

Gender differences in STEM career and educational choices of alumni of an urban, museum-based after-school program.

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Introduction & Framework

The Museum of Science and Industry, Chicago has run the **Science Minors and Achievers** (hereafter: SMA) program since 2005. SMA is an adolescent youth development program focused on scientific inquiry, communication, leadership and college readiness skills. Activities take place mostly on weekends during three ten-week periods throughout the year. The typical participant is active over the course of 2+ years. In 2015, the Museum conducted a retrospective longitudinal study of the first ten years of program alumni to answer the question: “What impact did participating in SMA have on STEM educational and career interests of alumni?”.



Retrospective studies looking at the long-term impacts of out of school time (OST) STEM experiences have suggested that they can provide opportunities to engage in STEM-related activities and practices, ways of thinking and communities. They act as an “...anchoring force in the learning ecologies of many individuals and communities...” (p. 195) (Brevan, 2013). McCreedy and Dierking’s (2013) investigation of the long-term impact of six OST programs for girls found they helped to shape women’s personal identities and life trajectories related to science. Learning happens across the physical spaces of home, school, informal institutions and communities and across diverse social material and other contexts (Bell, Bricker, Reeve, Zimmerman & Tzou, 2013). A key framework for our analysis is hybridity - where educators and learners form a new environmental place by combining elements of home, society and the classroom to generate knowledge, identity and discourse (Calabrese Barton, Tan & Rivet, 2008). It is as an effective way to look at how girls in particular view the scientific community since it addresses issues of identity, knowledge, skills and goals from a broad sociocultural perspective.

The Programs-Activities-Relationships-Culture (PARC) model (Hirsch, Deutsch & DuBois, 2011) can help describe and frame the variety of experiences youth have in the program. In a long-lasting, varied program like SMA it is important to look at culturally-relevant and community-specific needs of the participants at a variety of scales from the very small to very large (Williams & Deutsch, 2016). PARC can speak to the hybrid nature of the program specifically because it provides a mechanism for looking at culture of the space, the youth-staff relationships, the program activities and how they intersect and affect different youth in different ways.

Methodological Approach

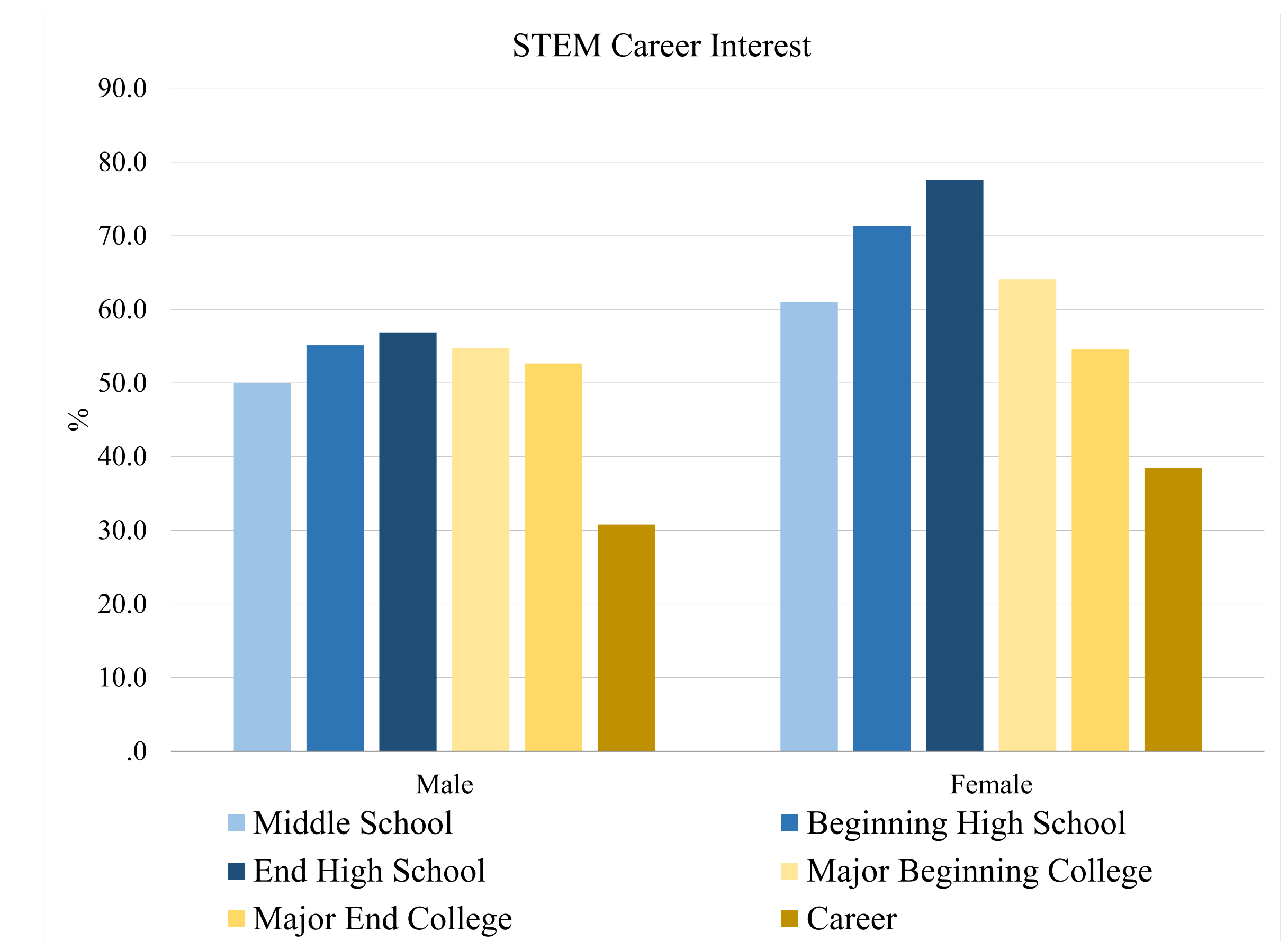
We reached out to **573** past participants (alumni) with online and postal-mailed surveys. Gift card incentives were offered in an attempt to attenuate the positive response bias. The survey instrument included measures for science attitudes, program memories, educational/career paths and demographics. The research team developed a new Hybridity Scale, which asked respondents to rate, on a scale of 1-10, whether the program’s physical space, staff members, and social environment each felt less or more like 1) home 2) school and 3) being with friends. To measure their educational and career interests, we asked participants to tell us what college majors/careers they were interested at various points in their life. We received responses from **170** alumni (mean age = 21 [SD=2]). They self-identified as **67%** female and **33%** male. Racial and ethnic makeup was **43%** African American, **24%** Latino/Hispanic, **15%** White (non-Hispanic), and the remaining categories were less than **6%** each. **28** participated in semi-structured interviews to look for deeper meaning behind the survey responses.



Analysis & Findings

Educational and career interests were coded into STEM or non-STEM categories based on definitions by the NSF (NSF, 2014). Interest in STEM careers by females increased more than males, $F(5, 62) = 3.97, p < .01, \eta^2 = .06$. Neither race nor SES was a statistically significant covariate at the $p = .05$ level. We found no relationship between final STEM career destination for females and their science attitude scores, age, SES, or race. However, we did find females tended to associate staff with teachers more than males. On a scale of 1-10 where 10 was a lot like teachers, females rated the staff at 5.7 while males at 5.1, $F(1, 168) = 5.91, p < .05, \eta^2 = .03$. There were no other differences in the hybridity scales.

In the interviews, female participants refer to staff as more like **teachers** and **family** (fictive kinship), while male participants saw them more as **mentors**. Beyond that, both genders alike found that key program elements were the extensive contact hours, strong relationships with staff, the diverse nature of the youth (demographics and interests) and the role the Museum plays as a physical space and community institution.



STEM Career Interest of Science Achievers Alumni

The *Growing YOUTH!* Project

Findings are limited in a number of ways, including possible positive response bias and the lack of a comparison group. Our new project, *Growing YOUTH!*, will follow three cohorts (~200) over a five-year period using a wide variety of culturally valid and sensitive instruments and frameworks. Quantitative data will be collected through surveys, tests, and program participation metrics. Qualitative data will be collected through semi-structured interviews and deep immersion participant-observation research using critical ethnographic methods. Comparison groups will be recruited from other OST programs both within and outside of the Museum.

Note: When we used an open-ended question to ask for participants’ gender identification, participants listed either male, female or no clear answer. However, we also recognize that gender and social identities are not fixed and not all youth identify with a gender binary.

Project Staff

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