

# A Look at the First Two Years of a 5-Year Longitudinal Study of an OST Program's Impact on STEM Career Interest

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**Abstract:** We report on the first two years' of data for a longitudinal study about the impact of a STEM-based high school OST program on career interests. Quasi-experimental survey data from 132 youth across two annual cohorts is analyzed. Results show the treatment group (program alumni) dropped by 10% while the control group's STEM career interest dropped by 34% after their first year of college. Results suggest this program's impact may extend into early college experiences.

## Introduction

This study focuses on a museum-based, positive youth development program based on scientific inquiry, public speaking/self-efficacy and college readiness. Typically beginning at the start of high school, youth visit for 10 Saturdays in a session with up to 3 sessions per year. The average youth is active in the program for 2.6 years. Developing YOUth! is a multi-year study of the program supported by the National Science Foundation (DRL#1514593). Following a quasi-experimental design, the study includes an annual, longitudinal survey of graduates from the SMA program along with a control group consisting of youth who have recently visited a science themed cultural institution. Three cohorts will be followed for at least 5 years after graduation.

## Literature review

STEM-based out-of-school time (OST) programs have shown consistent success in supporting STEM career interests of those in middle and high school (Young, Ortiz & Young, 2017). However, beyond high school there is less evidence about their impact. Retrospective studies looking at long-term impacts have suggested that they can provide opportunities to engage in STEM-related activities and practices, ways of thinking, and communities (McCreedy & Dierking, 2013). Jaber & Hammer (2016) found that opportunities in learning environments that allow students to meaningfully engage with science learning positively affect their science identity development and prolonged interest in science. Also, despite the national trend of female youth losing interest in STEM careers in high school at a higher rate than males, an earlier retrospective study of this particular program found the opposite – that female youth's STEM career interest increased more than their male counterparts (Price, Kares, Segovia & Brittian Lloyd, 2018). However, such retrospective studies are subject to positive response bias and may overstate their effect (Storksdieck, Haley-Goldman & Jones, 2002). The framework for our study is based on Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994) and ethnic identity, an individual's sense of belonging to an ethnic group defined by one's cultural heritage (Phinney & Ong, 2007), which has been linked to career decision making (Duffy & Klingaman, 2009).

## Methods

The survey is first given to graduates of the SMA program (treatment) and Museum visitors (control) in the summer after high school graduation and every summer thereafter. The survey has three sections: cultural experiences in education, attitudes towards persistence in science, and career interests. The cultural items were Likert and constructed-response items (ex: "Race mattered in my educational experience" followed by "Provide an example of when race did or did not matter in your educational experience"). The attitudes items come from a scale to measure science aspirations and related factors by Dewitt, Archer, Osborne, Dillon, Willis & Wong (2011) (Hereafter: "DeWitt scale"). Two constructed response items asked about their current career goals. They were categorized as being STEM or non-STEM based on definitions established by the National Science Foundation except that we included medical and computer science careers. Our first cohort consists of 23 treatment and 20 control group youth who took the survey in year one and 21 and 16 (respectively) who took it in year two. Our second cohort consists of 19 treatment and 72 control who took the year one survey and have not yet been given their year two survey. A third cohort will be recruited next summer. Youth self-report as 57% female, 43% male, <1% nonbinary. Ethnicity/Race reported as 46% White, 15% Hispanic, 15% multi-racial, 13% African American, 10% Asian and 2% other race/ethnicities.

## Preliminary results

While in college, the control group’s interest in STEM careers dropped from 67% to 33% (Table 1). This is in line with the 2013 NCES study of undergraduates that showed a drop in STEM career interest from 64% to 36% their first year of college (Chen, 2013). However, the treatment group’s STEM career interest only dropped from 90% to 80%.

Using repeated-measures ANOVAs, we also looked for changes in the cultural items and in the DeWitt scale factors between years 1 and 2. In the cultural items, we found no differences between groups that were statistically significant. However, we did find overall that both groups reported race mattered less and also felt more empowered in their first year of college than in high school. In the DeWitt scale, we only found a difference in a factor linked to aspirations in science,  $F(2,37) = 4.35, p < .05, \eta^2 = .12$ . In that factor, mean ratings from the control group dropped from 3.52 to 3.25 while the treatment group increased from 4.30 to 4.43. We did not find differences in levels of confidence that they can achieve their career. We did not find any relationship between racial identity and career interest.

**Table 1. Reported interest in STEM careers.**

|                  | Control<br>(N=91) |        |      | Treatment<br>(N=42) |        |      |
|------------------|-------------------|--------|------|---------------------|--------|------|
|                  | Year 1            | Year 2 | Diff | Year 1              | Year 2 | Diff |
| STEM Career Goal | 67%               | 33%    | -34% | 90%                 | 80%    | -10% |
| STEM Dream Job   | 65%               | 29%    | -36% | 81%                 | 75%    | -6%  |

## Implications

The first year of college poses substantial challenges for those majoring in STEM careers, with nearly one-third of early STEM majors switching to a non-STEM disciplines by the end of the academic year. Our data shows that a long duration, science themed OST program can help attenuate that decline. Dabney, et al. (2012) found a relationship between high school STEM OST experiences and *initial* STEM career interest in college. This study presents evidence that the association may persist through college. Results and ability to derive factors contributing to them are limited by our sample size, which is not yet large enough to allow us to do between-subjects comparisons.

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