Finding and Preparing Role Models in Mathematics for Girls

Lynda R. Wiest & Kellie J. Pop, University of Nevada, Reno
Contact: wiest@unr.edu

97th Annual NCTM Meeting and Exposition
San Diego, April 2019

Role Model vs. Mentor
- Role model: a person who is admired by another person as being worthy of imitating for specific purposes
- Mentor: a person who serves as a personal guide for another–usually less experienced or skilled–individual for specific purposes over a period of time

Sources: Bricheno & Thornton (2007); Mullen (2016); Vescio, Crosswhite, & Wilde (2004)

Benefits of Role Models for Girls in STEM
- Mitigate negative stereotypes of females in STEM (including ability stereotypes, which is especially important for gifted girls).
- Strengthen STEM-related dispositions (e.g., confidence, interest, sense of belonging).
- Improve STEM performance and participation, thereby promoting greater societal contributions from diverse perspectives and enhancing personal life quality.
- Address underrepresentation of females in STEM (encourage entrance into STEM careers).

Sources: Boston & Cimpian (2018); Techbridge (2013); Wiest (2019)

Qualities of Effective Role Models
- Similar to the target girls in important ways so they can "see" themselves and envision a similar path and trajectory
- Accomplished and knowledgeable in her field
- Good communicator
- Enthusiastic
- Across role models: diverse women, some of whom are from underrepresented groups

Sources: Boston & Cimpian (2018); Kekelis (2017); McCann (2013)

Cautions: Potentially Problematic Role Models
- Uninspiring or demotivating role models
- Role models who are too different from the girls or whose achievements seem unattainable
  Source: Boston & Cimpian (2018)

Role Model Preparation: Info to Provide
- Objective of the talk
- Audience composition and total number, and room set-up
- Date, time, location, and parking information
- Equipment and materials available
- Session approach and format (next below)
- Whether the talk will be conducted for a stipend or gratis

Source: Wiest (2019)

General Presentation Guidelines for Role Models
• Share personal stories and experiences.
• Bring job-related props.
• Use some job-related language but be mindful of the girls' developmental level.
• Include some discussion (e.g., pose one or more questions).
• Conduct a brief age-appropriate activity (preferably one that is not too complex and that has real-world application).
• Use minimal text on slides, and include visuals (e.g., photos).
• Show enthusiasm for the material and in interactions with the audience.
• Allow some time for questions and answers at the end.
Sources for this and next slide: Mosatche, Matloff-Nieves, Kekelis, & Lawner (2013); Techbridge (2013); Wiest (2019); Wiest, Sanchez, & Crawford-Ferre (2017)

Specific Guidelines for Role Models
• What her career is (name, brief general description)
• Why she entered this career
• Preparation needed to enter this career
• Specific types of work she does on the job, including an example of a recent or current project, and how she uses mathematics on the job
• How this occupation can help make the world a better place or improve people's lives
• To what degree and in what ways the job involves collaboration, communication, and creativity
• What she likes and does not like about the job
• Obstacles encountered in preparing for the job or on the job itself, and how she overcame them
• Personal hobbies and interests (evidence of a "rich" life beyond work)
• How she balances professional and personal life
Source: Wiest (2019)

Accessing Role Models
• Local professionals
• Word-of-mouth (e.g., social media posts)
• Contacts with local businesses or wider networks for specific occupations or hobbies (e.g., Women and Drones, womenanddrones.com, or The Ninety-Nines, an international women pilots organization, www.ninety-nines.org)
• Physical presence or online (synchronous, asynchronous)
[online benefits: negating transportation needs, providing flexibility with individual schedules, & allowing access to a broad variety of mentors, including same-age peers]
Sources: Stoeger, Hopp, & Ziefler (2017); Wiest (2019)

Possible Follow-Up Actions
• Give speakers feedback on their performance (what went well and what might be improved).
• Follow presentations with additional information or having students research facts they still want to know (e.g., typical salary or salary range for the occupation and important contributions, such as inventions, made by females within that occupation).
Sources: Kekelis (2017); Wiest (2019)

Selected Teaching Resources for Providing Female Role Models in STEM
- Biographies of Women Mathematicians: https://www.agnesscott.edu/lriddle/women/women.htm
- I'm an Engineer (Engineer Girl): https://www.engineergirl.org/Engineers/Directory.aspx
- Million Women Mentors: http://ngcproject.org/million-women-mentors
- People Like Me Resource Pack (WISE): https://www.wisecampaign.org.uk/people-like-me/the-resource-pack
- SACNAS (Society for Advancement of Chicanos/Hispanics and Native Americans in Science) Biography Project: http://bio.sacnas.org/biography/
- Techbridge Girls: Role Model Training and Resources: http://www.techbridgegirls.org/index.php?id=29
- Tutorial: How to Find Female Role Models in STEM (IWITTS): http://www.iwitts.org/free/tutorial
- Wiest, L. R. (2019). Role models for girls in maths. *Mathematics in School*, *48*(1), 7-9.
- Women @ Energy: https://energy.gov/diversity/listings/women-energy
- Women@NASA: https://women.nasa.gov/

References
- Boston, J. S., & Cimpian, A. (2018). How do we encourage gifted girls to pursue and succeed in science and engineering? *Gifted Child Today*, *41*(4), 196-207.
- Bricheno, P. & Thornton, M. (2007). Role model, hero, champion? Children's views concerning role models. *Educational Research, 49*(4) 383-396.
- Kekelis, L. S. (2017). Techbridge: Inspire a girl to change the world through STEM. In L. R. Wiest, J. E. Sanchez, & H. G. Crawford-Ferre (Eds.), *Out-of-school-time STEM programs for females: Implications for education research and practice* (pp. 55-79). Charlotte, NC: Information Age Publishing.
- McCann, T. M. (2013). Mentoring matters. *English Journal*, *102*(6), 88-90.
- Mosatche, H. S., Matloff-Nieves, S., Kekelis, L., & Lawner, E. K. (2013, Spring). Effective STEM programs for adolescent girls: Three approaches and many lessons learned. *Afterschool Matters*, 17-25. Retrieved from https://eric.ed.gov/?id=EJ1003839
- Mullen, C. A. (2016). Alternative mentoring types. *Kappa Delta Pi Record*, *52*(3), 132-136.
- Stoeger, H., Hopp, M., & Ziefler, A. (2017). Online mentoring as an extracurricular measure to encourage talented girls in STEM (science, technology, engineering, and mathematics): An empirical study of one-on-one versus group mentoring. *Gifted Child Quarterly*, *61*(3), 239-249.
- Techbridge. (2013). *A guide for role models*. Available at www.stemefg.org/index.php/download_file/view/151
- Vescio, J. A., Crosswhite, J. J., & Wilde, K. (2004). The impact of gendered heroism on adolescent girls and their sport role models. Paper presented at the at the Pre-Olympic Congress, *International Congress on Sport Science, Medicine, and Physical Education*. Thessaloniki. August.
- Wiest, L. R. (2019). Role models for girls in maths. *Mathematics in School*, *48*(1), 7-9.
- Wiest, L. R., Sanchez, J. E., & Crawford-Ferre, H. G. (2017). *Out-of-school-time STEM programs for females: Implications for education research and practice*. Charlotte, NC: Information Age Publishing.