

Role Models Matter: Investigating Students' Science Perceptions and Identity Using Draw-A-Scientist

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Introduction

- Despite efforts to promote gender equality in STEM, there remains a persistent gender gap that seems to be related to gender biases from early childhood (Miller et al., 2018).
- Students' ideas about who can do science can impact women's beliefs about their competence and identity in science, and male bias hinders female retention in STEM fields.
- SciTrek is a science outreach program designed to give students authentic science experiences. Guided by college student mentors, this program aims to enhance students' confidence and interest in science through guided discovery learning and experimental design.
- The Draw A Scientist Task (DAST) is a measure used to gauge children's perceptions of who comes to mind when they think of a scientist.

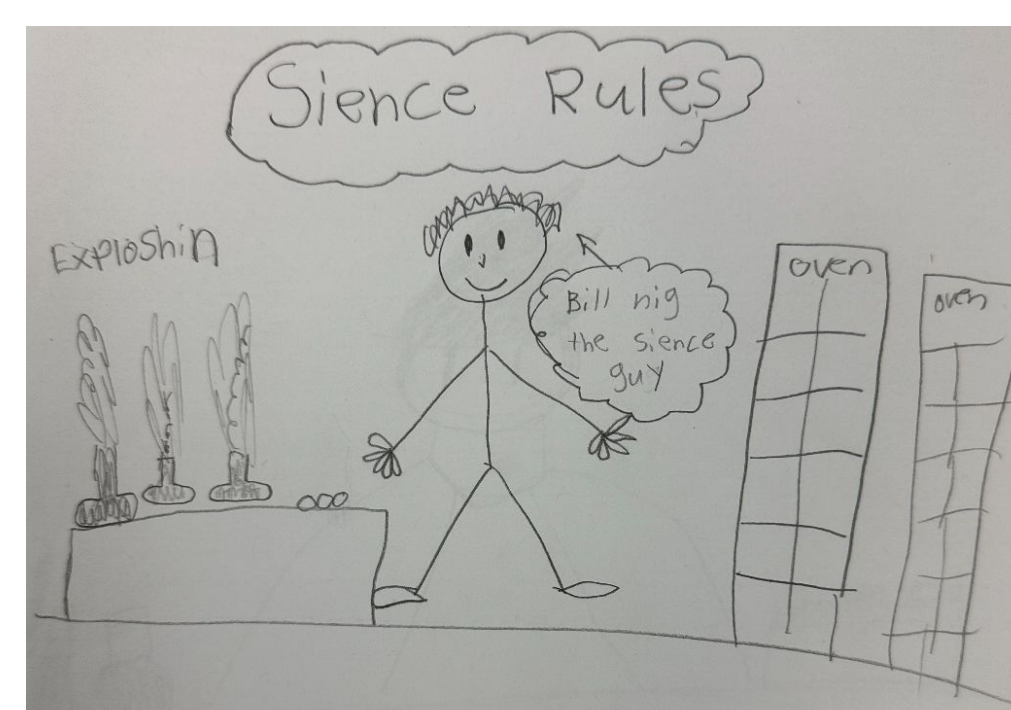
Research Question

Does program involvement and exposure to diverse college student mentors influence girls' perceptions of scientists?

Methods

Methods

Participants: The sample consisted of 1,069 2nd-6th grade students (41% girls); with a grade breakdown of: 246 third-graders (54.1% girls), 187 fourth-graders (55.1% girls), 304 fifth-graders (46.1% girls), 96 sixth-graders (49.0% girls). Our undergraduates served as mentors in the classroom (N=122) and their self-reported ethnic identification was 38% Asian; 2% Black; 41% White; 14% Latino/a; 5% not stated, and gender identification was: 27% males; 69% females; and 4% not stated.



Draw a Scientist Task (DAST)

Students allotted X minutes to draw a picture of a scientist

Qualitative Data Coding

Categories:

- **Person** - One / Multiple / No person
 - **Gender** - Male / Female / Can't tell
 - **Attitude** - Positive / Negative / Neutral / Can't tell
 - **Activity** - Doing an activity / Not doing an activity
 - **Location** - Inside / Outside / Can't tell
 - **Safety** - Safe / Dangerous / Can't tell
- * = Only coded if 'Doing an activity'

Who is in the picture?

Categories:

- **SciTrek (Lead OR Volunteer)**
- **Famous Scientist**
- **Themselves**
- **Other**

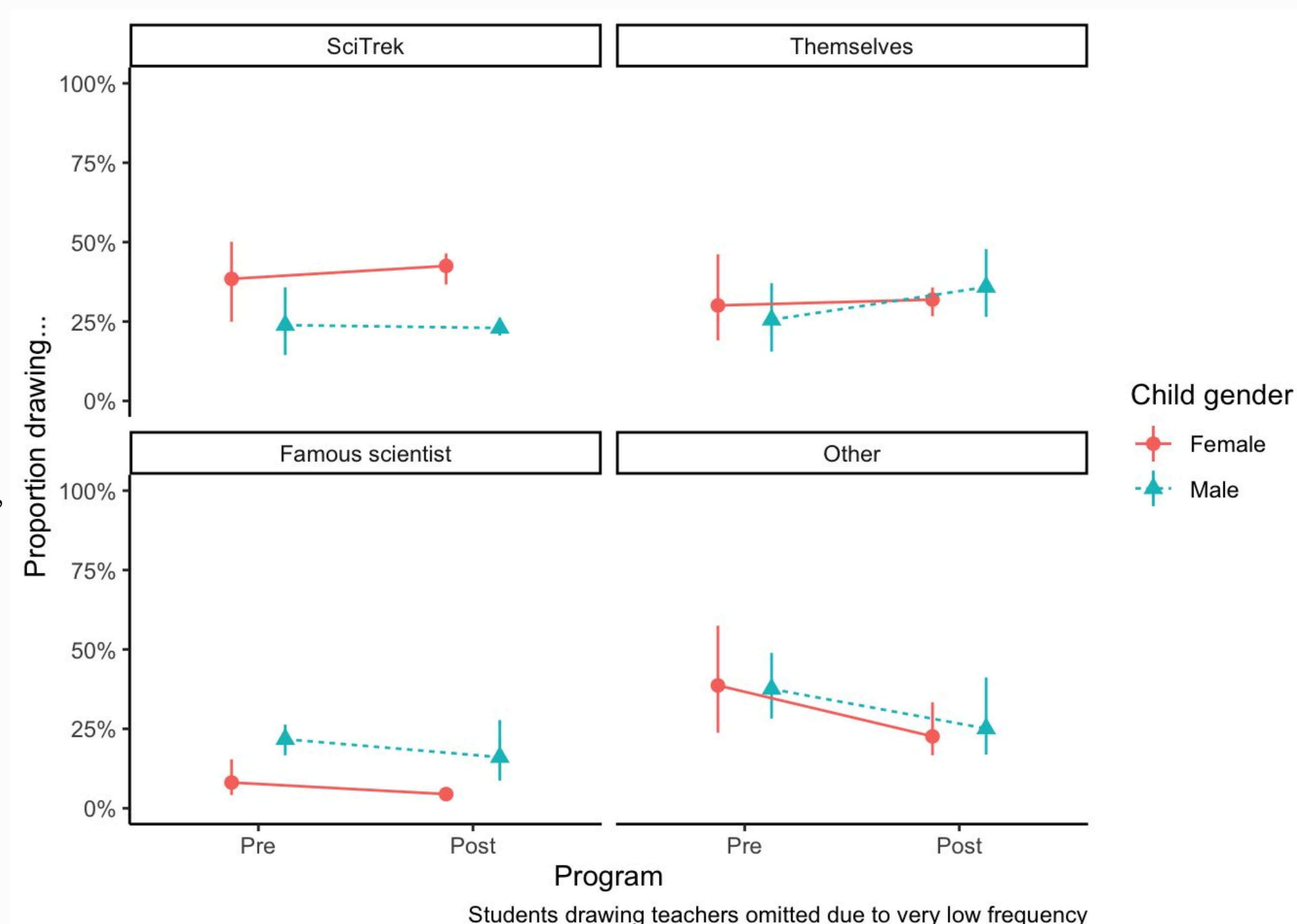
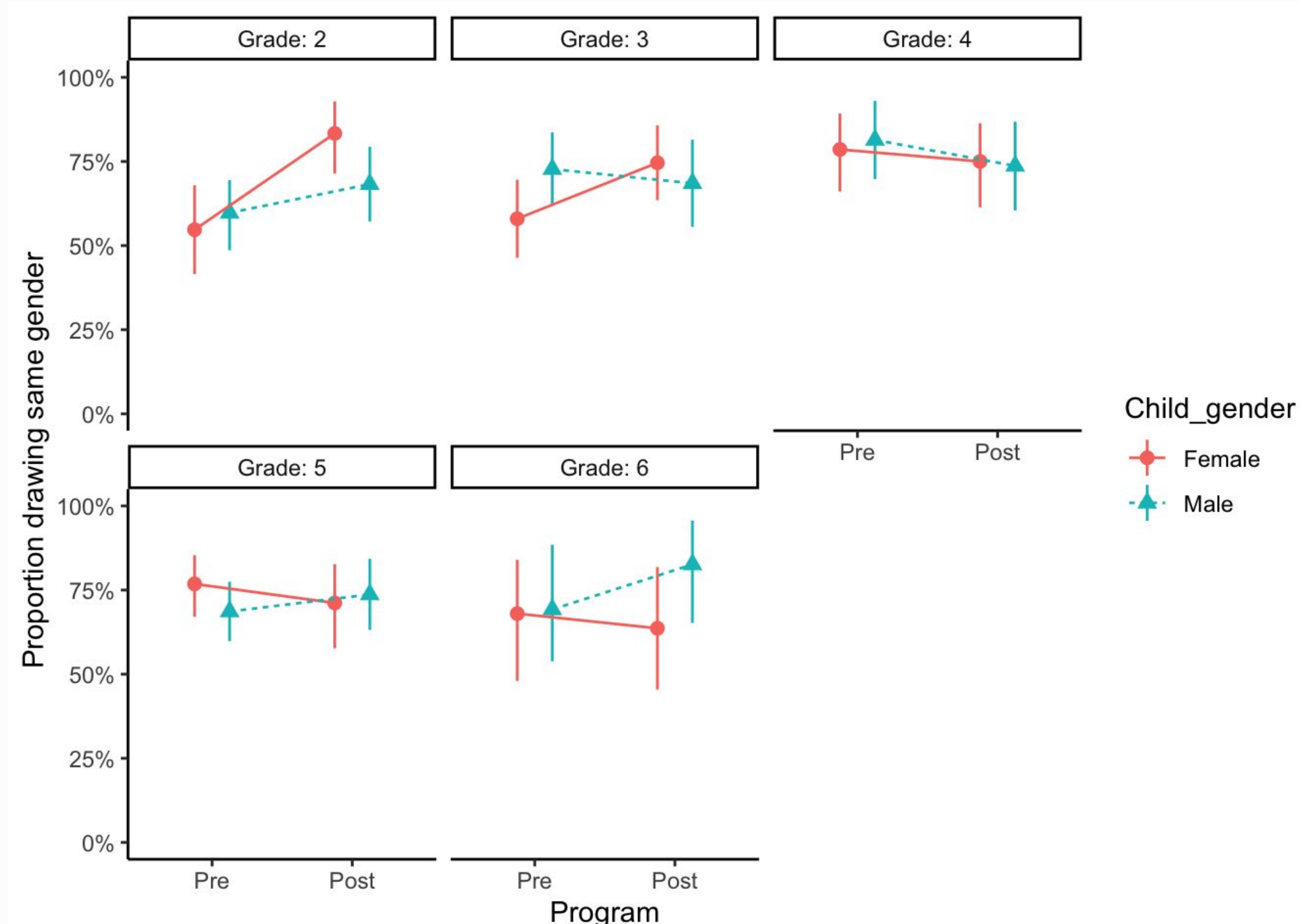
DAST Analysis 1: Did student's draw a scientist that matched their own gender?

We conducted a generalized linear mixed model, with 2 (gender; girls vs. boys) × 2 (program; pre vs. post) × 4 (grade; 2nd vs. 3rd vs. 4th vs. 5th) design predicting the likelihood that a student would depict: a scientist matching their own gender. The analysis revealed no significant main effects, but did show marginal interactions for program x grade ($\chi^2 = 9.09, p = 0.059$); and group x gender x grade ($\chi^2 = 8.37, p = 0.079$). Examining the results suggests that 2nd and 3rd grade girls drew women as scientists more often than boys, but this rate decreased between grades 4 and 6. 2nd, 5th, and 6th grade boys drew men as scientists more than girls, but this rate declines in grades 3 and 4.

DAST Analysis 2: Were there gender differences in who they drew as their scientist?

We conducted a generalized linear mixed model, with 2 (gender; girls vs. boys) × 2 (program; pre vs. post) design predicting the likelihood that a student would depict: (i) a scitrek volunteer; (ii) themselves or (iii) a famous scientist. The analysis for (i) scitrek volunteer revealed only a significant main effect of gender ($\chi^2 = 8.57, p = 0.003$); for (ii) themselves there were no significant differences, and for (iii) famous scientists revealed only a significant main effect of gender ($\chi^2 = 10.59, p = 0.0001$). Examination of the graph shows that females were more likely to draw a SciTrek volunteer compared to males, and males were more likely to draw a famous scientists compared to females.

Results



Qualitative Analysis

SciTrek Volunteers Mentoring Experiences: How did it feel to mentor the K-12 students?

"Not only did I teach them about science, but I talked to them about career aspirations and school, and gave them .. advice on their path to University."

"The students really needed someone to show them that they are capable and intelligent. It was definitely a challenge, ...many of them had the belief that they weren't intelligent and were bad at science.... I wanted to really instill in them a belief that they could become scientists, ... I know I didn't always believe in myself, especially in stem as a young girl, and I don't want the assumptions that society and that we internally make to effect the students esteem and confidence in their future as it has mine."

"The classroom was predominantly Latino students, and as a Latino I felt that the students could more easily envision themselves as scientists too."

Discussion

- Girls were more likely to draw SciTrek volunteers than boys, and boys were more likely to draw more famous or well known scientists.
- These findings suggest mentors who align with underrepresented groups, like women in STEM, could foster higher science interest in girls, combat their decline in science identity, and promote greater female interest in STEM in the future.

Future Directions

Some research has investigated time and gender in mentor relationships as a factor which may affect the influence an educational program has on adolescents, with longer mentor-mentee relationships benefitting girls more than boys (Rhodes et al., 2008). Length and quantity of SciTrek modules may have interesting results regarding its effects between male and female students.

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