Welcome to the NGCP National Webinar

Connecting Out-of-School-Time Activities and Student Interest in STEM
Vision

The National Girls Collaborative Project brings together organizations committed to informing and encouraging girls to pursue careers in science, technology, engineering, and mathematics (STEM).
NGCP Goals

1. **Maximize access** to shared resources within organizations interested in engaging girls in STEM.

2. **Strengthen the capacity** of programs by sharing exemplary practice research and program models.

3. **Use the leverage of a network** to achieve gender equity in STEM.
NGCP Model Activities

Virtually:
- Distribution and Content Projects
- *The Connectory – Collaboration Tool*
- FabFems – *Role Model Tool*
- E-Newsletter and Social Media
- Webinars – *Exemplary Practices*

Local Collaboratives:
- Professional Development: *Conferences and Forums*
- Incentives to Collaborate: *Mini-Grants*
- Newsletters and Local Resources
National Network of Collaborative Teams

[Map showing existing collaboratives across the United States]

[Group photo of participants]

[Photo of participants in a collaborative project setting]
Speakers

Susan Sunbury

Jacqueline Doyle
Connecting Out-of-School-Time (OST) Activities and Student Interest in STEM

Susan Sunbury, Ed.D. and Jacqueline Doyle, Ph.D.
February 26, 2020
Female Representation in Out-of-School Time Science (FROSTS)

- Advance understanding of female representation in out-of-school time (OST) activities

- Identify and test the OST-related factors that are hypothesized to strengthen interest, identity and career interest in STEM, particularly for female students

- For this webinar, we will focus on STEM interest
Evaluating large-scale and long-term impacts of OST activities

• Evaluation efforts often:
  • occur on a program-by-program basis
  • have small numbers of subjects limiting statistical power
  • use measures of short-term student satisfaction

• Longitudinal studies can:
  • be expensive
  • take a long time
FROSTS
a retrospective cohort study

• Large scale - can obtain representative samples
• More generalizable than small-scale evaluations of specific programs
• Can test the strength of multiple hypotheses
• Can be completed in a short time frame
The FROSTS survey

• Asked students to recall earlier experiences
• Questions based on review of relevant literature, survey of stakeholders and survey students
• Survey pilot tested then sent to over 30,000 students in compulsory first-year courses (English/writing)
• Schools chosen from a stratified random sample of two-year and four-year community colleges and universities
Final nationally representative sample
15,725
Survey questions

• Comprehensive survey - 33 questions (20 minutes)
  • STEM interest
  • STEM identity
  • Career interest and motivation
  • Participation in OST activities – structured and unstructured
  • Subjects taken in school/grades/scores
  • Family interest and involvement in STEM
  • Access and barriers to participation
  • Demographics
Measuring STEM interest

at the end of middle school
and again at the end of high school

<table>
<thead>
<tr>
<th></th>
<th>Not interested At all</th>
<th>Extremely Interested</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
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<td>2</td>
<td>3</td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Science</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Engineering</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Computing</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Types of STEM activities (examples)

<table>
<thead>
<tr>
<th>Activity</th>
<th>5-8</th>
<th>9-12</th>
<th>This activity increased my interest in STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM-related extracurricular clubs/teams at school</td>
<td>0</td>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>STEM-related clubs/teams outside of school</td>
<td>0</td>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>Group organization (e.g., Girl Scouts, Boy Scouts, 4H)</td>
<td>0</td>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>Maker/DIY STEM activities/events</td>
<td>0</td>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>Overnight STEM programs (museums, science centers etc.)</td>
<td>0</td>
<td>0</td>
<td>O</td>
</tr>
</tbody>
</table>
Opportunities within STEM activities (examples)

<table>
<thead>
<tr>
<th></th>
<th>I experienced this STEM opportunity</th>
<th>This opportunity increased my interest in STEM</th>
<th>This opportunity showed the real-life relevance of STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interacting with a STEM mentor</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Interacting with a STEM role model</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Taking on a leadership role</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Participating in hands-on STEM activities</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Using STEM equipment to collect data</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Learning about STEM careers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
How effective is “this increased my interest”?

• We built models predicting increases in five types of interest (each of the four in the question, plus an “overall STEM interest” which is indicated by the highest score in any interest), based on:
  • Whether they did the activity in question
  • Their gender

• Deliberately simplistic model that seeks to measure the size of an effect more than explain why it happens with covariates
How effective is “this increased my interest”?

• Significance (p-values) needed to get adjusted for the large number of models and variables we were processing independently
• The direct effect of “doing the activity” was never significantly different from zero
• For those who said the activity increased their interest in STEM, doing the activity had varying effects, depending on WHICH type of interest we were predicting
Interact with someone in STEM career

9% part, 71% inc.
Barriers to involvement

Q20. If you did NOT attend any STEM programs/activities outside of school, please indicate why. Mark all that apply.

- I didn’t know STEM opportunities were available in my area
- I looked, but there were no STEM opportunities available in my area
- STEM opportunities were available but I didn’t have the time (other commitments: work/home/other activities) to attend
- STEM opportunities were available but I didn’t have the resources (transportation/finances) to attend
- STEM opportunities were available but I was not interested in the specific topics offered
- STEM opportunities were available but I was not interested in STEM
- STEM opportunities were available but I didn’t feel welcome/comfortable attending

Unknown
Unavailable
No time
No resources
Not interested in that topic
Not interested in STEM
Felt unwelcome
Effect sizes are Cohen’s $h$ differences in proportion

** $p < 0.01$  
*** $p < 0.001$
Discussion question

What actions can you take as a result of what you learned/heard at the webinar?

What questions still need to be answered, but require additional research?
Thank you

Any questions?

This work was supported by NSF Grant Nos. 1612375 and 1611985. Any views are the authors own and do not necessarily reflect the views of the National Science Foundation.
Upcoming NGCP Webinar

The STEM Effect: A collaborative action agenda for understanding the long-term impacts of STEM programs on girls

Wednesday, March 25, 2020
11:00am Pacific | 2:00 PM Eastern
'Citizen science'

13% part, 8.9% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...
Designing and carrying out own STEM project

4.0% part, 73% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...

STEM | Science | Eng. | CS | Math
Extracurricular clubs

31% part, 32% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...

STEM  Science  Eng.  CS  Math
Interact with someone in STEM career

8.9% part, 71% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...
Interact with STEM mentor

6.7% part, 55% inc.
Interact with STEM role model

4.9% part, 81% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...
- STEM
- Science
- Eng.
- CS
- Math
Internships

13% part, 17% inc.

Predicted Increase in Interest (s.d.)

Interest in...

STEM | Science | Eng. | CS | Math

Significance @ p < 0.05

Gender

Male | Female

Male | Female
Learning about STEM careers
8.5% part, 65% inc.

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Black: Male
- Triangle: Female

Gender
- Male
- Female

Predicted Increase in Interest (s.d.)

Interest in...
- STEM
- Science
- Eng.
- CS
- Math
Participating in hands-on STEM activities

8.3% part, 64% inc.

Predicted Increase in Interest (s.d.)

Interest in...

STEM  Science  Eng.  CS  Math

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female
Participating in programs w/art or design

4.1% part, 73% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...

STEM | Science | Eng. | CS | Math
Presenting STEM data/info to others

5.2% part, 52% inc.

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Predicted Increase in Interest (s.d.)

Interest in...

STEM  | Science  | Eng.   | CS    | Math
Science fairs

33% part, 17% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...

STEM  Science  Eng.  CS  Math
STEM Cafes

13% part, 9.6% inc.

Predicted Increase in Interest (s.d.)

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

Interest in...

STEM
Science
Eng.
CS
Math
Taking on a leadership role

6.9% part,
51% inc.
Using STEM equipment to collect data

4.4% part, 56% inc.

Predicted Increase in Interest (s.d.)

Interest in...

- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female

[Graph showing data with various interest areas and significance levels]
Volunteering in STEM setting

19% part, 29% inc.

Predicted Increase in Interest (s.d.)

Interest in...

Interest
- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05
- Male
- Female

Gender
- Male
- Female
Working with older STEM students

3.8% part, 71% inc.

Predicted Increase in Interest (s.d.)

Interest

- STEM
- Science
- Eng.
- CS
- Math

Significance @ p < 0.05

- Male
- Female

Interest in...

STEM | Science | Eng. | CS | Math