

The Influence of Science Summer Camps on Career Interest in STEM

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Abstract

This study addresses the association between students' reported participation in science summer programs and their reported expectation of a career in the science and engineering field in the subsequent year. We collected data on 1580 students from eight middle schools in five states applying an accelerated longitudinal design. Two consecutive cohorts were sampled over a two-year period time, with four waves of data collected from each cohort. Results indicated that students who participated in science summer camps in the initial year had significantly greater odds in reporting to choose science and engineering as their future career in the subsequent year than students who did not, while accounting for differences in their initial career interest and gender as well as other demographic characters. It appears that science summer camps or programs serve students who later on are more likely to report career expectations in science and engineering.

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Introduction

Do students who report participating in science-focused summer programs have a greater likelihood of later reporting higher levels of interest and engagement in science-related activities? This question reflects an intense interest among out-of-school time science program administrators and facilitators as well as policy makers and researchers. In fact, U.S. Secretary of Education Arne Duncan emphasized “challenging the status quo” by calling people’s attention to students’ summer activities (2009). In addition, middle childhood is one of the most crucial periods for activities where young individuals are being identified through a mutual recognition of potentials and world views in the society (Erikson, 1982). A longitudinal study found that out-of-school activity participation predicted youth’s subsequent values and self-concepts of abilities (Simpkins, Davis-Kean, & Eccles, 2006). Thus middle school students’ participation in various activities largely influences their self-development and value formation. “If done right, a summer science camp can be the single most academic and career influencing experience of their lives” (Bachman, Bischoff, Gallagher, Labroo, & Schaumloffel, 2008, p. 31).

Generally speaking, studies pertaining to science summer camps have two different focuses. The first group of studies have been interested in the camp itself and what participants have learned during the camp. Many studies showed that science summer camps had positive impact on students’ study experience, self-confidence, personal autonomy, collaborative team work, subsequent adjustment, science skills, and knowledge of interdisciplinary science (Bischoff, Castendyk, Callagher, Schaumloffel, & Labroo, 2008; Fields, 2009; Sterling, Matkins, Frazier, & Logerwell, 2007; Saxon, Treffinger, Young, & Wittig, 2003; Stevens, Shin, Delgado, Cahill, Yunker, & Krajcik, 2007; Williams, Ma, Prejean, Ford, & Lai, 2007).

The other group of studies have been focusing on the effects and impacts of summer camps in the long run. Studies indicated that the science summer camp was an influential factor for students to consider studying STEM-related fields in high school or college (Bischoff et al., 2008; Gibson & Chase, 2002). However, few studies did not find statistically significant growth in students’ attitudes toward science careers (Bachman et al., 2008; Sterling et al., 2007). Another study showed that the camp was able to equip students of collegiate experience and to increase high school participants’ interest in choosing STEM fields as their college majors (Johnson, 2011).

In summary, the above studies indicate that summer camps can affect both students’ learning potential and their interest in future study. However, most studies applied relatively small samples and were mostly content-oriented—researchers used to study camps with specific content focuses and their particular effects. What is more, few studies were longitudinal or paid attention to long-run effects, not to mention the impacts on the future career choice. The research question we address in this paper is:

Are students who have once participated in summer camps or programs in the initial year more likely to consider choosing science and engineering as their future career field in the subsequent year?

Methodology

Originally, data used in this study were collected as a comparison to the 16 projects, located in various areas around the United States, which were funded through the National Science Foundation (NSF) Academies for Young Scientists (AYS) program. In the areas where those 16 AYS programs were located, we managed to gather longitudinal data from eight schools in 5 states located in urban, suburban and rural areas that agreed to participate in the study. The source of our data was a survey titled “Student Survey on Interest and Ideas about Science”, with topics including science summer program participation and future career plans.

Participants were middle school students from the eight schools who agreed to participate in this study. Specifically, two consecutive cohorts (the sixth graders and the seventh graders in the initial year) were sampled over a two-year period time, with four waves of data (surveys in the fall and spring semesters of each year) collected from each cohort.

Since it is a longitudinal study following students across two years, we selected students who were involved in the research in both years as our targeted sample. The sample size was 1580 with 639 sixth-seventh grade cohorts and 941 seventh-eighth grade cohorts. *Tables 1 and 2* present the demographic information for the participants.

Table 1. Gender information

	Percentage
Male	49.4%
Female	50.5%
Total	99.9%

Table 2. Ethnicity information

	Percentage
Asian	1.8%
Black	13.9%
Hispanic	18.3%
White	55.7%
Pacific Islander & American Indian	1.3%
Multiple Races	8.9%
Total	99.9%

Results

Participation in science summer camps. In the survey, we asked students whether they had attended science programs. Although some summer camps may include some science-related activities, but we are only interested in science camps which would spend most or all the time having students involved in various science-related activities.

Since students were followed across two years, we collected data about students’ participation in summer science camps in the initial year. As a result, students who answered “yes” to Question 6 in either Round 1 or Round 2 were classified as participators in their first year in this study. Results showed that among the 1579 valid responses, 137 (8.7%) students had been camp participators before, while 1442 (91.3%) students had not.

Future career plan. In the survey, participants were asked about their career aspiration for the future (*Figure 1*).

Figure 1. Future career question shown in the survey

17. What kind of job do you expect to be doing when you grow up?
 (Please check the ONE job category that comes closest to what you EXPECT to be doing.)

Agriculture and Natural Resources (like park rangers, farmers, gardeners)

Architecture and Construction (like builders, planners, architects)

Arts, Communications, and Tourism (like chefs, artists, fashion designers, newscasters, travel agents)

Business and Marketing (like accountants, file clerks, office managers, and receptionists)

Education and Counseling (like coaches, teachers, librarians, psychologists)

Entertainment (like musician, singer, actor/actress)

Finance (like bank tellers, economists, financial managers, insurance agents)

Government, Law, Security (like lawyers, police, inspectors, politicians, postal clerks)

Medicine (like nurses, doctors, physical therapists, dentists)

Manufacturing and Repair (like forklift operators, tailors, welders)

Science and Engineering (like scientists, engineers, computer programmers)

Sports (like professional athlete, coach)

Transportation (like pilot, truck driver, auto mechanic)

Not Working

Don't Know

If it's not on this list, please write your answer here: _____

There are various career fields in this list, among which we are interested in the field of “Science and Engineering”, since it is clearly stated and generalized, and we assume that students who prefer to work in STEM related fields will choose this option. For the same reason as the camp participation factor, we treated students who chose “science and engineering” in either Round 3 or Round 4 as those who considered science and engineering as future career in the subsequent year. As a result, among the 1222 valid responses, 169 (13.8%) students expected to work in science and engineering fields, while 1053 (86.2%) students did not.

Association between camp participation and career expectation. After providing definitions for the above two important factors, we’d like to know how much of students’ career aspirations can be accounted for by their camp participation after controlling their initial career expectation and demographic characters. To be more specific, of our interest is whether students’ participation in science summer camps before helps explain the probability of choosing science and engineering as their future career in the subsequent year after considering their career interest in the initial year and demographic information. Then a logistic regression was conducted with students’ initial career interest and demographic variables (i.e., gender, ethnicity, and school) controlled. The outcome tables are as below:

Table 3. Chi-square and Pseudo R-Square

<i>Chi-square</i>	<i>Df.</i>	<i>Sig.</i>	<i>Nagelkerke R Square</i>
259.12	16	***	.318
*p<.05 **p<.01 ***p<.001			

Table 4. Logistic regression model summary with odds ratio

Inputs	B (SE)	Sig.	Exp(B)
Intercept		Included	
Ethnicity		Included	
School		Included	
Reported Initial Career Interest		Included	
Gender		Included	
Participation in camps	.71 (.29)	*	2.03

*p<.05 **p<.01 ***p<.001

As Table 3 shows, the chi-square ($df=16$) is 259.12 (p-value <.001) and pseudo R-squared (Nagelkerke) is .318, which indicates that we can use camp participation, previous career expectation and demographic characters to explain 31.8% of variance in whether students chose science and engineering as their future career field in the subsequent year, which is significant at an α -level of 0.05. From the analysis, summarized in Table 4, it appears that camp participators have 2-times greater odds in choosing science and engineering as their future career than non-participators while accounting for differences in initial science interest and gender as well as other factors. In an effort to provide a more complete description of the associations, we examined interactions between gender and camp participation, and between initial career interest and camp participation. We did not find these interactions to be significant at an α -level of 0.05. That is to say, camp participation, initial career expectation, and gender affect students' career choices do not appear to interact.

Implications

Based on these analyses, it appears that students who reported participating in science-focused summer camps were more likely to choose science and engineering as their career fields in the subsequent year than students who did not report participating in these summer camps. This finding can be interpreted from two perspectives. First, some camp participants might have already shown interest in science before their participation, so they joined science camps expecting more interesting activities. It is hard to isolate students' interest in science from their participation in science activities. Thus we cannot directly infer that participation in summer camps will lead students to develop career expectations. However, we may conclude that science-focused summer campers have 2-times greater odds more than non-participants to report plans for future careers in science and engineering fields.

From another perspective, we may also surmise that some science-focused summer campers did not have an interest in science before their participation. As a result, these camps may have provided positive experiences with science and engineering related activities which may have influenced these students to later report science and engineering-related career plans. Regardless, which of these two perspectives one takes when considering these findings, it appears that science-focused summer camps serve students who later on have a greater odds of

reporting plans for future careers related to science and engineering and therefore have the contact with these students during a highly influential period of adolescence.

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