How Robotics Programs Influence Young Women's Career Choices: A Grounded Theory Model

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Abstract

Women in college, alumnae of a well-known high school robotics program, shared how it influenced their career choices and who they have become in this qualitative study. A general system theory model was developed using grounded theory practices, after conducting online focus groups and interviews.

Problem

Women remain less than 20% of engineering, physics, and computer science graduates in the U.S. after 20+ years of intervention programs. **Talent, aptitude, and skills are not the obstacle; the issue is choice** (Ceci & Williams, 2010; Fouad, N., Fitzpatrick, M., & Liu, J. P., 2011)

- US is losing innovative contributions from those missing women in engineering, physics, and computer science
- By not considering these challenging and high paying professions, women are missing out (National Academy of Engineering, 2008; National Academies, 2006).

Purpose

The main purpose of this qualitative grounded theory study was to **explore how a high school robotics program**—*For Inspiration and Recognition of Science and Technology* (FIRST) *Robotics Competition* (FRC)—**influenced young women's college major (career) choices**.

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Relevant Literature

Conceptual Framework

Career theory factors influencing career choice:

1. **Experiential activities** (Roe, 1952; Super & Bachrach, 1957; Super et al., 1957).
2. **Supportive relationships** (Buck, G., Plano Clark, V., Leslie-Pelecky, D., Lu, Y., & Cerda-Lizarraga, P., 2008; Mertz, 2004; Roe, 1952; Roe & Siegelman, 1964; Super & Bachrach, 1957).

Grounded Theory Practices

- Charmaz, K. (2006).
- Charmaz, K., & Bryant, A. (2010).
- Harry, B., Sturges, K. M., & Klingner, J. K. (2005, March).

Focus Groups and Interviewing

- Kamberelis, G. & Dimitriadis, G. (2005).
- Seidman, I. (2006)

Research Questions

How did FRC influence young women's career choices?

a. How and when did young women make their career decisions and college program selections?

b. How did the experiential part of the FRC program influence career choice?

c. What FRC heroes affected the young women and how?

d. How does a team's gender composition, that is, a single-gender versus mixed-gender team, make a difference, if any?

Procedures

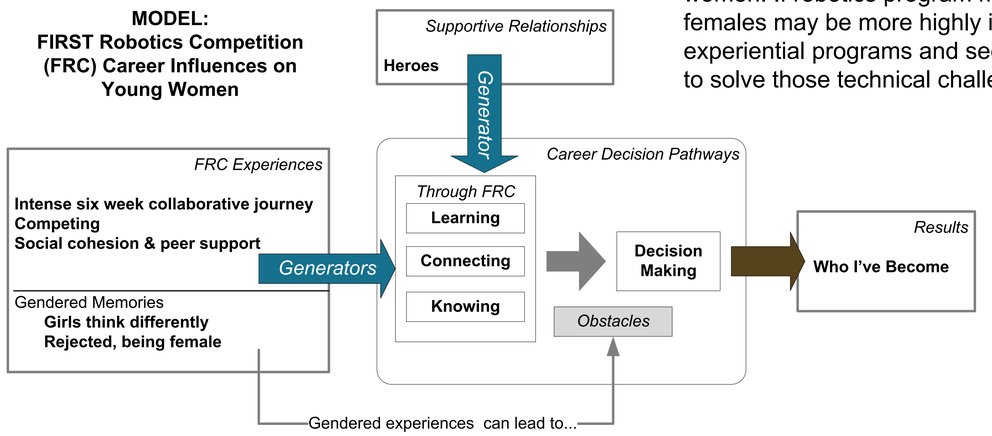
Online asynchronous focus groups offered young women a safe space to share their stories and memories. **One-on-one interviews** (online and face-to-face) explored ideas and categories further. Young women in both Science, Engineering, Technology, and Mathematics (STEM) and non-STEM careers were included from northern California FRC teams. **Observations** of a current robotics competition, photograph sharing, and **stakeholder reviews** provided additional triangulation steps.

Data Analysis

Grounded theory practices were foundational to the qualitative process.

Findings

General system theory type model grew from the analysis. Model resonated with mentors, researchers, and high school students currently in FRC teams.



Limitations

Participants were limited to 10 women in college, who were FRC alumnae, and all from northern California (by design). Further research is necessary to explore other regions in the United States.

Conclusions

Stories from the young women validated conceptual framework elements. The nascent model offers a foundation for further research.

Study recommendations included ideas to **foster connections to real-world challenges**, to **develop training programs for mentors**, and to **nurture social cohesion** (Notter, 2010), a mostly untapped area.

Ensuring that experiential activities are **relevant and connected to world problems** is important for women. If robotics program make these connections, females may be more highly influenced by these experiential programs and see themselves in careers to solve those technical challenges.

Social Change Implications

Programs that **encourage young women to move outside their comfort zone** and consider STEM careers or that help solidify their beginning love for solving engineering problems are something society needs.

Moreover, **engineering cultures need to change** to become more welcoming and interesting to young women. If improving these kinds of intervention programs inspire young women to pursue careers in engineering, physics, and computer science, then society will benefit.