Welcome to the NGCP National Webinar

Recognition: The Key Piece of Identity Development Framework

Wednesday, April 29, 2020

Please respond to the poll below:

NATIONAL GIRLS COLLABORATIVE PROJECT

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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).

NATIONAL GIRLS COLLABORATIVE PROJECT

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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.

NATIONAL GIRLS COLLABORATIVE PROJECT

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NGCP 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 GIRLS COLLABORATIVE PROJECT

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National Network of Collaborative Teams

NATIONAL GIRLS COLLABORATIVE PROJECT

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SciGirls

scigirlsconnect.org
pbskids.org/scigirls

SciGirls is an Emmy Award-winning PBS Kids show funded by the NSF that

- Features *real* girls doing STEM investigations they're passionate about;
- Highlights science and engineering processes;
- Features *real* female STEM professionals as role models and mentors

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Rationale

Why do we still care about girls and STEM?

- Boys and girls do not display a significant difference in their **abilities** in STEM. The cause is social and environmental.
- Differences consistently appear in girls' **interest** and **confidence** in STEM subjects, starting at a very young age.
- These differences can be linked to a **negative self-perception**, enhanced by stereotypes.

SciGirls

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The *SciGirls* Approach

On TV
- National PBS Kids series – Seasons 1-5 are airing now Season 6 in is production (funded by NASA)

Online
- A PBS Kids website with videos, games and role model profiles (pbskids.org/scigirls) and on the PBS Kids Video App

On the Ground
- STEM activities and professional development for 200+ partners and 3,600 trained educators, and hundreds of *SciGirls-affiliated* role models on *FabFems*.

SciGirls

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SciGirls Research to Practice Model

- *SciGirls* uses **research-based strategies** proven to engage girls in STEM to create media + outreach programs
- Five PBS seasons feature STEM role models working with real girls on **meaningful STEM projects**
- ***SciGirls* CONNECT** has trained over 3,600 educators in gender equitable teaching strategies, resulting in more than 1,600 youth programs for 101,000 girls (and boys!)

SciGirls

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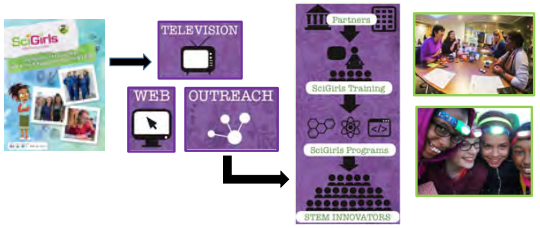
SciGirls Research to Practice Model



SciGirls

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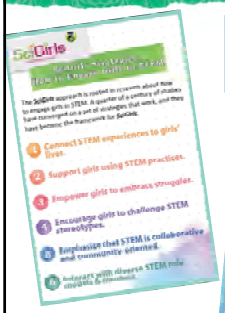
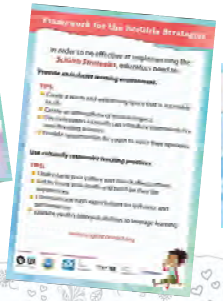


Our approach is grounded in research-based strategies that motivate girls around STEM engagement and include:



SciGirls

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Download videos, activities, and other resources to enhance your program!

scigirlsconnect.org

SciGirls

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SciGirls

CONNECT2 Research Team

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MAGNETIC FIELD LABORATORY

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Goal: To determine how SciGirls programming influences youths' STEM identity

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Identity

Sense of belonging and **perceptions of future success**

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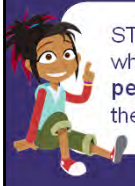

STEM Identity is **positively developed** when youth have **opportunities to perform their STEM competence** and they are **recognized by perceived experts**

Carlone and Johnson, 2007; Calabrese Barton et al., 2013

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The important **role of recognition** in developing STEM identities has resulted in calls to better understand how particular educational spaces, such as all-girls informal STEM camps, **support positive STEM identities**

Center for Advancing Informal Science Education, 2019

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Mixed Methods Study

- **N = 148 youth** (141 Female, 5 Male, and 1 Other)
- **Pre/post survey data of youth at 11 study sites** that measures STEM identity
- Observations of program components in **three site-based case studies**
- **Interviews** with educators, students, and parents from case study sites

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Demographics

Characteristics	N	Percent
Race and Ethnicity		
Asian	13	9%
Black or African American	35	24%
Hispanic or Latino/a	25	17%
White	70	47%
Other Race or Ethnicity	15	10%
Grade		
5th	29	20%
6th	36	25%
7th	52	36%
8th	21	15%
9th	6	4%
Enrolled in honors or advanced classes	86	59%

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Survey Data

Measured for:

- **STEM Identity**: Internal and external perception of oneself as a STEM person (*Aschbacher et al., 2010; AWE, 2008)
- **STEM Self-Efficacy**: Self confidence, openness to challenge, and willingness to learn*
- **STEM Capital**: Support and access to STEM resources (Archer et al., 2015)

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STEM Self-Efficacy Subscales

- **Self Confidence**: Confidence in STEM competence – *"I can understand difficult ideas in school"."*
- **Openness to Challenge**: Confidence in working through difficult concepts and teaching STEM concepts to others – *"When an assignment turns out to be harder than I expected, I usually don't complete it."* *(Reverse Coded)*
- **Willingness to Learn**: Enjoyment of learning in school – *"I like learning how things work."*

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STEM Identity Subscales

- **Self Perception**: Seeing oneself as a STEM person or someone who is competent in STEM – *"Science is an important part of who I am." or "Being a scientist is an important part of my identity."*
- **External Perception**: Believing that others see one as a STEM person or someone who is competent in STEM – *"Many people think of me in terms of being a scientist." or "Other people think doing science is important to me."*

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Results: Demographics

- **No significant differences** by race, ethnicity, gender, STEM capital, or enrollment in honors/advanced classes
- **Significant decrease by grade** in school

	Δ STEM Self-Efficacy		Δ STEM Identity	
	β	SE	β	SE
Gender	0.169	0.131	-0.171	0.260
Asian	-0.026	0.091	0.130	0.236
Black or African American	-0.013	0.073	-0.007	0.155
White or Caucasian	-0.085	0.063	-0.023	0.134
Hispanic or Latino/a	-0.113	0.072	0.165	0.147
STEM Capital	0.001	0.002	-0.002	0.005
Enrollment in honors/advanced classes	-0.003	0.053	-0.021	0.111
Grade	0.007	0.024	**-0.121***	0.049

* = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$

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Results: Program Type

- **No overall significant differences** in changes in STEM Identity or STEM Self-Efficacy
- **Magnitude of the change was largest for STEM Identity in afterschool programs**, indicating a need for more research into programmatic differences

	After School Programs		Summer Camps	
	Mean	SD	Mean	SD
Change in STEM Self-Efficacy	0.02	0.32	0.04	0.24
Change in STEM Identity	**0.26**	**0.75**	0.08	0.48

* = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$

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Results: Key Outcomes

- Considering **STEM Identity and STEM Self-Efficacy**, **only STEM Identity** had significant changes overall
- **Changes in STEM Identity** appeared to be largely **driven by changes in External Perception** (only subscale with significant changes)

	Mean Pre	Pre SD	Mean Post	Post SD	d
STEM Self-Efficacy	**4.1**	**0.51**	**4.1**	**0.56**	**0.07**
Self Confidence	3.9	0.66	4.0	0.66	0.10*
Openness to Challenge	4.0	0.65	4.0	0.65	0.03
Willingness to Learn	4.3	0.52	4.3	0.59	0.00
STEM Identity	**3.5**	**0.87**	**3.6**	**0.87**	**0.14***
Self-Perception	3.8	0.84	3.8	0.86	0.02
External Perception	3.3	0.99	3.5	0.96	**0.20****

* = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$

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Changes in External Perception

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Major Quantitative Findings

- Significant **increases** in **External perception** scores resulting in increased **STEM Identity**
- **As students get older, they are less likely to see increases in STEM Identity**

External Perception

Youth's perceptions of how others view them as STEM people

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Qualitative Data

- **Observations at three summer camp sites** focusing on **STEM identity changes** using:
  - Interviews with youth and educators
  - Video recordings of activities

	Fun with Engineering	Marine STEM	Energizing STEM
# of participants	23	20	10
Length	2-day camp	5-day camp	5-day camp
STEM capital mean	5.2	11.1	4.8

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Confidence Building Spaces

- Each camp gave girls **opportunities to perform** and **be recognized for other salient identities**
  - Dancer, artist, communicator
- Marine STEM and Energizing Energy camps ended their day with **"shout-outs"**
  - Focus was on STEM performances and other identities
- These opportunities gave the girls **confidence to perform STEM identities**

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Recognition Events

- Focused on **group activities** where girls could **verbally perform** STEM competencies and be recognized
  - Introductions to lessons/challenges
  - Presentations/discussions of results
  - Q&A sessions with role models
- **"Expert" was the teacher or role model** in activities, so we focused on their responses to girls' performances
- **Recognition varied** by who was called on, how often, who engaged in scientific conversations with experts

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The Role of Recognition

- **To feel a sense of belonging**, youth need to have **opportunities to participate in the practices of science** (using logic, thinking creatively, building on prior knowledge, and/or making deductions)
- Activities that call for **varying levels of science practices**
  - **Call and Response** (simplest) – "*What is the name of this tool?*"
  - **Demo of competence and interest** (not full scientific practices): Youth initiated science focused questions – "*How do you clean the coral?*"
  - **Science conversations:** Youth and experts build off of each others

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Example: Building Off of Ideas

Educator: *[showing the dolphin and manatee skulls] look at the eye sockets, look at where the brain might fit. All right. And these will be up here later for you all to touch. So they are pretty awesome. Yeah, what's your question?*

Sue: *The manatees teeth almost remind me of, of our molars.*

Educator: *Yes, human molars, Right? And we use those back teeth to crush all the salads that you girls have eaten, right? Yeah.*

Brandi: *Another difference is the fact that the dolphin has a long, thin, mouth and the manatee has a short mouth.*

Miss A: *Yes, **You're absolutely right**. Okay. So we can pretty much tell the difference between a dolphin and a manatee.*

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Example: Deduction

Educator: *Now these tales look a little bit strange. Can someone tell me what they think has happened or why these tails look so weird?* [**Kali**, Becky, Sam, Olive, **Alice**] *Yes.*

Sam: *Maybe boat strikes.* [**Alley** and **Alice** hands up]

Educator: *Yeah. Okay, so maybe boat strike. Both these animals have big chunks out of their tail missing what else is going on?* [Becky, **Kali**, **Alley**]

Alley: *Maybe they got tangled in fishing net.*

Educator: *Okay, so maybe they got entangled in a piece of fishing net and a piece of their tail might have come off. What's a natural predator of dolphins?* [**Kali**, Becky, **Alice**]

Kali: *Sharks.*

Educator: *So sometimes they get into a little bit of a fight. Um, so all these things could have happened. Now with all that in mind, would you send someone out to assess the situation and see if these animals are okay? Thumbs up if you think yes [girls vote], thumbs down, if you think no [girls vote]. Okay. I want you to take a closer look at these tails.*

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Future Plans

- **Currently analyzing**
  - Activities to determine how girls performed their competence and how they persisted in their performances across the camp
  - How the girls were recognized by educators to see how this influences girls' STEM identity
- **Look for publications in 2021!**

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Conclusions

- **Informal STEM programs can positively impact girls' STEM identities**
  - Multi-day programs = more opportunities to engage in scientific practices
- Performing **non-STEM identities** helped girls to feel **more confident to try STEM performances**
- **Recognition is key** to STEM identity development
  - **Requires educators to be self-reflective** as to who is trying to be recognized and how all personalities (e.g. introverts) can be recognized
- **Creating a variety of opportunities for girls to practice thinking like a scientist will improve their sense of belonging in science**

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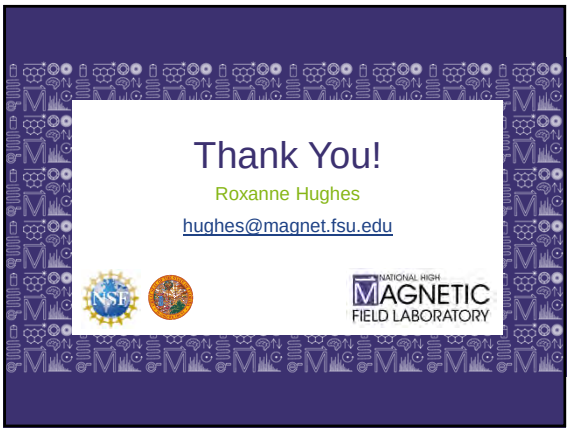
Thank You!
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Upcoming NGCP Webinar
Making STEM Meaningful for Girls
Wednesday, May 6, 2020
11:00am Pacific | 12:00pm Mountain | 2:00pm Eastern
Register on the NGCP Website
SciGirls
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