



Educational and Social Psychological Outcomes of a STEM Program for Adolescent Girls

Keywords: STEM, fashion, adolescent, girls

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Concerns about adolescent girls' disengagement from STEM learning have prompted the development of educational programs to build girls' interest in math and science (e.g., Valla & Williams, 2012). The educational program described here, Fashion FUNdamentals (FF), is unique compared to many other STEM programs designed for adolescent girls inasmuch as it frames STEM learning within the context of fashion, a discipline rooted in STEM principles but not conventionally associated within STEM education. Fashion frequently captures adolescent girls' imaginations (Drake-Bridges & Burgess, 2010), and, as such, it may represent an apt catalyst to ignite their interest in the STEM disciplines. Connecting STEM learning to fashion is supported by world view theory, which proposes that situating STEM education in the context of "familiar phenomena of everyday life" that "hold...force in student lives" can support meaningful learning and conceptual change (Cobern, 1994, p. 21). Thus, the purpose of this research was to explore how participation in FF shaped girls' interest and confidence in the STEM disciplines, their STEM learning, and their feelings about themselves.

FF is a two-week, no-cost, summer program (M-F, 9 am-5 pm) targeting underserved adolescent girls aged 10-13 years. Faculty in the Department of XXX at XXX University developed the program, which is delivered on the university campus. Technical programming is designed to cultivate interest and aptitude in STEM disciplines by engaging girls in the hands-on application of STEM concepts to develop solutions that address real-world problems in the global fashion industry. Social programming addresses topics of concern among adolescent girls (e.g., bullying, body image/health/wellness, social media use) and is intended to positively influence girls' self-confidence/self-esteem as well as their academic performance. The program has been offered three times (2015-2017) and has served 129 girls (mean age, 11.25 years; 59.2% Caucasian; 40.8% ethnic minority; 32.6% free and reduced lunch).

At the conclusion of each year's program, the FF team conducted focus groups with participants ($n = 69$: 16 from 2015, 27 from 2016, and 26 from 2017). Focus groups included 6-10 girls. Focus group dialogue addressed participants' experiences in FF, including their impressions of how the program shaped their understanding of STEM and their sense of self. Focus group discussions were transcribed and were analyzed using the constant comparison approach. Analyses revealed five emergent themes, which are discussed below.

Theme 1: Expanding/Enriching Girls' Understanding of STEM. Girls expressed that participation in FF expanded their appreciation for the value of STEM and the relevance of STEM to everyday life contexts (e.g., fashion, cooking) in ways that they found intriguing and that they had not previously considered. Seeing STEM as "more than just atoms" and appreciating varied applications of STEM to fashion supported girls' increased interest and confidence in the STEM disciplines, in part because they experienced STEM as "fun" and

engaging. As a result of their participation in FF, girls also perceived that their STEM knowledge had expanded and shared an understanding of the interconnections among the STEM disciplines.

Theme 2: Expanding/Enriching Girls' Understanding of the Global Apparel and Merchandising (AM) Industry. Girls noted that participation in FF supported an understanding of concepts and issues central to the global AM industry, knowledge that was not familiar to them prior to their experience in the program. For example, girls articulated an understanding of concepts related to textile science (e.g., fiber properties, dyeing processes), apparel costing and pricing, and social responsibility (e.g., implications of various labor practices, implications of textile processing/consumption/disposal on the environment). Participants also observed that acknowledging the STEM foundations of AM legitimated their interest in fashion as "academic."

Theme 3: Building Girls' Foundation for Academic and Professional Success. Participation in FF developed a foundation for girls' future academic and career aspirations. Girls entering 6th grade sensed that their experience in FF had prepared them well for the transition to middle school, strengthening their STEM and social skills. Participation in FF also prompted girls to discover new academic interests (e.g., in STEM, fashion). And, offering FF to underserved girls on the XXX campus inspired girls to attain a college degree and to open their minds to diverse career possibilities, underscoring the role of STEM in varied careers.

Theme 4: Building Girls' Foundation for Personal/Social-Psychological Well-Being. Participating in FF moved girls toward increased self-acceptance, self-confidence, and self-esteem. Social programming empowered girls to stand up against bullying; to express their "authentic" selves; and to strengthen their body image. Mastery of new STEM skills, expansion of problem solving abilities, and opportunities to realize creative visions in design also fostered a sense of expanded confidence. Participants identified hands-on/experiential learning opportunities, peer and mentoring relationships, and the safe/supportive program culture as essential in supporting their personal social and emotional growth.

Theme 5: Challenges and Trials Encountered as a FF Participant/Opportunities to Strengthen the Program. Although participation in FF was largely experienced positively, a few participants did elucidate some negatively charged experiences encountered. Some participants found the STEM content to be too challenging and expressed a desire for grade-levelled program offerings. Others found that FF STEM content exacerbated their math anxiety and shared a desire for more one-on-one mentoring. And, some participants were disappointed that not all FF participants shared their enthusiasm for STEM. Finally, at the conclusion of the program, not all participants regarded STEM learning as relevant to their everyday lives, suggesting opportunities to further strengthen program content contextualizing STEM learning.

Participating in FF can support girls' STEM interest/confidence/comprehension as well as their self-confidence and educational and career preparedness, suggesting that adopting a lens of fashion to explore the STEM disciplines can promote girls' academic and personal development. Future FF offerings will provide additional one-on-one mentoring and will continue to emphasize the value of STEM in various everyday, academic, and professional contexts. Future plans also include evaluating longitudinal outcomes of FF participation and disseminating the FF curriculum to educators at other institutions with AM programs.

References

- Coburn, W.W. (1994). Worldview theory and conceptual change in science education. *Scientific Literacy and Cultural Studies Project, 15*. Retrieved from http://scholarworks.wmich.edu/science_slcsp/15
- Drake-Bridges, E., & Burgess, B. (2010). Personal preferences of tween shoppers, *Journal of Fashion Marketing and Management, 14*(4), 624-633.
- Valla, J.M., & Williams, W.M. (2012). Increasing achievement and higher-education representation of under-represented groups in science, technology, engineering, and math fields: A review of current K-12 intervention programs. *Journal of Women Minorities in Science and Engineering, 18*(1), 21-53.