonparticipants of recruitment and retention programs will be essential to determine best practices in improving persistence to graduation. Survey instruments can be used to collect data on quality and applicability of programming components and may be preferable for certain types of data collection; however interviews and focus groups will yield richer and more in-depth information necessary for fine-tuning programs to address specific needs. Survey instruments and interview questions have been included in the pertinent studies cited in this paper (Hurtado & Carter, 1997; Hurtado, Carter, et al., 1996; Reyes, in press; Sy, 2006; Sy & Romero, 2008; Tate & Linn, 2005; Wawrzynski & Sedlacek, 2003).

Areas for future research should include qualitative and quantitative studies (disaggregated by sex and ethnicity) that examine the experiences of women of color in STEM while they are at community colleges and after they transfer to universities. Assessments that compare participants and nonparticipants of recruitment and retention programs will be essential to determine best practices in improving persistence to graduation. Also missing from the literature are studies of women of color in STEM that compare long-term impact of programmatic recruitment and retention programs on participants and nonparticipants.

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