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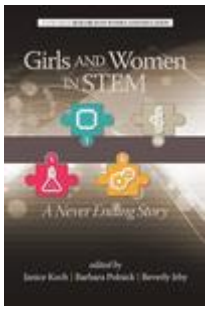

Breaking Barriers: Engaging and Retaining Women in STEM

A Review of

Girls and Women in STEM: A Never Ending Story
by Janice Koch, Barbara Polnick, and Beverly Irby (Eds.)
Charlotte, NC: Information Age Publishing Inc., 2014. 258 pp. ISBN 978-1-62396-556-3, $45.99, paperback; $85.99, hardcover

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In recent years, there has been a significant increase in the number of females pursuing science, technology, engineering, and math (STEM) college degrees; however, women are still underrepresented within STEM fields. For example, even though women represent 48% of the U.S. workforce, they make up only 24% of STEM workers (Beede et al., 2011). The scarcity of women in STEM is even more dramatic when intersected with race/ethnicity. Only 16% of African American females and 13% of Latinas in college choose a STEM major (Riegle-Crumb & King, 2010). Women's representation in STEM declines further at the graduate level and yet again in the transition to the workplace.

The underrepresentation of women in STEM fields is consistent with research on gender differences in attitudes toward math and science. Research suggests that although math ability does not differ between males and females (Hyde, 2014), attitudes toward math and science do differ (Else-Quest, Hyde, & Linn, 2010). Specifically, women report less positive attitudes toward the subjects. This is likely a result of stereotypes that assume women to perform poorly in science and math and force females to question their self-efficacy within these academic areas and cause educators to lower their expectations for women within these subjects (Hyde, 2014).

In the edited book *Girls and Women in STEM: A Never Ending Story*, the contributing authors convincingly argue that despite improvements in women's participation in STEM fields, there is still much work that needs to be done. Specifically, this book highlights the importance of considering the intersectionality of gender with race, class, and language. For example, participation in STEM fields for women of color is undermined by both stereotypes about gender and academic stereotypes related to race that compromise their learning environment and self-perceptions, discouraging their pursuit of STEM careers. This intersectionality of identities is important to consider, yet research frequently only focuses on one social identity. This approach is a strength of the book.

The book also emphasizes a developmental focus, reminding readers that at each stage of a woman's academic career there are gender-related barriers that threaten her continuation in STEM. Given that women face unique obstacles at each point of the academic process, it is crucial that interventions to encourage women in STEM fields are tailored to each of these different life phases. This includes supporting young girls in middle school to start pursuing STEM classes, encouraging females in high school to think about the possibility of a future in STEM, increasing self-efficacy and sense of belonging for undergraduate women in STEM fields, and assisting women in attaining higher degrees and preparing to enter the workforce that often has a "chilly climate."

The book's 11 chapters are organized in two parts. The first part consists of qualitative research depicting real life stories of women's experiences in STEM, which sets the context of the issues facing women pursuing these fields. The stories highlight the many barriers for women in STEM. For example, women report a sense of lack of belonging due to stereotyping, limited female role models, and direct overtly discriminatory experiences. These all can contribute to a sense of isolation and self-doubt, and ultimately to women pursing nonSTEM fields.

Part Two of the book utilizes quantitative research to guide development of interventions to encourage women's participation and continuation in STEM. Across the chapters on interventions, it appears that the best practices have some commonalities. For example, application of learning to solve practical and meaningful problems appears to improve women's attitudes toward science. Moreover, out-of-class experiences that include collaborative and hands-on learning appear to promote a more holistic teaching of science and help sustain girls' interest in STEM to encourage career exploration. The importance of role models and mentoring is also highlighted as having helped women to develop a sense of belonging and career fit and is consistent with a body of research on the importance of mentors (Oswald & Harvey, 2003).

The book also highlights that teacher education is important for supporting women's pursuit within STEM fields. These teacher-focused interventions should ensure that faculty are competent and using the best practices to teach science and math. Furthermore, teachers need to be aware of their own gender and racial biases that could influence their expectations for students and their effectiveness in the classroom. Observations of teacher interactions suggest that teachers still give more attention and feedback to male students; however, making teachers more aware of this process can be effective at reducing this gender finding (see Taube & Polnick, 2014). Additionally, it may be beneficial to incorporate culturally related teaching into the classroom so as to prepare the path for successful learning among diverse learners. Finally, professional development through the use of teacher evaluations, in which teachers self-reflect on their teaching skills and encourage feedback from other educators, has been shown to improve teacher effectiveness and promote teacher growth.

Overall, *Girls and Women in STEM* tells a compelling story of women's experiences in STEM and offers suggestions to help encourage women to successfully pursue their talents and interests. This book would be useful to educators who are designing interventions as well as for the training of math and science teachers. Business and industry leaders who are looking for ways to encourage talented women in STEM would also benefit from reading about the many barriers that women experience. As it currently stands, many talented women are

discouraged from STEM fields resulting in an unfortunate loss of talent to industry and a failure of women to realize their fullest potential.

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